



Universidad
Rey Juan Carlos

TESIS DOCTORAL

FIAT LUX & Crony Capitalism

*The impact of monetary policies & public incentives on the
automobile industry in the USA & Europe from 2001 to 2018*

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**Programa de Doctorado en Ciencias Sociales y Jurídicas
Escuela Internacional de Doctorado**

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*To my Parents
and to Vanesa*

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*“The struggle for freedom is ultimately
not resistance to autocrats or oligarchs
but resistance to the despotism of public opinion.”*

Ludwig von Mises (1957, p. 66)

Abstract

This doctoral thesis focuses on evaluating the short-term and long-term effects of monetary and fiscal policies on the US-American & European automotive market in the period from 2001 to 2018, looking at the impact of excessive growth in bank credit, as well as of public interventions such as company bail-outs, scrappage campaigns, and public incentives for alternative fuel vehicles (AFVs). We will use political and economic theory on monetary and fiscal policies, paying particular attention to the Austrian Business Cycle Theory. Consequently, based on the findings of Mises (1940, 1957), methodological dualism and Praxeology, the science of human action, will be applied. We will use deduction in our research to come to general *a priori* conclusions. Moreover, we will use historic data to illustrate the appropriateness of our theoretical concept in regard to the analyzed events within the mentioned time period.

In the first part of the analysis, and by using tools such as capital based macroeconomics and the Hayekian triangle, we will evaluate the general economic effects of expansive monetary policies, referring primarily to the latest subprime-crisis in 2008-2009. The effects of expansive monetary policies and of public interventionism through fiscal policies will be evaluated in regard to their impact on the US-American and European automotive sector in the first decade of the 21st century. The limitations of empiricism are considered in our methodological approach. However, also econometric methodology based on Keeler (2001), Mulligan (2006), as well as Cachanosky & Lewin (2016) is depicted to interpret empiric results and to illustrate the validity of our theory, showing a strong correlation between money supply, interest rates and the stages of productions with the recently seen economic boom and bust cycles.

As for fiscal policies, the impact of public incentives such as scrappage campaigns will be critically evaluated. Ultimately, in the final section of our analysis, this thesis will examine the effectiveness of government incentives in promoting alternative fuel vehicles (AFVs) in Europe within the period from 2010 to 2018. Thus, the rather positive sales evolution of AFVs will be analyzed from an economic perspective, detecting whether the seen sales growth was mainly caused by actual customer demand or by governmental policies. The price competitiveness of AFVs will be evaluated, also raising the concern that such significant public incentives may ultimately be unsustainable from a macro-economic perspective, possibly leading to market distortion and a new artificial market bubble. Aiming to connect the dots, we evaluate the hypothesis that the seen expansive monetary policies and protectionist fiscal policies in the first decade of the 21st century were just as unsustainable for the automotive industry, as the recent boom of alternative fuel vehicle sales (mainly caused by public incentives) will be. Consequently, by analyzing the impact of credit expansions as well as of fiscal policies such as scrappage campaigns and public incentives for alternative fuel vehicles, we will explain how monetary and fiscal policies influenced the sales evolution of automotive OEMs in the USA and Europe within the years 2001 to 2018.

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List of Abbreviations

Abbreviation Explanation

ABCP	Asset-Backed Commercial Paper
ABCT	Austrian Business Cycle Theory
ACEA	European Automobile Manufacturers' Association
ADF	Augmented Dickey-Fuller test
AFVs	Alternative Fuel Vehicles
AGW	Anthropogenic global warming
B-EV	Battery-Electric Vehicle (Full-Electric Vehicle)
CCC	Cash Conversion Cycle
CEECs	Central and Eastern European countries
CO ₂	Carbon dioxide
Covid-19	Coronavirus disease 2019
DSGE	Dynamic stochastic general equilibrium framework
ECB	European Central Bank
EFTA	European Free Trade Association
EMU	European Monetary Union
ERE	Evenly rotating economy
EU	European Union
EVA	Economic value added
FCA	Fiat Chrysler Automobiles
FC-EV	Fuel-Cell-Electric Vehicle
FED	Federal Reserve
FIH	Financial Instability Hypothesis
FRB	Fractional Reserve Banking
FSB	Financial Stability Board
GDE	Gross Domestic Expenditure
GDP	Gross Domestic Product
GHG	Greenhouse gas (emissions)
GVA	Gross Value Added
H-EV	Hybrid Electric Vehicle
ICCT	International Council on Clean Transportation
ICEs	Internal combustion engines
IEA	International Energy Agency
IMF	International Monetary Fund
INE	Instituto Nacional de Estadística
IoT	Internet of Things

IRTS	Interest Rate Term Spread
LTCM	Long-Term Capital Management
NOx	Nitrogen oxide
OEM	Original Equipment Manufacturer
PEV	Plug-in Electric Vehicle
PH-EV	Plug-in Hybrid Electric Vehicle
PPF	Production Possibility Frontier
PRI	Pure Rate of Interest
QE	Quantitative Easing
RMS	Repair, maintenance and service
ROI	Return on investment
RV	Residual value
STR	Short-term interest rate
TARP	Troubled Assets Relief Program
TMS	True Money Supply (Metric)
TPB	Theory of planned behaviour
TCO	Total cost of ownership
USA	United States of America
VAR model	Vector auto-regression model
WLTP	Worldwide Harmonized Light Vehicle Test Procedure
WtC	Willingness to Consider' concept
WWII	World War II

1 Introduction

Since the end of World War II, the European automotive industry has generally shown a stable growth rate, only significantly hampered by the effects of the so-called '1973 oil crisis', the latest financial crisis ('subprime crisis') in the period from 2007 to 2009 as well as by the effects of the Covid-19 disease spread and consequent 'economic lockdowns' in the years 2020 and 2021 (ACEA, 2021). As this thesis is primarily focusing on the impact of monetary and fiscal policies, we consider the mentioned subprime crisis in the first decade of the 21st century as the economically most interesting of the mentioned periods. As a consequence of the economic bust in 2008 and to 'stabilize the economy', several monetary policies (such as 'quantitative easing') and fiscal policies (including scrappage campaigns and other public incentives) have been implemented by central banks and governments, ultimately causing market distortions and unsustainable economic effects such as prolonged periods of low interest rates, financial volatility and misallocation of resources (Alonso *et al.*, 2011).

In 2005, while finalizing an MBA program in London, I started to get more familiar with the ideas and economic concepts of Walter Eucken, Friedrich A. von Hayek, Ludwig von Mises and Israel Kirzner whose ideas raised my fascination for economic theories. In 2008, four months before the filing for 'Chapter 11 bankruptcy protection' by Lehman Brothers Holdings Inc., I had started working for General Motors Europe, the former European regional entity of General Motors.

Ultimately, the financial crisis led to General Motors Corporation's own filing for Chapter 11 bankruptcy protection, significantly hampering the company's strategic and operational abilities. Thus, as I had experienced the previous financial crisis directly as an employee of GM, I started to evaluate the impact of monetary policies and public incentives on the automotive industry, paying specific attention to the differing business cycle concepts and models of John M. Keynes (1923, 1936), Milton Friedman (1953, 1957, 1961, 1962, 1987) and Hayek (1931, 1932, 1939, 1941, 1969).

The popular explanation among politicians and journalists is, that laissez-faire - often also disrespectfully referred to as 'neo-liberal' - politics had deregulated the financial markets which ultimately led to the financial crash (Krugman, 2008; Piketty, 2014). Also Marxists, such as Michael Hardt and Antonio Negri, blame 'capitalism' for most economic evils of the past decades, considering it as a contradictory concept which is subject to a control by the dominant class and political elites (Hardt & Negri, 2017). This research intends to analyze the validity of this assumption, while also considering the opposite hypothesis that national governments and other institutions, such as the Federal Reserve and other central banks, as well as the US Congress and the European Union (EU) are the actual originators of the recent crisis.

Economists such as Huerta de Soto (2008, 2009b), Hülsmann (2010), Ravier (2011), Bagus *et al.* (2012), and Alonso Neira *et al.* (2013) argue that the main cause of the so-called subprime crisis of 2008 were the expansive monetary policies led by the Federal Reserve System, the European Central Bank and other central banks, by increasing the money supply while reducing interest rates to an often-unsustainable level. These actions are considered to have led to the heavy recessions seen in several economies between 2007 and 2009 (Huerta de Soto, 2009b). Based on Huerta de Soto, we argue that these policies also led to a significant crisis in the automotive industry which hampered several automotive manufacturers (herein referred to as 'original equipment manufacturers', abbreviated by 'OEMs'), ultimately accelerating General Motor's bankruptcy filing in 2009. However, instead of ending mentioned ultra-loose monetary policies, several governments and central banks - in particular the US-American Federal Reserve - increased the money supply from 2007 onwards, with the aim to boost the economy, helping stimulate investments and consumption (Huerta de Soto, 2009b; Ikenson, 2011; Bagus *et al.*, 2012; Alonso Neira *et al.*, 2013).

1.1 Main Problem Statement & General Research Objective

Our main research question, which can also be seen as the central theme of this thesis, is:

'How did monetary and fiscal policies influence the sales evolution of automotive OEMs in the USA and Europe within the years 2001 to 2018, analyzing the impact of credit expansions caused by central banks as well as by evaluating the impact of fiscal policies such as scrappage campaigns and public incentives for alternative fuel vehicles?'

Table N°1: Research Objectives

Chapter 4 of this thesis will focus on responding to the following 5 major research objectives:

N°	Research Objectives
1	Define the impact of increased money supply (facilitated by low reserve-ratio requirements in a fractional-reserve banking system) on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.
2	Specific analysis of the impact of artificially low interest rates (below the 'natural rate of interest') on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.
3	Evaluation of the impact of so-called 'scrappage campaigns' on the automotive sales evolution in Europe and the USA in the period from 2009 to 2012.
4	Evaluation of the impact and effectiveness of public incentives for AFVs on the vehicle sales evolution in Europe in the period from 2010 to 2018.
5	Critical evaluation of the sustainability and market competitiveness of the AFV technology without public incentives.

(Author's own design)

Based on von Mises (1949, 1957) we will use Praxeology, the science of human action, to obtain deduced propositions which are true *a priori*. We intend to illustrate the validity of the theoretical assumption that public interventionism into the market process is always unsustainable, leading

to the misallocation of resources and corresponding harmful market distortions (Mises, 1934, 1940; Rothbard, 1962; Huerta de Soto, 1998, 2005). Consequently, we will evaluate whether the expansive monetary policies and fiscal stimulus packages seen from 2001 to 2009 were harmful and unsustainable for the automotive industry, distorting the free market process. If our research positively confirms this hypothesis, we may conclude that all types of public interventionism will have a negative long-term effect on the economy, for which a corresponding bust is likely to occur. Accordingly, when looking at the recent increase of public incentives for alternative fuel vehicles (AFVs), we will evaluate whether the recent sales increase of AFVs was mainly caused by mentioned public incentives, as such market distortion could likely lead to another unsustainable market bubble. We will analyze the impact of credit expansions and fiscal stimulus packages (including scrappage campaigns) on the general automotive sector, as well as of public incentives for alternative fuel vehicles. By doing so, we will explain how monetary and fiscal policies have influenced the sales evolution of automotive manufacturers (herein referred to as 'OEMs' as for 'original equipment manufacturer') in the USA and Europe within the years 2001 to 2018.

The time period from 2001 to 2018 is chosen for the following reasons: In 2001 the U.S. central bank cut its federal funds rate, the interest rate banks charge each other on overnight loans, a total of 9 times, decreasing it from 6% in January 2001 to 2.5% at year-end (Alonso Neira *et al.*, 2013). A main hypothesis raised and evaluated in this study is whether this significant decrease caused the financial crisis seen in the year 2008. The time period analyzed in this thesis ends in 2018, ten years after the mentioned financial crisis and the filing for bankruptcy of Lehman Brothers Holdings Inc. Moreover, in 2018, according to the Norwegian Road Traffic Information (OFV), 49.1% of the 147,929 new passenger cars registered in Norway were 'plug-in electric vehicles', which includes so-called all-electric and plug-in hybrid vehicles. In the second half of 2018, more than 50% of all new passenger car sales in Norway were 'plug-in electric vehicles', for which 2018 must be seen as the year in which alternative fuel vehicles (AFVs) have become 'mainstream' products in at least one country belonging to the European Free Trade Association (EFTA). In addition, the Worldwide Harmonized Light Vehicle Test Procedure (WLTP) was introduced in September 2018, which can be defined as a mandatory measurement of fuel

consumption and CO2 emissions for passenger cars and light commercial vehicles. Vehicles must meet the corresponding standards, in order to be legally sold in Europe. Consequently, the introduction of mentioned WLTP can be seen as another relevant milestone of public interventions, implemented to better monitor negative externalities caused by motor-powered vehicles.

In the first part of our analysis, we plan to detect whether mentioned financial and economic crisis allows us to illustrate the validity of the Austrian Business Cycle Theory (Mises, 1912, 1934; Hayek, 1939, 1941; Huerta de Soto, 1998; Garrison, 2001), properly showing how expansive monetary policies can cause boom-and-bust cycles. Based on Ikenson (2011), McMaken (2018), Salerno (2015) and Schnabl (2011, 2015), we then intend to demonstrate to which extent not only the European, but even more so the US-American automotive industry, were heavily affected by the economic crisis. Thus, we will evaluate the interconnection between public interventionism and expansive monetary policies with artificial credit expansions by central banks on the one hand, and the corresponding unsustainable distortion of the automotive sector on the other hand. Consequently, the initial key research objective is to define the impact of expansive monetary policies on the automotive sector as well as to detect the impact of artificially low interest rates (below the 'natural rate of interest') on automotive sales in Europe and the USA in the period from 2001 to 2008. We will then analyze fiscal stimulus packages and other public interventions implemented in the peak of the financial crisis to avoid a major wave of bankruptcies and lay-offs in the automotive sector (Ikenson, 2011; McMaken, 2018; Salerno, 2015). These public activities included bailouts and scrappage programs. Particularly in regard to fiscal policies, such as the mentioned scrappage campaigns, our findings shall give a critical evaluation of their long-term effects, not only from a macroeconomic perspective, but also to analyze whether in fact such protectionism has most significantly hampered precisely those automotive OEMs which the governments planned to protect, by keeping them from proactively investing into future-oriented products, as well as into competitive internal processes and structures (McMaken, 2018; Salerno, 2015). The outcome of our study could be used by public institutions to critically reconsider the efficiency of these fiscal stimulus packages, but also by automotive OEMs to adjust their sales strategies to business cycles and potential new economic crisis.

In the final part of Chapter 4, we will evaluate the effects of public incentives for alternative fuel vehicles (AFVs) on automotive sales in selected European countries such as Norway, the Netherlands, Germany, and Spain between the years 2010-2018. The most relevant findings of this section were illustrated by the author in his academic paper '*The Subsidized Green Revolution: The Impact of Public Incentives on the Automotive Industry to Promote Alternative Fuel Vehicles (AFVs) in the Period from 2010 to 2018*', which was published in a special issue of the peer-reviewed, open access journal *Energies* (Reimers, 2021). The impact of the transport sector on climate change and energy-related greenhouse gas (GHG) emissions has become a major aspect of political discussion throughout the past years (Axsen *et al.*, 2015; Brand *et al.*, 2013; Hartmann, 2018). Vehicles run by fossil fuels like petroleum products such as gasoline, diesel fuel or fuel oil are not only criticized for mentioned global GHG emissions, but also for causing noise and local air pollution, hampering people's health, in particular in urban environments (Dudenhöffer, 2016, 2019; Brand *et al.*, 2013; Gass *et al.*, 2013). Moreover, governments of several EU-member states have criticized the car-related petrol and diesel demand for having created a strong dependence on foreign energy sources, depending on providers from non-EU and non-NATO countries (Brand *et al.*, 2013).

Primarily based on these reasons, national and local governments in Europe, but also in other parts of the world, have adopted a wide range of measures to increase the use of alternative fuel vehicles (AFVs). Already in 2010, a total of 16 of the EU member states had implemented a tax and/or purchase incentive related to vehicle engine fuel types (ACEA, 2011). Particularly throughout the past decade, a thorough transition towards the usage and production of renewable energies has been incentivized by public and multinational institutions.

In the EU, the patchwork of initiatives, legislations and incentives on local and national level has been changing significantly within the 21st century, and is expected to continue doing so in the near future (Sinn *et al.* 2019). Already by 2012, countries like Denmark, France, Germany, Ireland, the Netherlands, Portugal and the UK had implemented their own initiatives (Drossinos *et al.*

2017). Meanwhile, Norway, which has been seen as the benchmark in regard to AFV incentives, offered a combination of purchase tax exemption and local user benefits (Skonhoft *et al.*, 2014).

Several studies indicate that there are crucial environmental, consumer fuel-saving, and macroeconomic benefits (Achtnicht, 2012; Nealer, 2015) associated with alternative fuel vehicles which are said to exceed the costs of electric vehicle incentives (Greene *et al.*, 2014). Moreover, it is expected that throughout the next decades, public incentives for AFVs can be reduced due to the ongoing optimization of these vehicle technologies, not only in regard to their production costs but also regarding their driving range, which will naturally increase their competitiveness (Lutsey N. S., 2015a). Meanwhile, public subsidies and taxation reductions implemented for electric vehicles in several European markets have been substantial within recent years (Axsen *et al.*, 2015; Carlucci *et al.*, 2018; Dudenhöffer, 2016).

Governments have increased this market growth through a combination of financial incentives, other incentives such as parking and lane access, as well as by supporting charging infrastructure, training/education and outreach activities (Lutsey N., 2015b). Consequently, in particular in Norway and the Netherlands, incentives have made up a significant portion of the total vehicle cost (Kok, 2015; Mock *et al.*, 2014). However, AFVs still face relevant barriers to adoption, barriers which are common to most new technologies, such as the lack of knowledge by potential adopters, a low consumer risk tolerance (Jaffe and Stavins, 1994; Stoneman & Diederer, 1994), as well as high initial production costs (Buller *et al.*, 2009; Epple, 1995).

1.2 Main Scope of the Thesis

Table N°2: Analyzed Scope & Main Topics

Scope	Topic	Analyzed Aspect	Main Effect	Region	Period
N°1	Monetary Policy	Money supply increase	Currency devaluation -> Price inflation	USA & Europe	2001-2008
		Low market interest rates (below 'natural rate')	Increase of investments (in early stages of production)		
N° 2	Fiscal Policies/ Public Incentives	Bailouts & Scrappage Campaigns	Increase of vehicle sales, despite economic crisis	USA & Europe	2008-2010
		Public incentives on alternative fuel vehicle (AFVs)	Increase of price competitiveness and sales volume of AFVs vs internal combustion engine vehicles (ICEs)	EU & Norway	2010-2018

(Author's own design)

1.3 Rationale of the Research

This thesis aims at covering several different issues related to monetary policies and business cycles, as well as to fiscal policies and other forms of public interventionism. All mentioned topics shall be analyzed in the context of their impact on the automotive industry, by mainly applying a perspective from the Austrian School of economics.

Our aim is to enrich economic theory with a thorough analysis and new findings on the defined research objectives. We argue that this thesis is unique in providing a comprehensive and profound analysis on the impact of expansive monetary policies and public interventionism on the automotive industry, applying persistently an Austrian School theoretical approach. Most of the

recent relevant literature we found can roughly be split into four categories: First of all, we need to highlight those academic papers which have been written on public incentives for alternative fuel vehicles (Brand *et al.*, 2013; Diamond, 2009; Drossinos *et al.*, 2017; Greene, 2014; Lutsey N., 2015b; Tran *et al.*, 2013). However, these papers had a rather technical approach, using empiricism to detect eventual causations between the analysed variables.

Accordingly, mentioned papers aimed at illustrating whether a certain action (public interventions to provide public incentives for AFVs) caused a concrete outcome (increase of the AFV sales volumes). However, these analyses lacked a theoretical approach in regard to public interventionism and were certainly not based on Austrian School concepts. Thus, the theoretical and methodological approach of these papers was neither based on deduction, nor on praxeology, not considering the need to apply methodological dualism. The second category of relevant recent literature consists of papers and articles written by economists which criticized the described public interventions, but without referring to the theoretical concepts of the Austrian School of thought. Accordingly, the corresponding literature (Sinn *et al.*, 2019; Sala-i-Martin, 2005) criticized the analysed fiscal policies and other public incentives but without referring to any concrete school of thought, or superficially referring to the findings of the Chicago school of economics (Friedman, 1953, 1962, 1969, 1987) or Ordoliberalism (Eucken, 1949, 1950, 1952). The third group of evaluated papers (Huerta de Soto, 2009b; Hülsmann, 2010; Ravier, 2011; Bagus *et al.*, 2012; Alonso Neira *et al.*, 2011, 2013) consists of detailed articles written by Austrian School economists on expansive monetary policies and public interventionism within the 21st century. Mentioned papers provided a thorough illustration of the boom-and bust cycle related to the 2008-2009 subprime crises, while also generally criticizing any form of public interventionism. However, neither Huerta de Soto, nor Hülsmann, Ravier, Bagus *et al.*, or Alonso Neira *et al.*, (2011, 2013) specifically referred to the automotive sector, for which no concrete analysis of the impact of expansive monetary and fiscal policies on the automotive industry was provided. Finally, the fourth category of relevant recent publications can be summarized as 'consolidated politico-economic articles by Austrian School economists on developments in the automotive sector'. In this context, we refer to articles by Ikenson (2011), McMaken (2018), and Salerno (2015) which

criticized attempts by the Federal Reserve and US governments to protect US American automotive OEMs from bankruptcy. Written by Austrian School economists, these articles (primarily related to public interventions to protect General Motors and Chrysler) provided compressed information, combining short illustrations of selected historic data with brief conclusions by the authors. However, these articles did not provide in-depth academic analysis, neither offering a detailed academic illustration of historic data, nor thoroughly explaining the corresponding theoretical framework the authors' conclusions are based on.

Consequently, this thesis fills a relevant research gap. We did not find any other publication which provides such an in-depth analysis of the impact of expansive monetary policies and public interventionism on the automotive industry from an Austrian School perspective. No other academic research we found provided such a comprehensive illustration of historic data on the automotive industry with a theoretical framework that is based on praxeology, methodological dualism and deduction (Mises, 1940, 1957). Moreover, our concept is based on an ethical theory which defends the non-aggression principle (Rand, 1964) and the benefits of human cooperation in a free society (Mises, 1912, 1940, 1957; Hayek, 1939, 1944), which clearly differentiates it from purely empiric market research (generally based on cross-sectional time-series analysis and triangulation) and the concepts of mainstream economics. Accordingly, this thesis should also provide decision makers within the automotive sector with a detailed analysis of our main research question from an Austrian School perspective. Combining our theoretical approach with a detailed analysis and illustration of historic events, we intend to enable these decision makers to better understand previous events in order to properly prepare for the future.

In Chapter 1, we will explain the general scope of our thesis, as well as the main research objectives and the conceptual scope of the research. Then, in Chapter 2, we refer to the most relevant literature and information sources for our analysis. The reader will be able to get familiar with the most important books and academic papers used, including scholarly literature and the magna opera of Friedman (1953, 1962), Hayek (1935, 1939, 1941), Keynes (1936), Mises (1912, 1934, 1940), Garrison (2001) and Huerta de Soto (1998, 2005, 2009a).

In Chapter 3, we will outline the research methodology, explaining the reasons for our deductive research approach, while highlighting the importance of differing between theory and history (Mises, 1957). We will clarify the benefits of methodological dualism, while also explaining the need for a praxeologic approach (Mises, 1940, 1957) and for applying capital-based macroeconomics (Garrison, 2001) and the Hayekian triangle (Hayek, 1939, 1941) in our research.

Chapter 4 will thematically be split into 2 sections - monetary policies and the Austrian business cycle on the one hand, and public interventionism/ public incentives on the other hand - while both mentioned main topics will also be analyzed from a theoretical and historic perspective. Consequently, in the first sections of Chapter 4, we will explain the general effects of monetary policies on the economy from the perspective of the Austrian School of economics (Hayek, 1941, 1976; Huerta de Soto, 1998; Garrison, 2001; Hülsmann, 2008), also referring to the individual causes and effects of the 'subprime' crisis in the USA and Europe. Increases in the money supply enter the economy through credit markets, when central banks literally 'lend money into existence'. Such market distortion - caused by central banks' interventionism, meant to create (short-term) economic growth - inevitably 'drives a wedge' between savings and investments within the economy (Garrison, 2001; Huerta de Soto, 2006). Based on Mises (1940), Hayek (1941), Huerta de Soto (1998) and Garrison (2001), we will illustrate how these new low interest rates stimulate investments in the early stages of production, e.g. construction works/ housing and the automotive industry. Whereas most classical and neo-classical economists mainly ignore the heterogeneous and multi-specific structure of capital, the winner of the 1974 Nobel Memorial Prize in Economic Sciences, Friedrich August von Hayek (1899-1992) emphasized on the temporal pattern of heterogeneous capital goods as well as on the different stages of production which can act entirely differently to the injection of new monetary units by central banks. These different stages of production will be thoroughly examined.

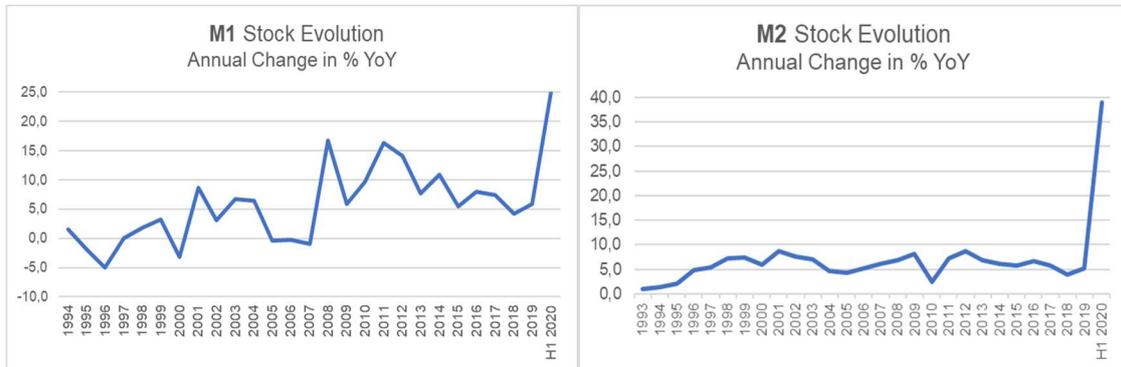
In regard to the general macroeconomic effects and risks of monetary policies, several thorough recent research papers can be found. Among others, the German economists Gunther Schnabl

(2008, 2011, 2015) and Philipp Bagus (2014), Spain’s Miguel A. Alonso Neira (2011, 2014) and Huerta de Soto (1998, 2009b, 2010), but also Tobias Adrian and Hyun Song Shin (2008), George Selgin and Lawrence H. White (2012) as well as David Howden and Joseph Salerno (2015) have written thorough and detailed analyses on the correlation between short term economic booms, caused by ultra-loose monetary policies, and the following recessions. Also Jörg G. Hülsmann’s ‘The Ethics of Money Production’ (2008) must be seen as a ground-breaking book which we will refer to. It is often argued that in particular the construction sector and the automotive industry have suffered from the long-term effects of market distortions such as ultra-loose monetary policies and artificial credit expansions.

Evolution of US Money Stocks: Annual changes (‘Year-on-Year’) in US money stock

Chart N°1: M1 Money Stock (USA)

Chart N° 2: M2 Money Stock (USA)



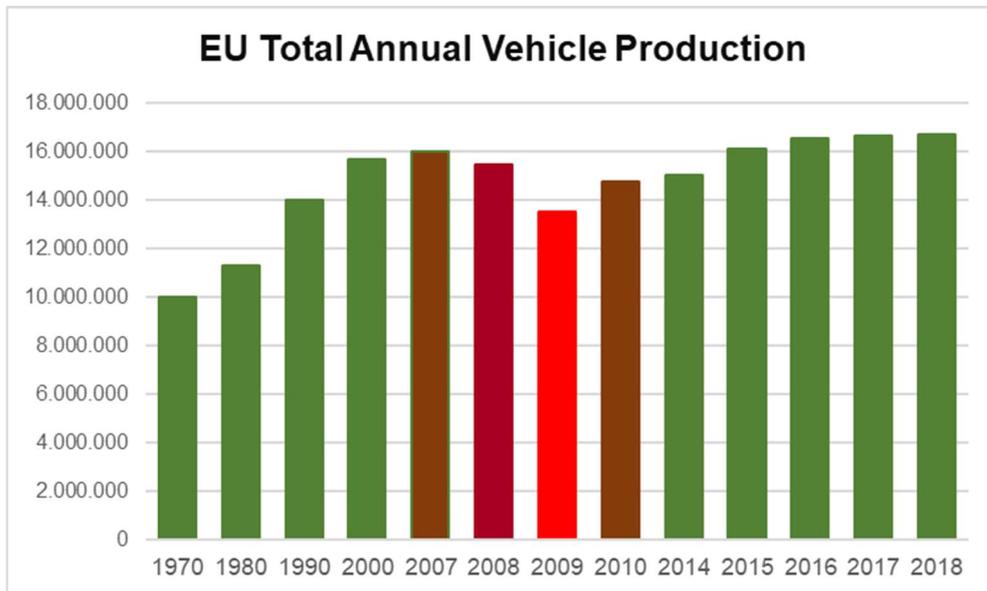
Own elaboration, based on data from: Federal Reserve St. Louis (2020)

However, while detailed research papers have been written on the so-called US-American ‘mortgage crisis’ in 2007 and the Spanish ‘property bubble’ in 2008 (Selgin *et al.*, 2012; Schnabl *et al.*, 2017), almost no thorough research can be found on the monetary origins of the simultaneously occurring crisis within the automotive sector, which led to significant challenges for major OEMs, such as General Motors, Chrysler, Ford, PSA and SEAT. Consequently, neither economists from the Keynesian and monetarists schools, nor most automotive experts have found a precise definition of the correlation between monetary policies and the latest crisis of the

automotive industry. Moreover, a simple correlation is certainly not the same thing as causality. Correlation simply describes a statistical (and therefore historic) relationship between characteristics. Causality however generally refers to a truly causal connection (Schüller, 2020). Thus, as indicated, in Chapter 3 of this thesis we will explain more precisely the theoretical and methodological approach of this research, referring to methodological dualism and praxeology. However, at this stage we can already state that without truly understanding the real causes of historic events, it is impossible to properly prepare for similar situations in the future. With this research, the mentioned data and knowledge gap should be filled.

Thus, we will detect the economic crisis' correlation with and impact on the evolution of the automotive sector in the period from 2001 to 2010. These effects will not only be measured by simply evaluating the OEMs' sales volume evolution, but also by arguing that certain OEMs such as General Motors and Chrysler would have been forced to become more efficient and competitive long before the peak of the global financial crisis in 2008, if they had not been protected by the Federal Reserve's artificial expansive monetary policies in the first place (Ikenson, 2011).

Chart N° 3: Vehicle Sales Evolution in the EU



Own elaboration, based on data from: ACEA (2019)

As shown in the above chart, up until the beginning of the 21st century, the European automotive production had constantly increased throughout past decades, reaching its peak in 2007 right before the financial crisis. After significant decreases in 2008 and 2009, the markets started to recover in 2010, showing again a constant growth since then.

We will also examine the impact of fiscal measures implemented by several western national governments after the outbreak of the financial crisis at the beginning of the 21st century. Public support for OEMs by providing public incentives or even by offering public bailout packages, differed between the individual countries, but the official purpose of these public interventions has generally been to ‘stabilize the economy while protecting workers’ (Ikenson, 2011; McMaken, 2018; Salerno, 2015). We will detect how certain companies, such as Toyota and Volkswagen easily survived the economic crisis without any significant specific fiscal supports by their local governments, while other automotive OEMs such as General Motors and Chrysler would possibly not have survived the financial crisis, if it had not been for the significant interventionism by the US government in the period from 2008-2010.

Moreover, as initially mentioned, this thesis will also examine the amount and effectiveness of government incentives on the automotive sector between the years 2010-2018 in European countries such as Norway, the Netherlands, Germany, and Spain, meant to promote alternative fuel vehicles (Carlucci *et al.*, 2018; Dudenhöffer, 2016; Hartmann, 2018; Sinn *et al.* 2019). Therefore, as mentioned, with the aim to 'connect the dots', we strive to detect if there are any similarities between the public interventions (credit expansions, bailouts, and scrappage programs) implemented in the first decade of the 21st century to prevent the automotive industry from a down-turn, with the recent public incentives to increase the attractiveness and financial competitiveness of AFVs. Thus, it is also key for this research to look at the importance of free prices (Hayek, 1931, 1941; Friedman, 1962; Kirzner, 1973; Boettke, 2001), crucial to properly allocate resources, since on the contrary, governmental interventions on pricing via taxes and subsidies lead to a hampering market distortion (Hayek, 1931, 1941; Mises, 1940).

The so-called 'electric car revolution', of which several journalists, politicians and (self-declared) automotive experts have been talking throughout the past decade was mainly initiated by the launch of models such as Opel Ampera / Chevrolet Volt, the Nissan Leaf, and Tesla's Model S (Egbue *et al.*, 2012). Previous research related to AFVs have thoroughly analyzed the impact of fiscal incentives for AFV users (Brand *et al.*, 2013; Diamond, 2009; Drossinos *et al.*, 2017; Skonhoft *et al.*, 2014; Greene, 2014; Tran *et al.*, 2013) as well as of regulations directly effecting manufacturers (Walther *et al.*, 2010; Thiel *et al.*, 2014). Throughout the past years, public entities on EU-, national and municipal level have tried to promote alternative fuel vehicle (herein abbreviated by 'AFVs') technologies with different forms of fiscal and legal support. Meanwhile, a wide range of incentives and promotion actions exist which different national and even regional governments have adopted to increase the attractiveness of AFVs. These incentives have clearly increased the awareness of AFVs (Brand *et al.*, 2013; Sinn *et al.*, 2019; Carlucci *et al.*, 2018). Throughout the past years and across different markets, the term 'alternative fuel' has been used rather differently, for which there is no general rule as to what engine technologies must be included into this category. In this thesis we will only focus on vehicles which use one or more electric motors or traction motors for propulsion, including hybrid electric vehicle (H-EV) which

combine a conventional internal combustion engine (ICE) system with the mentioned electric propulsion system. Thus, vehicles run on alcohols (such as ethanol and methanol) or methane (including natural gas and biogas), as well as biodiesel and synthetic fuels, are herein not considered as AFVs. Instead, we will focus on the four most relevant electrified alternative fuel technologies within the period from 2010-2018, which are Hybrid (H-EV) and Plug-in Hybrid (PH-EV) as well as Battery-only/ 'full-electric' (B-EV) and Fuel Cell (FC-EV) engines.

We also included Hybrid vehicles (H-EVs) in our analysis, as this technology must be seen as the 'stepping stone' for alternative fuel concepts, which has paved the way for Plug-in Hybrid Electric (PH-EVs) vehicles and Battery-Electric-Vehicles (B-EVs). However, in most recent literature, the term 'alternative fuel concepts' is generally referring to 'Plug-in electric vehicles', abbreviated by 'PEVs'. A 'PEV' is any vehicle that can be recharged via an external source of electricity, e.g. wall sockets, and the electricity stored in its rechargeable battery packs moves, or contributes to move, the vehicle's wheels. The abbreviation 'PEV' can be seen as an umbrella term for electrified vehicles, which includes all-electric, or battery electric vehicles (B-EVs), as well as plug-in hybrid vehicles (PH-EVs). Thus, whereas Hybrid vehicles ('H-EVs') are herein considered AFVs, they do not belong to the group of 'PEVs'.

Even by the year 2018, which represents the last year of the analysed period, Europe was still in the adoption phase of AFVs with a relatively low market share in most markets (Hartmann, 2018; Sinn *et al.*, 2019). From a different perspective, one can positively highlight that particularly in certain north-western European countries, such as the Netherlands and Norway, sales volumes of AFVs have been growing to advanced levels (Drossinos *et al.*, 2017; Jiménez *et al.*, 2015; Skonhoft *et al.*, 2014). Interest in alternative fuel technologies has also increased due to the so-called '(Volkswagen) diesel emission scandal' and the continuous approach by governments to reduce fine particulate and nitrogen oxide (NOx) emissions. Public support for OEMs by providing public incentives or even by offering public bailout packages, differ between the individual countries (Skonhoft *et al.*, 2014).

It should critically be evaluated if public incentives could in any case be justified from an economic perspective, or whether any form of public incentives is unsustainable, leading to a harmful market

distortion. To detect the actual price competitiveness of AFVs with traditional internal combustion engine (ICEs) vehicles, independently from any public support, we will consider 'total cost of ownership' comparisons (TCO comparisons) of ICEs versus AFVs, including all costs related to the vehicle ownership and usage, such as fuel costs and insurance costs as well as repair, maintenance and service costs (RMS costs) (Brand *et al.*, 2013; Drossinos *et al.*, 2017). We argue that, to assure a long-term stability of the market, sustainability needs to be assured, and product distribution must primarily be based on an actual customer demand, not on public incentives. We will evaluate the hypothesis that, in case such sustainability is not given, mentioned fiscal interventionism to artificially boost vehicle sales will further distort the market, causing a new form of 'bubble' which could ultimately lead to another severe crisis in the automotive sector.

Even if this thesis mainly focuses on the impacts of political, fiscal and monetary interventions on the industry, we must not ignore that a company's competitiveness ultimately depends on entrepreneurial creativity, on its management's ability to adapt to market changes, while constantly trying to detect market niches (Kirzner, 1963, 1973; Huerta de Soto, 2009a). Thus, we must not ignore the corresponding concepts on market changes and entrepreneurial creativity developed by Schumpeter (1934) and Israel Kirzner (1973), as well as on dynamic efficiency (Huerta de Soto, 2009a) and '*contrepneurship*' (Taghizadegan, 2016). We will argue that the short-term thinking of many managers in the automotive industry as well as of several principal shareholders which control such automotive OEM stock corporations, has led to unsustainable decisions, not being oriented in the long-term success of these corporations. Such moral hazard, including situations in which executive employees pursue their own personal interests which collide with the long-term interests of the company, are a common example of the principal-agent problem. Consequently, the lack of truly long-term, sustainable entrepreneurial thinking must be criticized and seen as one of the major reasons for entrepreneurial failure.

1.4 Structure of the Thesis

The thesis is split into the following seven chapters, which can briefly be described as follows:

Chapter 1 can be seen as the **introduction** to the research topic, covering the main scope, theoretical background, the key research objectives and corresponding research questions used. It also raises central hypotheses as well as *a priori* truths which refer to our theoretical approach, based on Praxeology the science of human action (Mises, 1940, 1957). At a later stage of this thesis, throughout chapter 4, we will evaluate mentioned hypotheses and considered *a priori* truths on their validity for the evaluated period of time.

Chapter 2 provides an overview of used **literature** which had a concrete connection to the analyzed topic. Useful literature included recent academic papers and classical writings on economic theory, and economic policy, focusing on selected schools of economic thought, such as the Austrian School economics, Keynesianism economics and the Chicago school of economics. Examples are the magna opera of Friedman (1953), Hayek (1935, 1939, 1941), Keynes (1936), Mises (1912, 1934, 1940), Garrison (2001) and Huerta de Soto (1998, 2005, 2009a), as well as recent literature by Schnabl (2008, 2011, 2015), Bagus (2014), Alonso Neira (2011, 2014), George Selgin and Lawrence H. White (2012) and several others. It also highlights important references to specific technical literature on the automotive industry, including automotive market analyses, AFV sales reports and related case studies. We will also consider economic theory on negative externalities, public incentives and public finance.

Chapter 3 outlines the **research methodology**, including a comparison of the deductive and inductive research approach, also referring to the challenges and benefits of quantitative and qualitative research. Based on the findings of Mises (1940, 1957), we will properly explain the reasons for our deductive approach, also referring to the importance of properly distinguishing

between theory and history in academic research. We will use Praxeology, the science of human action, which is based on the axiom that human beings exist and act (Rothbard, 1957; Hoppe, 1983). We aim to correctly derive praxeological statements, obtaining deduced propositions which are true *a priori*. Our research uses methodological dualism, acknowledging that methods used to properly analyze the actions of human beings must be different to those used in natural sciences, such as physics and chemistry (Hoppe, 1983, 1995). Because of the reflective knowledge of humans, because of their own individual ideas, thoughts, value judgments, choices and volitions, human behavior and social phenomena must be analyzed differently than molecular behavior and physical phenomena in natural science (Mises, 1940, 1957). Moreover, we will refer to the different economic concepts and tools used throughout our research. This includes the concept of capital-based macroeconomics, with its evaluations on the production possibilities frontier, the loanable-funds market, the structure of production as well as the stage specific labor market analysis (Garrison, 2001). Moreover, we will refer to the Hayekian triangle which illustrates all spending within an economy in the shape of a triangle, indicating production in different stages, from the early stages (higher-order) to the late stages of production (lower-order), ending with the final consumer good (Hayek, 1939, 1941). Details about sampling, the data collection method and the analysis process will be provided, as well as a reference to the credibility, reliability and validity of the findings. We focus on the use of deduction and reasoning, as well as on political and economic theory to come to fruitful conclusions (Mises, 1957; Rothbard, 1957; Hoppe, 1983). Effects have underlying reasons (lat: '*effectus sequitur causam*'), which need to be detected.

Chapter 4 will present a detailed elaboration on our theoretical concept in regard to the analyzed topics, and will then use empiric data to illustrate the validity of our theory in regard to the analyzed time period. In this context, the findings from our literature review and further analyses will be presented. Chapter 4 is basically divided into two separate analyzed areas, namely 'monetary policies and business cycles' on the one hand, as well as 'public interventionism such as public incentives' on the other hand. In our theoretical approach on monetary policies and business cycles we will pay special attention to the Austrian Business Cycle Theory (ABCT), and in the section on 'public interventionism' we will particularly highlight the ideas of Mises (1951), Rothbard

(1970), and Huerta de Soto (2005) in regard to the economic impossibility of socialism and any other form of a centrally planned economy.

Thus, as stated, these two main areas will be evaluated separately. We will analyze these two main topics initially from a theoretical perspective, to then use empiric data in order to illustrate the validity of our theoretical approach for the analyzed period of time. Thus, in the first part of the chapter, we will initially compare the different business cycle concepts of Keynesianism, the monetarists and the Austrian school of economics. To do so, we will evaluate the monetarists' concepts of Milton Friedman (1953, 1962, 1969, 1987), as well as the economic thoughts of John M. Keynes (1936) in regard to monetary policies, business cycles and fiscal stimulus packages. Special attention will be paid to the ABCT of Ludwig von Mises (1912, 1934, 1949), and F.A. von Hayek (1931, 1939, 1941), and the more recent findings of Roger Garrison (2001), Huerta de Soto (1998) and Hülsmann (2008). After understanding these different theoretical concepts, we will evaluate the actual causes, effects and symptoms of the recent economic crisis in the first decade of the 21st century. Empiric data of specific historic events can neither generally confirm nor generally refute the validity of an economic theory. Instead, depending on our findings throughout this research, we plan to detect general axiomatic truths within the Austrian School concept. This will allow us to illustrate the ABCT in regard to the economic boom and bust cycle seen within the period from 2001 to 2010. In the second part of chapter 4, we will focus on governmental interventionism through fiscal policies. Based on the ideas of Mises (1951), Rothbard (1970), Huerta de Soto (2005), Ikenson (2011), McMaken (2018), Salerno (2015) and Schnabl (2011, 2015), we plan to evaluate the economic effectiveness and sustainability of public interventions, arguing that any form of protectionism, including subsidies and public incentives, distorts the market process, ultimately leading to a misallocation of resources. Throughout his doctorate, the author published a total of four academic articles on economic theory in the journal 'Procesos de Mercado', which are also incorporated into this thesis (Reimers, 2018, 2019, 2020a, 2020b). To illustrate our theoretical approach for the specific analyzed period, data on automotive sales evolution will be evaluated in order to detect potential correlations with simultaneously implemented fiscal policies/ public incentives. The findings of the quantitative and qualitative research approaches will be compared to the findings from our literature review.

Chapter 5 will elaborate on concepts for a more sustainable approach on monetary and fiscal policies. In the chapter's first section, new technologic advancements and business concepts will be presented which could present valid alternatives to the current FIAT money system. Potential benefits of crypto currencies, and other alternative banking systems will be reviewed. Moreover, different schools of thought, such as Ordoliberalism (Eucken, 1949, 1950, 1952) and the Austrian School of economics will be considered as alternatives to Keynesian school theories which have strongly influenced the expansive monetary policies and significant public interventions in recent decades. Without going too much into the technical details of the mentioned concepts, we want to raise the reader's awareness that there are solid alternatives to our current politico-economic system shaped by expansive monetary policies of central banks and constant public interventionism. We elaborate on alternative economic orders in which the automotive sector could develop more freely, assuring that the most competitive OEMs will prevail and grow, whereas *malinvestments* and the misallocation of resources could be minimized.

Chapter 6 will provide a personal conclusion by the author, commenting on the findings. Based on the praxeologic axiom of human action, we elaborated our theoretical approach, with corresponding propositions considered as *a priori* truths. In this chapter we will refer to our initial main research objectives and to the validity of our *a priori* propositions. We will state our conclusions on the initially raised key research objectives and hypotheses. It will critically evaluate the relevance of our findings and the efficacy of the used methodology and research process. We will evaluate the appropriateness of the different business cycle models presented and the potential negative impact of public interventionism on the free market process. Moreover, we will briefly summarize the key benefits and challenges related to the alternative concepts for a more sustainable approach on monetary and fiscal policies, indicated in Chapter 5.

Chapter 7 will provide a general summary of the research findings leading to our ultimate conclusion.

1.5 Main Research Objectives

We had already briefly mentioned our main research objectives to give the reader an initial orientation on our research. These are contained in the main thesis, and will be used throughout the research process. Corresponding research questions were defined, which will help us to provide a detailed response to our major research objectives. These research questions, linked to their corresponding research objectives, are as follows:

1.) Definition of the impact of expansive monetary policies on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.

→ Research Questions:

- a.) How significant has the expansive monetary policy of the past decades been?
- b.) Can causalities be detected between expansive monetary policies and the corresponding currency' devaluation?
- c.) Does a currency devaluation (caused by expansive monetary policies) help exporting automotive OEMs to better sell their vehicles abroad?

2.) Analysis of the impact of artificially low interest rates (below the 'natural rate of interest') on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.

→ Research Questions:

- a.) Were interest rates in the period from 2002-2004 below the natural rate?
- b.) Did the extremely low interest rates in the period from 2002-2004 cause an artificial boom of automotive sales in the USA and Europe?

3.) Evaluation of the impact of so-called 'scrappage campaigns' on the automotive sales evolution in Europe and the USA in the period from 2009 to 2012.

→ Research Questions:

a.) Did the scrappage campaigns in the USA, Germany, and Spain within the period from 2009 to 2010 re-assure a long-term stability of the automotive sector or did they only lead to a short-term artificial sales bubble?

b.) Did the scrappage campaigns rather 'stabilize' or distort the automotive market?

4.) Evaluation of the impact and effectiveness of public incentives for AFVs on the vehicle sales evolution in Europe in the period from 2010 to 2018.

→ Research Questions:

a.) Which of the incentive models implemented in the different analyzed markets have been most successful and why?

b.) By comparing the examples of countries such as Norway, the Netherlands, Poland and Italy, can a significant causality be found between public incentives and local AFV sales evolutions?

c.) Should public incentives mainly be used to optimize the retail price competitiveness of AFVs, or rather for aspects not related to the vehicle price, such as an improved refilling/ recharging station network - in particular for FC-EVs and B-EVs?

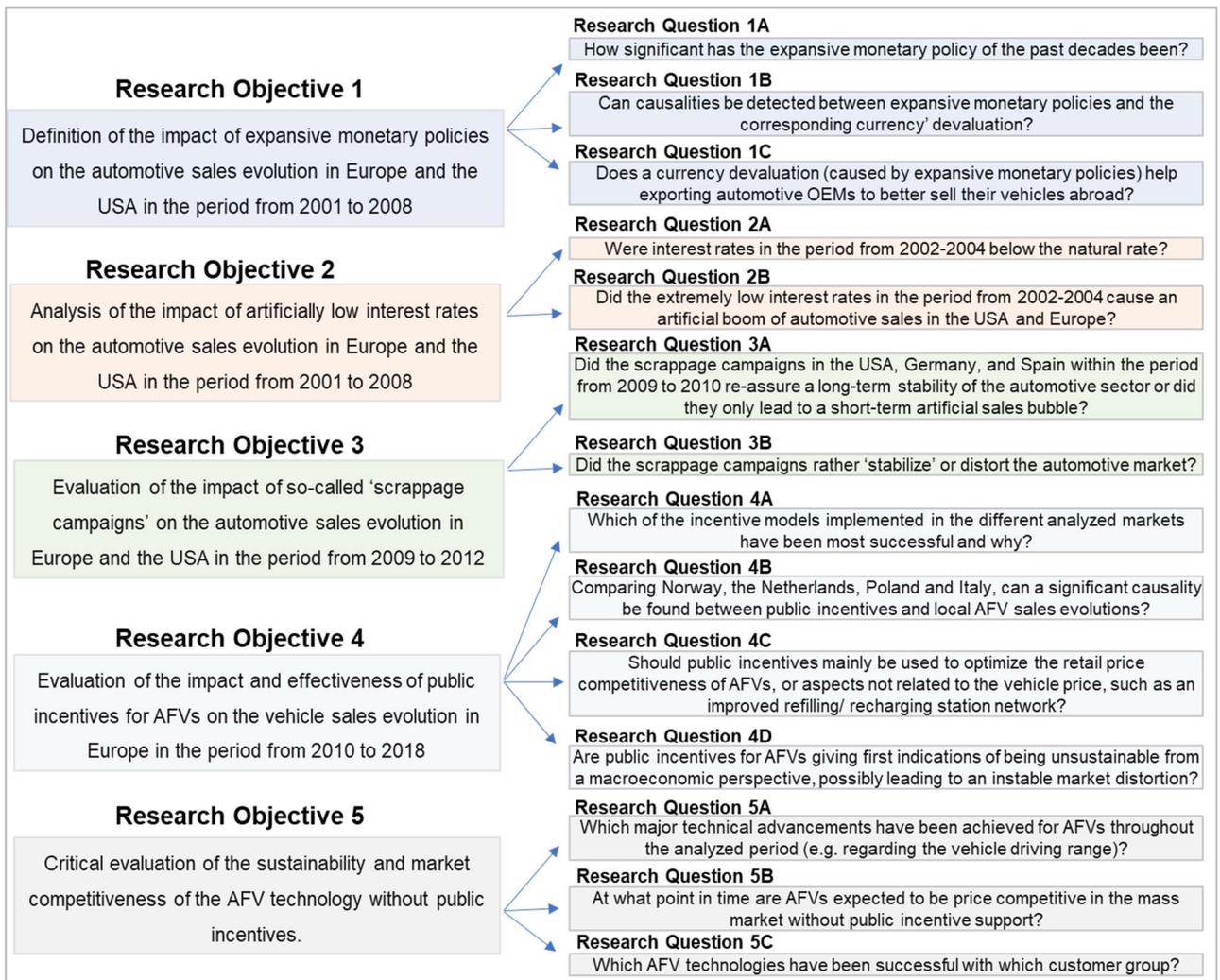
d.) Are the discussed public incentives for AFVs giving first indications of being unsustainable from a macroeconomic perspective, possibly leading to an instable market distortion?

5.) Critical evaluation of the sustainability and market competitiveness of the AFV technology without public incentives.

→ Research Questions:

- a.) Which major technical advancements have been achieved for AFVs throughout the analyzed period (e.g. regarding the vehicle driving range)?
- b.) At what point in time are AFVs expected to be price competitive in the mass market without any public incentive support?
- c.) Which AFV technologies have been most successful with which specific customer target group?

Chart N° 4: Structure of Research Objectives & Questions



Source: Author's own design

1.6 Main Hypotheses

Throughout this research, the following assumptions will be investigated on their validity:

- 1.) Monetary policies, such as an increase in money supply and unsustainable credit expansions, lead to a distortion of the natural market process.
- 2.) Expansionary monetary policies in combination with an increase of credit supply not backed by previous savings, led to the unnatural growth of the automotive market in the period from 2001 to 2007.
- 3.) Before the visible start of the subprime crisis, automotive OEMs like General Motors and Chrysler would have already been forced to become more competitive, if there had been a truly free automotive market, without expansive monetary policies, protectionism and public incentives.
- 4.) Long-term public support via significant public incentives has increased over-production, reducing the OEMs' willingness to become more efficient, lean and competitive.
- 5.) In several markets such as Norway and the Netherlands, a clear correlation can be seen between the recent growth of 'green technology' vehicle sales and the simultaneously implemented public incentives.
- 6.) When comparing the AFV sales evolution in the different European countries, customer demand has not only been influenced by public incentive schemes, but also by the individual local geographic, cultural and economic particularities.
- 7.) Public incentives to promote AFVs lead to a harmful market distortion, hampering the market process. The corresponding increase in customer demand for AFVs would not have occurred in a free market, for which such public interventions do not lead to a natural growth of AFV demand.

1.7 The Conceptual Model and its Variables

This thesis focuses on the US-American and European automotive market, paying particular attention to monetary policies and public incentives implemented with the official aim to indirectly or directly stabilize the (automotive) economy. Throughout this thesis, special attention is given to certain markets, such as USA and Spain as well as Norway and the Netherlands. In the first part of our analyses on the causes and effects of the central banks' monetary policies at the early 21st century, we will see that Spain and the USA both suffered significant economic crises in the analyzed period. The recent financial and economic crisis in the USA and Spain can be seen as 'perfect examples' of how expansive monetary policies can cause boom-and-bust cycles. Both, the US-American and the Spanish economy and their automotive industries were heavily affected by the mentioned crisis, for which the impact of mentioned monetary and fiscal policies on the commercial and financial results of automotive OEMs will be evaluated. In the latter part of the thesis, when analyzing the effects of public incentives for alternative fuel vehicles (AFVs), special attention is paid to the 'European front-runner' countries Norway and the Netherlands which – thanks to strong interventionism – quickly achieved a notable increase of AFV sales. We need to understand that employing a concrete theory is indispensable for the proper observation of facts. For a proper theory, different aspects of knowledge on reality must be put together in a systematic way. When evaluating certain events, it is impossible to simply 'let the facts speak for themselves' without consciously applying a certain theory. Mises understood that people's "*reasoning may be faulty and the theory incorrect; but thinking and theorizing are not lacking in any action*" (Mises, 1949, p. 177). Moreover, based on Mises, a proposition of an aprioristic theory cannot be refuted by personal experiences. He stated:

"There is no such thing as a mere recording of unadulterated facts apart from any reference to theories. As soon as two events are recorded together or integrated into a class of events, a theory is operative." (Mises, 1949, p. 647).

Based on praxeology and by using deduction, it is possible to draw conclusions about human behavior that are both objective and universal. In line with Mises (1957), we argue that an

irrefutable, true starting point of social scientific theory is necessary. Based on such an *a priori* true starting point, proper deduction will then allow us to further develop a *a priori* true social scientific theory of general validity, independently of individual experiences. *A priori* refers to a declarative statement expressing knowledge which has been acquired prior to or independently from an experience (Hoppe, 1983, 1995). In line with Mises (1940, 1957), we intend to define and illustrate relevant *a priori* synthetic judgments. To qualify as an *a priori* synthetic judgment, a proposition must meet two requirements: it must not result from experience but from reasoning, and it cannot be denied without causing an intellectual contradiction. As indicated, Mises (1949, 1957) realized that the axiom of human action, which states that humans act, is an *a priori* synthetic judgment. By using formal logic, other truths can be deduced from the irrefutably true axiom of human action, and the truth of knowledge derived from a *a priori* theory can be validated independent of any sensory experience.

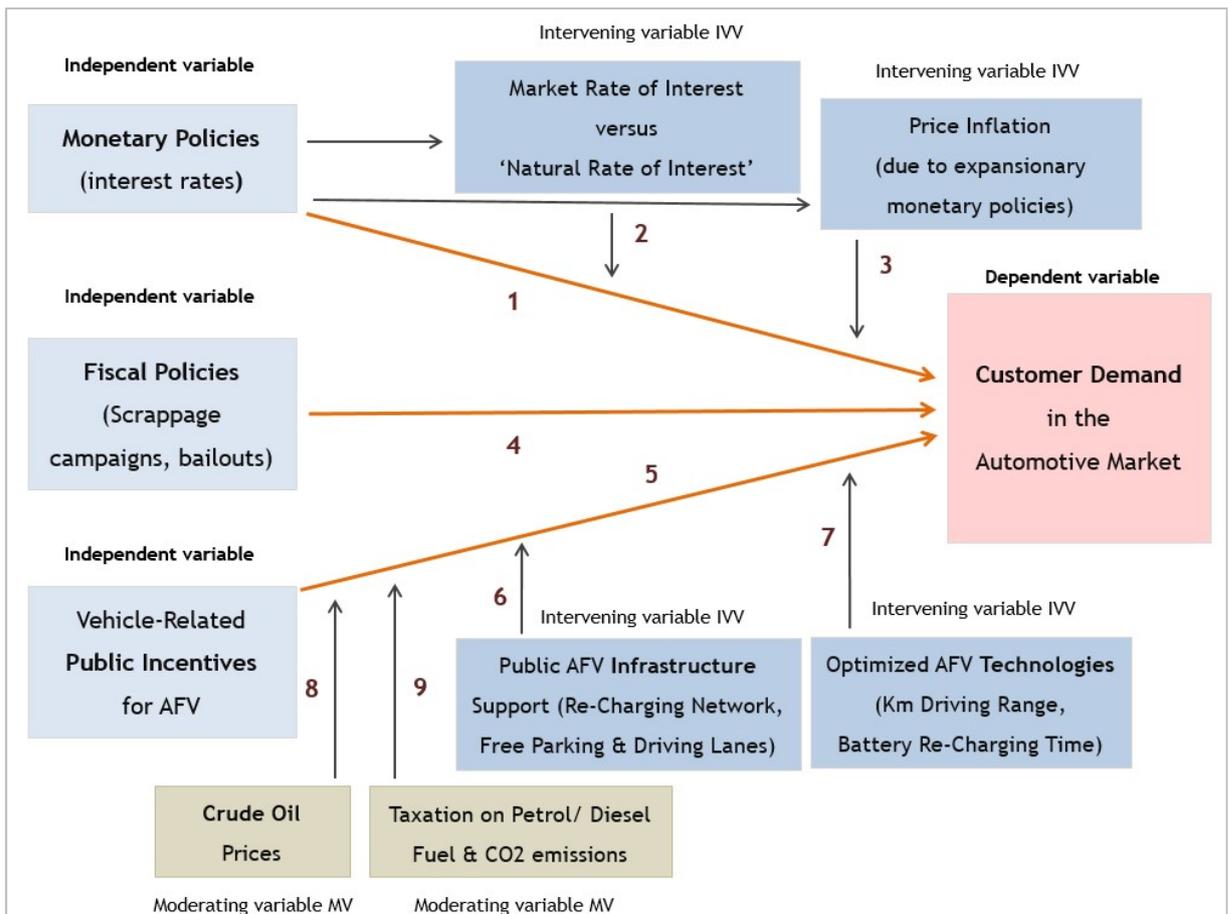
1.8 A Priori Truths

Based on this, we want to prove that the following propositions can be seen as *a priori* truths:

1. Fiat money, being typically created through bank circulation credit, causes economically detrimental effects on the economy, causing capital consumption and *malinvestment*.
2. A decrease in the market interest rate (below the natural interest rate) caused by expansive monetary policies of central banks stimulates entrepreneurs to misallocate resources, leading to market distortions and an unsustainable boom.
3. Fiscal policies distort the free market process (e.g. by implementing public incentives for some market players while hampering others), and will lead to unsustainable misallocations, ultimately lowering people's average standard of living, hampering free entrepreneurship and free consumer choice.

Further details on the difference between theory and history, on our theoretical approach, as well as on how the concepts of methodological dualism, deduction and Praxeology are applied in this thesis, will be stated in Chapter 3. While recognizing regional particularities, acknowledging the existence of socioeconomic predictor variables over time, and potential different intervening and moderating variables, we are confident that by using the concepts of methodological dualism, praxeology and capital-based macroeconomics, we will come to general conclusions and recommendations for the automotive industry.

Chart N° 5: Conceptual Framework



Source: Author's own design

1.) Monetary policies (e.g. (quantitative easing) with impact on the economy/ customer demand

- 2.) A market rate of interest clearly below the natural rate of interest will stimulate investments into the early stages of production and incentivizes consumption.
- 3.) Price inflation due to expansionary money supply, meant to stimulate consumption & investments
- 4.) Fiscal policies, such as scrappage campaigns, to (artificially) boost automotive sales.
- 5.) Public incentives for AFVs to optimize their overall competitiveness by reducing their purchase/usage costs, leading to an increase of customer demand.
- 6.) Public support for AFV infrastructure, including free parking areas, special driving lanes, as well as a subsidized refilling-station network, is intended to make AFV usage more customer-friendly
- 7.) Further investments by automotive OEMs to optimize the technologic competitiveness of AFVs, e.g. by increasing the driving range. We will evaluate whether investments by private automotive OEMs increase if a certain consistency in public support for the AFV industry can be expected.
- 8.) Changing crude oil prices have generally shown an impact on petrol/ diesel fuel prices and may therefore influence the cost-related competitiveness of AFVs
- 9.) Increased taxation on ICE vehicles – mainly based on their CO₂ emissions – is argued to have shifted customer demand towards AFVs. These public taxes can have a crucial (negative) impact on the relative price competitiveness of ICEs

The shown conceptual framework aims to provide an effective, impartial analysis. A well-structured research process will be used to obtain useful, reliable results. A proper theoretical approach based on methodological dualism and the Austrian Business Cycle Theory will be carried out, while using empiric data to illustrate the correctness of our theoretical approach for the specific analyzed period of time. To properly evaluate the research topic, we need a wide range of specified literature which we further explain in the literature review of this thesis.

The thesis had also been read by and discussed with Prof. Dr. Gunther Schnabl, Prof. Dr. Adrián Ravier, Prof. Dr. Jörg Guido Hülsmann, Prof. Dr. Leef H. Dierks, Prof. Dr. Antony Mueller and Dr. Carlos Sabino who provided very valuable recommendations on this thesis' content, structure and methodology.

2 Literature Review, focusing on Monetary Policies & Public Interventionism

In his book '1984', Orwell ironically stated: "*The best books... are those that tell you what you know already.*" (Orwell, 1949, p. 229). Thus, to provide a holistic overview of the latest research on the analyzed topics, a broad and intense literature review is seen as crucial. Webster and Watson (2002, p. 1) argue that literature reviews create "*a firm foundation for advancing knowledge*", while facilitating "*theory development... uncovering areas where research is needed*". It will give us a conceptual framework to understand what has already been explored and analyzed in the field, which research has been done, and which debates have been held. Several academic papers and studies on the economic crisis of 2008 have been written, and different useful comparisons of the discussed schools of thought can be found. Also in regard to alternative fuel vehicles, several empirical studies on the sales evolution of AFVs and on consumer preferences for AFVs have been published over the last decades. Even detailed comparisons of the individual public incentive models can be found. In 2003, for example, Canes finalized a study comparing the total lifecycle costs of equivalent hybrid and gasoline models of that time and detected that lifecycle costs for hybrid vehicles clearly exceeded those for equivalent non-hybrid vehicles at the corresponding fuel prices at the time of analyses (Canes, 2003). However, a recent thorough paper which evaluates the impact of mentioned monetary and fiscal policies specifically in regard to the automotive industry, is not known to the author of this thesis. This is even more the case, when trying to analyze the mentioned research topic based on Austrian School literature. Moreover, we consider it as crucial to also consider recent research papers, benefitting from the latest findings. However, instead of running the risk to be taken away by evaluating too many different aspects, we want to focus on key arguments for the specific analyzed scope (lat: '*argumenta non sunt numeranda, sed ponderanda*').

A clear research process is needed to respond to the research questions mentioned in Chapter 1 of this thesis. Our literature review should be seen as the basis to elaborate on the main research objectives. The found literature inspired the author to further elaborate on valuable ideas

and concepts to respond to the research questions, while properly connecting the conceptual model, the hypotheses and the methodological approach. In this chapter, we will provide a literature review to demonstrate which main sources were used and which aspects are evaluated to assure a thorough understanding of the topic.

2.1 Introduction to the Literature Review

This review will help in clarifying the following aspects: How have previous academic studies on monetary and fiscal policies been done in regard to the methodology, modelling techniques and experiment design used? When comparing individual European markets, to what extent did the individual public incentives have an impact on the vehicle sales evolution? Moreover, what research gaps can be detected from the currently available academic papers? As stated, automotive OEMs and governmental institutions need to adjust quickly to future market developments for which we intend to draw general conclusions for the future economic development, if the described monetary policies of the European Central Bank and the US Federal Reserve, as well as the fiscal policies of mentioned countries do not change drastically. We focus on recognized, academic secondary literature related to macroeconomics, monetary policies (particularly in regard to business cycles and interest rates) and fiscal policies. Moreover, we focus on academic papers related to the automotive industry, with special emphasis on the so-called 'scrappage campaigns' in the early 21st century and public incentives for alternative fuel vehicles.

The academic articles used for this thesis were selected based on their relevance to the research questions, while also considering the number of citations and the currentness of the indicated data. Several of the mentioned research papers were found in specific academic journals and magazines, such as the 'International Journal of Automotive Technology' as well as 'The Journal

of Economics & Management Strategy'. We also considered journals devoted to the history of economic thought, such as 'History of Political Economy', journals published by think tanks such as the 'Cato Journal' as well as multidisciplinary journals like 'Critical Review' and regular publications following an Austrian School approach, such as the 'Review of Austrian Economics', and the 'Quarterly Journal of Austrian Economics'.

2.2 Categorization and Sources of Used Literature

Most of the used literature for this thesis is gained through the following two categories:

- A. Recent academic papers on the evolution of the automotive industry in general and on public incentives for AFVs in particular, including specific technical scholarly literature.
- B. Economic theory and academic papers on monetary policies, and business cycle theories, as well as on negative externalities and public finance theories.

A.) Academic Papers on the Automotive Industry & AFV Incentives

In regard to the proper selection and analysis of academic literature, several aspects need to be considered. The herein mentioned literature helped us to properly evaluate two of our main research objectives. These objectives are: a.) the evaluation of the impact and effectiveness of public incentives for AFVs on the vehicle sales evolution in Europe in the period from 2010 to 2018, and b.) a critical evaluation of the sustainability and market competitiveness of the AFV technology without public incentives. A wide range of incentives and promotion actions exist which different governments have adopted to increase the attractiveness of AFVs. Therefore, research literature will be consulted to detect those public policy elements which have been most effective.

As mentioned, the four main alternative fuel technologies of the first two decades of the 21st century will be in our focus, which are Hybrid (H-EV) and Plug-in Hybrid (PH-EV) as well as Battery-only/ 'full-electric' (B-EV) and Fuel Cell (FC-EV) engines. According to Axsen the main constraint to the commercialization of EVs has been the limited energy storage (Rezvani *et al.*, 2015), and the evolution of battery technology has been limited by the trade-off between power, energy, longevity, cost, and safety. As stated, very sophisticated academic journals, specialized on automotive and environmental topics are for example: 'Energy Economics', 'Transportation Research', 'Journal of Cleaner Production', 'Transport Policy', 'European Transport Research Review'. We will examine the research literature on its indications regarding how the type, timing, eligibility, and clarity of the incentives impacted the efficacy of the individual AFV promotion programs. Several studies confirm that governments have incentivized this market growth through a combination of financial incentives, other incentives such as parking and lane access, as well as by supporting charging infrastructure (Lutsey N., 2015b). Previous research related to AFVs have thoroughly analysed the impact of fiscal incentives for AFVs users (Brand *et al.*, 2013; Diamond, 2009; Gass *et al.*, 2013; Lane & Potter, 2007; Mock & Yang, 2014; Tran *et al.*, 2013) as well as of regulations directly effecting manufacturers (Walther *et al.*, 2010; Thiel *et al.*, 2014). In particular in Norway and the Netherlands, incentives can make up a significant portion of the total vehicle cost, for which these markets will be analyzed in particular, using studies from Mock *et al.* (2014), Bjerkan *et al.* (2016), Figenbaum *et al.* (2016) and others. To evaluate the impact of environmental issues on the strategic approach of automotive OEMs in Spain we will also refer to the research '*Análisis y Perspectiva de la Situación Medioambiental del Sector de Automoción en España*' (Carrasco, Díaz & Martín, 2009). In this research, the Spanish automotive industry was not only analysed in regard to its evolution within the first decade of the 21st century (including the corresponding impact of the economic crisis of 2008-2009), but also paying special attention to the automotive OEMs' investments into environmentally friendly processes and technologies (Carrasco *et al.*, 2009). Several other academic papers on the competitiveness of the AFV technology will also be reviewed, evaluating all crucial aspects, including a limited maximum speed, relatively long refilling times (Adnan, 2016), high initial purchase prices (Carley *et al.*, 2013), still relatively low driving ranges (Axsen *et al.*, 2015) and a limited network of recharging

stations (Brand *et al.*, 2017). The vehicle's driving range and the need to recharge AFVs are generally seen as crucial factors, but only a very few studies actually distinguish between "longer and shorter" recharging times. We will also refer to Sinn *et al.* (2019) who strongly questions any economic benefits of the recent incentives for AFVs. Aspects of customer behavior modeling will be evaluated (Rogers, 2003; Aizen, 1985; Struben & Sterman, 2006; Bockarjova, 2014), referring to the corresponding models used by E. Rogers ('diffusion of innovations model'), and I. Aizen ('theory of planned behaviour'), as well as the 'willingness to consider concept' by Struben & Sterman. For new technologies such as AFVs, it is always crucial that reference groups help to increase the product awareness and product image. Robert K. Merton hypothesized that individuals compare themselves with reference groups of people who already occupy the social role to which the individual aspires. Angus Deaton evaluated in his work 'Understanding Consumption' (1992) theories related to price theory, utility theory and demand estimation, studying liquidity constraints and ways to properly model heterogeneity across groups and households. Deaton as well as Solomon (1994, 2016) showed us that properly understanding customer behaviour remains a core task of economists. Sovacool and Hirsh (2009) state that the majority of Western consumers, while making choices, stick to 'notions of traditions and familiarity', rather than to look for new technologies.

B.) Monetary Policies, Business Cycle Theories & Entrepreneurship

Apart from recent academic papers, we must also highlight specific classics of economic theory, which were crucial for this research. A wide variety of books from different schools of thought, such as the Austrian School of economics, Keynesianism, monetarism, public choice economics, new institutionalist economics as well as the economics of governance, including the Bloomington school, were studied. However, we only want to mention those books and academic papers which were truly essential for our key findings, by directly addressing one or more of our research questions. Thus, the herein mentioned literature helped us significantly to define the key research objectives related to monetary policies, business cycle theories and/ or fiscal policies. These

objectives are to understand and analyse the impact of expansive monetary policies and artificially low interest rates (below the 'natural rate of interest') on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.

For our analysis on monetary policies, it was essential to compare the different business cycle concepts of Keynesianism, monetarism and the Austrian School. Thus, the 'magna opera' of Milton Friedman ('Capitalism and Freedom', 1962 & 'Price Theory', 1962), John Maynard Keynes ('The General Theory of Employment, Interest and Money', 1936), Ludwig von Mises ('Theorie des Geldes und der Umlaufmittel', 1912; 'Human Action', 1949) and F.A. von Hayek ('Prices and Production', 1931) have been absolutely crucial. These books provided the basis for our research and comparison. However, in this chapter we want to focus on those two books, both published within the 21st century, which have been most relevant for properly understanding monetary policies and business cycles. First of all, a book that must be seen as fundamental to properly understand the business cycle concepts of Keynesians, monetarists and Austrian School economists is Roger Garrison's 'Time and Money' (2001). Garrison recognizes the intertemporal structure of capital and the harm interventionism by governments and central banks can do to the economy. To understand business cycles and the corresponding theories of the mentioned economic schools, Garrison pays particular attention to three aspects: scarcity, the market for loanable funds, and the time structure of production. Each of these three principals is presented by a corresponding diagram, namely the 'production possibilities frontiers', the 'supply and demand curves', as well as the 'Hayekian triangles'. However, as shown by Garrison, if central banks increase the supply of bank credit to 'stabilize the economy' while driving the interest rate below the 'natural rate', investors can be misled and the entire economy might be severely hampered in the long run. This process that was perfectly illustrated by the recent episodes of boom and bust cycles in modern capital-intensive economies.

Secondly, Huerta de Soto's book 'Dinero, Crédito Bancario y Ciclos Económicos' (1998), released in English as 'Money, Bank Credit, and Economic Cycles' (2006), must be highlighted. Huerta de Soto properly stated that "*the main theoretical challenge facing economists at the dawn of the twentieth century lies most likely in the field of money, credit, and financial institutions*" (Huerta de Soto, 2006, xxii). Building-up on the major findings of Mises 'Human Action' (1949), the book

thoroughly explains economic theory, particularly referring to monetary policies and the causes of business cycles from the perspective of the Austrian School of economics. It provides a detailed description of the credit expansion process and a thorough theoretical analysis of the business-cycle effects of credit expansion, while also emphasizing on the importance of entrepreneurial creativity and market-based entrepreneurship. Referring to the findings of Böhm-Bawerk (1891) and Hayek (1941), and in line with Garrison (2001), Huerta de Soto explains that production can be divided into several stages, depending on the distance of the product from consumption goods. In particular for the automotive industry, which requires the production of capital goods depending on the earliest stages of production such as the transformation of iron ore to iron to then produce steel, Garrison's and Huerta de Soto's explanations are extremely concrete and up-to-date. More recent academic papers which provided relevant insights into monetary policies and business cycles were Ravier's 'Rethinking Capital Based Macroeconomics' (2011) and Huerta de Soto's 'Crisis Financiera y Recesión Económica' (2009), as well as academic papers by Schnabl (2008, 2011, 2015), Bagus (2012, 2014), Alonso Neira (2011, 2014), George Selgin and Lawrence H. White (2012).

Another main research objective was to evaluate the impact of so-called 'scrappage campaigns' on the automotive sales evolution in Europe and the USA in the period from 2009 to 2012. For this topic, we thoroughly analyse literature on economic freedom and public interventionism, ideally with a direct connection to the automotive industry and the mentioned time period. One crucial book related to interventionism is Murray N. Rothbard's 'Power and Market' (1970), which was originally planned to be a complementary text of Rothbard's 'Man, Economy, and State' (1962). It emphasizes on the economics of government intervention and the negative economic consequences of any form of public interference in markets. Rothbard explained how exchange enables people to cooperate toward their mutual betterment, generally considering public interventions as harmful market distortions and as a misallocation of resources, rejecting all types of public incentives and taxations. His book covers a wide range of topics, but for this thesis, the following sections are considered as most relevant: price control, public utilities, corporate taxes, property taxes, government ownership and government spending. Another relevant book for this thesis has been Walter Block's 'Privatization of Roads and Highways' (2009). Based on the ideas

of Rothbard (1962, 1970), Block offers precise benefits of a private property order, in which also the entire infrastructural system of an 'order' (country) could be privatized. Moreover, several publications of Ikenson, such as his 'Lasting Implications of the General Motors Bailout' (2011), as well as McMaken's 'How Long Will Cheap Debt Bail-Out Automakers?' (2018) are directly related to the implications of public interventionism and fiscal policies on the automotive industry, for which their findings are relevant for this thesis. However, none of the mentioned publications can provide a detailed response to all research objectives defined for this thesis. Moreover, while at least some of the mentioned academic papers provide a clear theoretical approach to monetary policies and business cycles, they do not provide in-depth knowledge of the automotive industry. On the other hand, while several other indicated academic papers have criticized fiscal policies to stimulate the automotive industry (particularly public incentives for AFVs), the corresponding authors have generally not been able to support their findings with a precise economic theory.

2.3 Conclusion on the Literature Review

A careful selection and proper review of the used literature is crucial to assure solid analyses. Mentioned books and academic articles were essential to get a thorough understanding on monetary policies, business cycles, fiscal policies as well as particularly on public incentives for alternative fuel vehicles. We aim to evaluate the recent automotive market evolution, for which not only classical works on economics and the automotive industry will be analyzed, but more specifically recent academic papers on monetary and fiscal policies and the impact of public incentives in the discussed industry. The found literature assured us that we will be able to respond to our research objectives and questions, believing that it provides a solid basis for our methodological approach. Our research revealed that it is only feasible to properly solve all mentioned key research questions when using a wide but well-structured set of specialized academic literature. The details of our research methodology will be presented in the following chapter.

3 Theory & Research Methodology

This chapter shall provide details on the research methodology used to investigate the key research objectives and questions. It also explains the respective choices made in regard to the research philosophy, research approaches and the data collection method chosen. It will explain those concepts which are essential for our research methodology, such as methodological dualism, Praxeology, and deduction (Mises, 1940, 1957; Rothbard, 1957; Hoppe, 1983, 1995). We will explain the importance of distinguishing between theory and history and highlight the limitations of positivism and empiricism. Moreover, we will explain the different macroeconomic tools used. This includes the concept of the Austrian Business Cycle theory (Mises, 1912, 1934; Hayek, 1932, 1939, 1941; Huerta de Soto, 1998; Hülsmann, 1998, 2008), and its 'outgrow' the capital-based macroeconomics with its analysis on the production possibilities frontier, the loanable-funds market, the structure of production and the stage specific labor market analysis (Garrison, 2001). Accordingly, we will also pay special attention to the Hayekian triangle which illustrates all spending within an economy by indicating production in different stages (Hayek, 1939, 1941). As indicated, we intend to enrich economic theory with an in-depth analysis and new findings on the discussed research topic. This thesis shall provide a unique comprehensive analysis of the impact of expansive monetary policies and public interventionism on the automotive industry from an Austrian School perspective.

3.1 Introduction to Chapter 3

Our thesis' methodology will be based on the concepts of methodological dualism (Mises, 1957), and Praxeology (Mises, 1949), using deduction to come to general conclusions and *a priori* truths. By using methodological dualism, we acknowledge that due to the reflective knowledge of humans, because of people's individual ideas, thoughts, value judgments, choices and volitions,

human actions are entirely different to phenomena analyzed in natural sciences such as physics and chemistry. Thus, human behavior and social phenomena cannot be properly analyzed in the same way that molecular behavior and physical phenomena are evaluated in natural science (Mises, 1940, 1957).

Based on the findings of Mises, we will properly explain the reasons for our deductive approach, also referring to the importance of properly distinguishing between theory and history in academic research. It is crucial to apply a concrete theory in order to properly observe facts. Mises stated, in social science the validity of a theory can be assured by elaborating *a priori* truths, using correct propositions which consider true knowledge about reality. This approach allows us to define a theory of general validity, independent of individual experience. To say it differently, Mises (1949, 1957) argued that a proposition of an aprioristic theory cannot be refuted by historic experiences. *A priori* refers to a declarative statement expressing knowledge which has been acquired prior to or independently from an individual experience (Mises, 1949; Hoppe, 1983, 1995). For this, we will use Praxeology, the science of human action, which is based on the axiom that human beings exist and act (Mises, 1957; Hoppe, 1983, 1995). In line with Mises, we strive for defining relevant so-called *a priori* synthetic judgments. As briefly stated in Chapter 1, to qualify as an *a priori* synthetic judgment, a proposition must meet two requirements: it must not result from experience but from reasoning, and it cannot be denied without causing a logic contradiction. By using formal logic, such *a priori* truths can be deduced from the irrefutably true axiom of human action. Thus, we will derive praxeological statements, obtaining deduced propositions which are true *a priori*.

To some extent, we will also use quantitative research and empiric analyses on automotive sales within the analyzed period in time to illustrate the validity of our theory. A major disadvantage of quantitative research is, that it only takes a 'snapshot' of a phenomenon, measuring variables at a specific moment in time with a specific sample, but failing to ascertain deeper underlying meanings and explanations. Therefore, empiric analyses may help to illustrate a theory for a specific occasion, but empiric data can neither generally confirm nor refute the accuracy of a theory. By relying on quantitative research and empiric data, it is difficult to evaluate the individual

events in their proper context. Thus, quantitative research may potentially explain ‘what’ happened from a quantitative perspective, but it generally fails in showing the complexity of the topic, not being able to show ‘*how*’ and ‘*why*’ something occurred (Mises, 1949, 1957; Rothbard, 1957; Hoppe, 1983). Accordingly, for a deeper and qualitative understanding, a proper theory is essential, which can be accomplished by applying methodological dualism and Praxeology, and by deducing propositions which are true *a priori* based on the axiom of human action.

In regard to monetary policies, we will compare the Keynesian (1936) equilibrium & circular flow-framework with Friedman’s monetarism (1953, 1962, 1969, 1987) and the Austrian Business Cycle Theory, which was mainly developed by Mises (1912, 1934, 1940) and further optimized by Hayek (1931, 1939, 1941), Huerta de Soto (1998) and Hülsmann (2008). Special attention will then be paid to Garrison’s (2001) concept of ‘capital-based macroeconomics’, including the corresponding ‘Production Possibilities Frontier’, the ‘Loanable Market’, the ‘Structure of Production’ and the ‘Stage Specific Labor Market Analysis’, while also paying special attention to the Hayekian triangle (Hayek, 1941). We will highlight the criticism on Keynes’ (1936) ‘paradox of thrift’, while paying special attention to the impact of interest rates on the production structure, as mentioned by Hayek (1969), Garrison (2001), Huerta de Soto (2006), and Keeler (2001). We intend to evaluate, differentiate and explain the different mentioned concepts. Moreover, we intend to illustrate the empiric validity of ‘capital based macro-economics’ on specific historic events, referring to Keeler and Mulligan (2002, 2006).

3.2 Methodology & Research Design

The research design refers to the strategies and methods of data collection used to address the key research questions and objectives of this thesis. The so-called strategies of inquiry can be either of a quantitative or qualitative design, but may also be based on a mixed method.

Chart N°6: Qualitative and Quantitative Research:

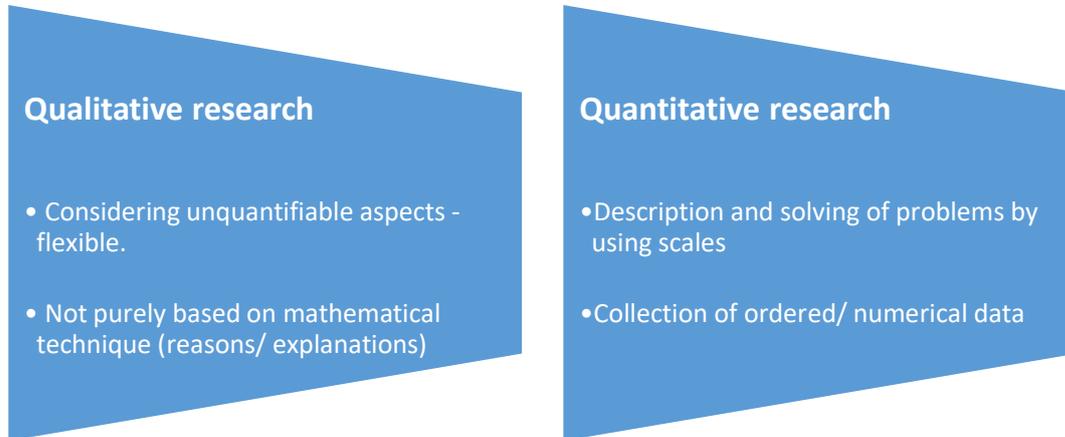


Chart N°7: Descriptive and Analytical Methods:



Source: Author's own design

3.3 Theory & History

This section will explain the importance of defining and following a precise theoretical approach, clearly differing between theory and history. The conceptual basis for our methodological approach was largely defined by the economist von Mises (1940, 1957). The starting point of our approach is based on the praxeological axiom of human action, referring to the undeniable fact that human beings act, which therefore must be seen as an *a priori* synthetic judgment (Mises 1940, 1957; Hoppe, 1983, 1995). *A priori* theory allows researchers to review and possibly revise commonly held theoretical explanations of historical events (Rothbard, 1957, 1962). Simultaneously, by considering the inconsistencies of positivism and empiricism, we will embrace the concept of methodological dualism. Mentioned theories and approaches will be explained in detail throughout the following pages.

3.3.1 Methodological Dualism

In his book '*Nationalökonomie: Theorie des Handelns und Wirtschaftens*' (1940), Mises advanced the system of causal-realistic economic theory, while integrating Mengerian value and price theory with his own earlier restatement of monetary theory (Rothbard, 1962). Already in the late 19th century, Menger had developed a detailed economic theory of social institutions, stating that social institutions arise as a result of an evolutionary process. In this process, an innumerable amount of humans act and interact, each of them shaped by his own personal experiences, subjective knowledge, preferences, goals and feelings (Huerta de Soto, 2006). This spontaneous evolutionary process, a series of behavior patterns emerge, and humans' ongoing discovery processes initiate a decentralized trial and error process, in which the most effective behavior patterns become more accepted and widespread. Consequently, an unconscious social process

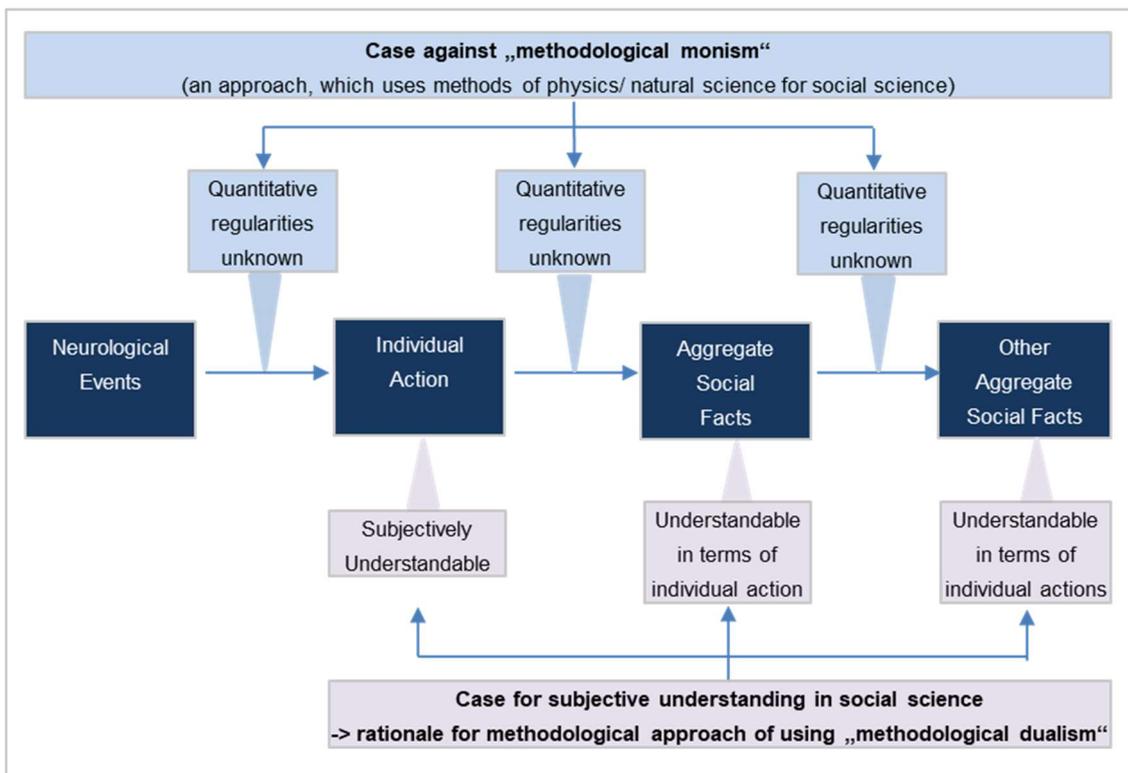
of learning by imitation gradually extends from the most creative individuals up to the rest of society (Menger, 1883).

In 'Theory and History', Mises (1957) further elaborates on the need to use methodological dualism, to properly distinguish between social and economic science on the one hand and natural sciences on the other hand. Mises strongly criticizes any intentions to equate these different sciences and any attempts to measure and calculate human actions with scientific tools used in physics or chemistry. Moreover, if politico-economic decisions by governments are based on the assumption that human actions are scientifically predictable, then these policies will have to lead to a chain of wrong decisions. Thus, based on his concept of praxeology, the science of human action, and as an antithesis to historicism, determinism, and positivism, Mises further elaborated on his definition of methodological dualism (Mises, 1957). Also in the methodologic approach of this thesis, we recognize the limitations of historicism and empiricism, while basing most of our argumentation on the rules of von Mises' praxeology. In line with Mises (1949), also Rothbard (1962), Hoppe (1995), Huerta de Soto (2006, 2009a), Hülsmann (2008), and Benegas Lynch (2011) stated that while natural sciences (such as physics or chemistry), in order to discover scientific laws, must presuppose a strict regularity in the occurrence of causes and effects (e.g. determinism), such a presupposition cannot be held in the case of human action.

Mises criticized behaviorism, determinism, historicism, materialism, dialectic materialism, and positivism, as none of these schools of thought could be considered as conducive to a scientific understanding of human behavior (Mises, 1957). Mises saw in historicism (as well as in positivism) a fatally wrong epistemological approach, referring to its denial of the existence of universal laws, independent of any specific historic events. Mises argued that in order to properly understand human behavior, one must attribute volition and purpose to human behavior, as this needs to be seen as the epistemological and methodological basis of the sciences of human action. He considered his methodological dualism as essential, while criticizing behaviorists and positivists for not being able to properly distinguish between human behavior and social phenomena on the one hand, and molecular behavior and physical phenomena on the other hand. Hoppe (1982), extending the arguments of Mises, defended the existence of *a priori* knowledge, the validity of pure theory, and the use of deductive logic, while ultimately stating that

economics is only a part of the larger discipline of praxeology. Hoppe considers economics as an *a priori* science whose propositions can be given a rigorous logical justification and which therefore has more in common with applied logic than with empirical natural sciences. As Mises (1949), Rothbard (1962), Hoppe (1995), Huerta de Soto (2006, 2009a), and Hülsmann (2008) already stated, economic predictions can only be qualitative as they cannot disclose concrete quantitative forecasts. Thus, scientifically, there is no such thing as a quantitative economic outlook.

Chart N° 8: Methodological Principles



Own elaboration, based on data from: Tonsberg & Henderson (2016)

3.3.2 Praxeology and Thymology

For Mises, the branch which deals with the logical implications of action is called praxeology. In philosophy, praxeology (from Ancient Greek πράξις (praxis), meaning 'deed, action', and -λογία (-logia), meaning 'study of') generally refers to the theory of human action, being based on the notion that humans engage in purposeful behavior. Mises was influenced by several theories in forming his definition of praxeology, including the concepts of Immanuel Kant's, as well as Max Weber's work on methodological individualism, and Carl Menger's development of the subjective theory of value (Selgin, 1987). In Mises' praxeology, the fact that 'man acts' becomes the starting point of all considerations, an *a priori* truth which may then lead us to further findings. The purpose of a man's action is its end, and the desire to achieve this end is man's motive to initiate the action. Thus, human action is goal-oriented and it uses means. These actions and means take time, for which acting men develop a time preference, categorizing tasks and desires by their importance. Mises puts this logic of human action at the center of praxeology. Consequently, whatever does not 'act', not behaving purposefully, can no longer be classified as 'human' (Rothbard, 1962). Mises then added further aspects, such as the fact that ideas determine human action, for which the immense number of new ideas of each individual make it impossible to define behavioral constants to predict future events. According to Mises, the assumption that social or economic processes would be precisely predictable simply ignores the actual dualism of the sciences (Mises, 1957). Mises argued that in the analysis of human action, the social sciences must take thoughts, ideas, and judgments of value as ultimately given. Based on Mises' findings, Rothbard (1962), Hoppe (1995), Huerta de Soto (2006, 2009a), and Hülsmann (2008) argued that in natural sciences such as physics, using mathematics is indispensable to define quantitative laws, and to formulate theoretical explanations for observed phenomena. However, whereas in physics, causal relations are generally verified by referring to precise observable regularities, in praxeology this "*causal force is human action, motivated purposeful behavior, directed at certain ends*" (Rothbard, 1962, p. 324). Even mainline economists such as Buchanan (1990) and Ostrom (1990) agree that acting individuals are the relevant unit of analysis. Without using the term praxeology in their writings, both agree that even if there are some patterns in human behavior, scientist

cannot foresee how every person will react in any situation given. Boettke (2012) and Buchanan (1990) agree that the science of human action is very different from natural sciences, and the philosophical or scientific models needed to better understand human behavior cannot be identical to those used in natural sciences. Unlike in physical sciences, the human sciences begin with the plans and purposes of individuals. Thus, in the human sciences, the relevant ‘facts’ of the world are shaped by what the actors think, believe and do. The goal of the science of human action is to understand human behavior, not to predict it. Kirzner (1963) stated that laws of physical nature are based on the observation of constant sequences of physical events, whereas economic laws “*are founded on our understanding of the influence that a given event will have upon the actions of individuals*” (Kirzner, 1963, p. 4) Thus, evaluating past economic events, including business cycles, from a statistical point to then conclude a general theory from the used historic data, is impossible and scientifically unsound. Any historical-statistical fact is a complex result of many causal influences and must not be used to construct a causal theory (Huerta de Soto, 2006).

In addition, also man’s ignorance to the origins and causes of certain phenomena forces economists to adopt a dualistic approach (Mises, 1957; Hoppe, 1983). Mises’ approach must be seen as crucial when thoroughly analyzing historic events while trying to draw proper conclusions from them. For Mises, the science of human action must deal with ends and means, with volition, with meaning and understanding, with thoughts, ideas, and the judgments of value. Action must be seen as the purposive use of chosen means for the attainment of chosen ends (Mises, 1949). Consequently, ideas, beliefs, and judgments of value define the choice of both, means and ends. Thus, for Mises, these mental phenomena must be given a central role and consideration in the sciences of human action as “acts of choosing are determined by thoughts and ideas” (Mises, 1957, p. 11). Directly linked to these findings is another fundamental implication derived from the essence of human action: the uncertainty about future events. As man constantly acts, and as all human choices are continually changing as a result of changing valuations and changing ideas, man cannot know the precise outcome of future events. Mises highlighted the limitations of using natural sciences for the analysis of human behavior, as these would be unable to define “*how definite external events [...] produce within the human mind definite ideas, value judgments, and*

volitions" (Mises, 1962, p. 83). Thus, when evaluating human knowledge, we must consider two distinct fields, the "realm of external events" on the one hand, and the "realm of human thought and action" on the other.

By doing so, he also emphasizes on the concept of thymology as a branch within praxeology. Thymology can be defined as the study of human aspects which precede or cause purposeful human behavior. It is the knowledge of the social environment in which man lives and acts, dealing with the mental activities of man which define his actions, aspects which cannot be properly considered by the methods of the natural sciences (Mises, 1957, p. 266-272).

Mises argued that since humans are thinking and acting beings they can reflect on the meaning of their actions and intentions. And it is precisely this kind of reflective knowledge, which "*is our own because we are men*" (Mises, 1949, p.64). Moreover, for Mises, causality is a category of action, as "acting" means to interfere at some earlier point in time in order to produce some later result. Categories such as values, ends, means, choice, profit, loss, time and causality are all implied in the axiom of action. Therefore, in order to come to adequate conclusions in this thesis, Mises' methodological dualism will be considered, as we strongly question whether the traditional concepts of historicism, positivism and empiricism could help us in properly evaluating the research questions raised in Chapter 1.

3.3.3 The Limits of Empiric Data

As stated we analyse a specific period of time in this thesis, namely the period from 2001 to 2018, trying to illustrate the appropriateness of our theoretical approach by using the corresponding empiric data. By explaining the rationale of Praxeology and methodological dualism, we already highlighted our approach that empiric data will neither allow us to quantitatively predict future events nor to draw general conclusions on the future. However, we now want to evaluate the assumed potential benefits of empiricism more thoroughly. Empiricism pretends to detect

causalities not only to come to general causal explanations, but also to elaborate future prediction. To explain events causally, empiricists generally formulate statements such as "if A, then B" or, in case the variables allow quantitative measuring, "an increase (decrease) in A, is directly related to an increase (decrease) in B." In the sphere of human action statistics have been a relevant method of historical research, as it records historical facts in quantitative terms. However as thorough statistical information about recent events may be, it keeps being information about the past and can therefore not provide any precise outlook on the future of human actions. Thus, if the future were only a constant continuation of trends which prevailed in the past, there would not be any uncertainty (Mises, 1957; Hoppe, 1983; Sowell, 2015). Recognizing the limitations of empiricism and focusing on the concepts of capital-based macroeconomics and the Austrian Business Cycle Theory in this research, our methodological approach intends to combine two different goals:

On the one hand, we intend to illustrate the validity of the Austrian Business Cycle Theory (ABCT) with empiric data on the 2008-2009 global financial crisis and its impact on the automotive industry. In this context, we consider it as reasonable to use empiric data in order to illustrate the validity of the ABCT for this specific analyzed event, which shall even convince those readers of our thesis, who might reject the general concept of Mises' Praxeology.

On the other hand, this thesis is certainly not meant to be a pure 'case study', empirically evaluating a limited period of time in history. As mentioned, the inductive analysis of previous events based on empiricism will not allow us draw conclusions for future occasions. Thus, we recognize the limitations of both, empiricism and positivism, also acknowledging that induction will not allow us to define any general valid conclusions. Mises (1957) argued that economic prediction can never disclose any information on the concrete quantitative future relations concerned, for which economic forecasts can only be qualitative. Also Morgenstern (1950) demonstrated the fallacies behind much academic economic theorizing. Morgenstern explained the challenges related to proper economic measurement, challenging the accuracy of empiric evaluations, including official public data (Bagus, 2011a). In his book 'On the Accuracy of Economic Observations' (1950), Morgenstern referred to the challenges in properly detecting, analyzing and interpreting economic data. By referring to the example of national income data to

reach conclusions about the state of a country's economy and corresponding useful public policies. Consequently, we must not get caught in the trap of empiricists to assume inductive analysis of historic events could lead us to concrete predictions on the evolution of the automotive industry. As one example of recent times, we may refer to economic forecasts made at the end of the year 2019 in regard to the expected economic outlook for 2020. Provisions of all well-known consultancies have proven to be completely wrong, certainly not being able to foresee the drastic global economic downturn which started in the first quarter of 2020, related to the outbreak of the Covid-19 pandemia.

Thus, even if in the past, a causality between "an increase (decrease) in A, and an increase (decrease) in B" could be detected in empiric analyses, such inductive conclusion cannot give us any scientific quantitative indication on future events. Such assumptions would always be hypothetical, as its veracity depends on the outcome of future observations which cannot be known in advance. Even if the next future experience also confirms the previously stated hypothetical causal explanation, it would still not prove the "general validity" of the hypothesis to give a scientific outlook on future outcomes. Later experiences could still possibly falsify it. The philosopher and objectivist novelist Ayn Rand once stated that "*contradictions do not exist. Whenever you think that you are facing a contradiction, check your premises. You will find that one of them is wrong.*" (Rand, 1957, p. 199) In other words, referring to the principle of non-contradiction and the basis of *reductio ad absurdum*, Rand argued that 'contradicting conclusions' do not occur due to the complexity of the discussed topic, but because at least one of the used premises was incorrect. Contradictory propositions cannot both be true in the same sense at the same time, for which the two propositions "A is B" and "A is not B" are mutually exclusive. Moreover, in our research, we do not define **causality** as constant, time-independent operating causes, of constant variables which would allow us to predict relations of upcoming events by projecting past observations into the future. Instead, as stated by Hoppe, "*the principle of causality must be understood as implied in our understanding of action as an interference with the observational world, made with the intent of diverting the 'natural' course of events in order to produce a different, preferred state of affairs*" (Hoppe, 1983, p. 77). In line with the *a priori* truths of human action, we agree with Mises (1940) and Rothbard (1957) that all people have individual

goals and adopt means to achieve them. Historic economic events are complex, heterogeneous and therefore ultimately unique. Thus, the analysis of human action must not be a purely empiric evaluation with historic data. In line with von Mises, also Lachmann (1986) focused on a subjectivist approach, emphasising on the spontaneous, unpredictable nature of human action for which he rejected a mechanistic notion of time and probability in social science. Mises stated that each historical event is a complex resultant of a shifting variety of multiple causes, none of which ever remains in constant relationships with the others. Consequently, every historical event is heterogeneous and cannot be used to construct laws of history. According to Mises (1940), there can be many similarities between historic events, but no complete homogeneity, for which no scientific laws can be derived from these events. Rothbard (1957) and Hoppe (1983) even argue that it is the praxeologist who is truly empirical because he recognizes the unique and heterogeneous nature of historical facts – unlike self-proclaimed ‘empiricist’ who ignore the independent, unique facts of history by attempting to reduce these to quantitative laws.

3.3.4 Dynamic Efficiency & the Impossible Neo-Classical ‘Perfect Competition’

Moreover, and in line with praxeology and methodological dualism, also the concept of dynamic efficiency (Huerta de Soto, 2009a) and the criticism of the neo-classical concept of ‘perfect competition’ (Kirzner, 1963, 1973) are key elements of Austrian School economics. Thus, these approaches will also be considered throughout the thesis. In the neoclassical model, the market process mainly consists of recognizing what is generally already known, and then simply acting upon it, ignoring the fact that resources and technology are not ‘given constants’ in the real world, but that both can significantly change due to entrepreneurial actions (Garrison, 2001). Israel Kirzner (1973) defined a detailed alternative to the unrealistic approaches of the neo-classical school, emphasising on seeing competition as a constant process in which alert and creative entrepreneurs intend to detect market niches and other business opportunities to optimize customer satisfaction, market share and profit.

In line with both, praxeology (Mises, 1940), as well as with Hayek's (1944, 1945) definition of the spontaneous order, Huerta de Soto's concept of dynamic efficiency rejects the idea that historic data can assure a proper forecasting of future market changes. Humans evaluate things differently, and they constantly learn, changing priorities while making experiences and gaining new knowledge. Consequently, all human actions are unique, which ultimately explains why also entire markets constantly change (Huerta de Soto, 2009a).

3.4 Methodological Approach to the Theoretical Concept of 'ABCT'

Two of our main research questions in this thesis are: How significant has the expansive monetary policy of the past decades been? As well as: Did the extremely low interest rates in the period from 2002-2004 cause an artificial boom of automotive sales in the USA and Europe? We want to define the impact of expansive monetary policies on the automotive sales evolution as well as of simultaneously low interest rates in Europe and the USA in the period from 2001 to 2008. Thus, a key theoretical concept for our analysis will certainly be the so-called Austrian Business Cycle Theory (ABCT). It is seen as particularly crucial to properly illustrate the boom-and-bust cycle in the period from 2001 to 2009. In his first major treatise '*Theorie des Geldes und der Umlaufsmittel*', Ludwig von Mises (1912) further elaborated on Carl Menger's findings regarding the subjective theory of value and explained how it can be integrated with Mises' theory of money. Mises explained the origins of money by using his "regression theorem", as according to him, certain commodities have historically been accepted as money, only if there had been a demand for the money commodity in a barter economy. More importantly for our thesis, Mises tried to demonstrate that fractional-reserve banking is the root cause of business cycles (Mises, 1934). He stated that a fiat currency system with unbacked money substitutes reduces the interest rate in the credit market below its natural level, that is, below the level it would have reached in the absence of public interventionism. In the 19th century, only a few economists were able to define a thorough and structured approach to deduce a business cycle theory from general economic

analysis, of which according to Rothbard the two most important and consistent approaches came from Hayek and Mises (Rothbard, 1962). Unlike Hayek and Mises, most writers used aggregative models with no relation to a general economic analysis of individual actions. Rothbard (1962), Hoppe (1995), Huerta de Soto (2006, 2008), Hülsmann (2008), and Benegas Lynch (2011) agree that all of these models, generally based on conceptual realism, must be considered as incorrect as aggregative concepts which ignore the basic concept of individual human actions cannot provide useful general explanations of the real world. Thus, our analysis in Chapter 4 will consider different theoretical approaches (apart from the ABCT), but will also indicate their particular limitations and inconsistencies.

3.4.1 Capital Theory and Time Preference

First of all, to understand the foundations of capital theory, we need to understand “*the subjectivist conception of human action as a series of productive stages intended to achieve an end*” (Huerta de Soto, 2006, p. 266). Mises (1949) defined human action as any deliberate behavior or conduct, as a person acts to attain certain goals. The importance of these goals is defined subjectively by the actor. He gives a subjective value to his goal and defines the means which he (subjectively) considers as best to accomplish his goal. Thus, after having defined the ends which should be accomplished, the actor defines the means to be used, which he – generally tacitly – incorporates them into his respective plan of action (Huerta de Soto, 2006). This plan consists of different future stages, elements and circumstances which might occur until the end is ultimately achieved. Any human action is aimed at achieving an end (such as a consumer good) which should then subjectively satisfy the needs of that acting human (Mises, 1940). The term *first-order economic goods* has traditionally been used for consumer goods which (in a certain subjective context) represent the direct achievement of the pursued goal by the actor. However, the ultimate achievement of these goals (acquisition of the desired consumer goods, or first-order economic goods) is preceded by a series of intermediate stages. These previous stages are represented

by “higher-order economic goods” (second-order goods, third-order goods... etc.): the higher the order of the individual stage, the further that good is from the final consumer good. These ‘higher-order economic goods’ (or factors of production) can also be called ‘capital goods’, subjectively materializing at the intermediate stages within the particular action process (Rothbard, 1962). Moreover, to understand the capital theory, we must consider that all human action takes place in time, considering time in a subjective sense, by referring to the actor’s subjective perception of time within the context of his action (Böhm-Bawerk, 1891). In this subjectivist conception, the actor realizes the passage of time while he acts, or, to say it differently, he experiences new ends and means, while designing his plans of action and eventually completing the different stages. Thus, in economics, time is inseparable from human action, since what separates the actor from achieving his goal is the time period needed throughout the series of successive stages required (Hayek, 1941). Consequently, humans intend to accomplish their goals as quickly as possible, for which, if one is faced with two goals of equal subjective value, one generally prefers to achieve the goal that can be attained in less time (Bagus *et al.*, 2014). In other word, humans only consider postponing the achievement of their ends if they expect to attain even more valuable objectives at a later stage (Mises, 1949). Every actor’s subjective assessment of his time preference is what enables him to properly coordinate or adjust his behavior in order to achieve his goals (Hoppe, 1995). We may summarize that, other things being equal, the law of time preference indicates that ‘present goods’ are always preferable to ‘future goods’.

We will use the term ‘capital goods’ to refer to the intermediate stages of each action process, in line with Huerta de Soto (2006) who defines every intermediate stage in an actor’s production process as a capital good. In a sustainable economy, each process of investment in capital goods requires previous saving (Böhm-Bawerk, 1889). Capital goods are the intermediate stages considered as necessary by the actor to ultimately achieve the actual purpose of his action (O’Driscoll, *et al.*, 1985). Capital goods are the result of three aspects, namely labor, time and natural resources. In a free market, the ‘sine qua non’ in order to produce capital goods is prior saving as well as the renouncement to or postponing of immediate consumption (Reimers, 2018). In modern economies production processes are often rather complex and lengthy in terms of time, as they incorporate a variety of interrelated stages (Rothbard, 1962). Garrison (2001) followed-

up on the findings of Hayek (1932, 1941), using Hayek's model of a structure of production which extends from earlier stages to later stages, with different specific types of capital for these different stages. Garrison rehabilitated Hayek's theory of the trade cycle, while also explaining why the nature of macroeconomic fluctuations can only be understood when considering the heterogeneous nature of capital.

As the entire process of producing a car takes several years, consisting of a multitude of productive stages, we may use the industry sector analyzed in this thesis as a perfect example (Huerta de Soto, 2006): This process starts by defining the general concept of the vehicle (the stage furthest from final consumption), leading to the definition of its design, as well as the selection and ordering of the corresponding materials from automotive suppliers. In further phases, the actual production of all parts, accessories and of the engine starts, leading to the actual production and assembling of the final vehicle and its delivery to the dealer network and/ or the final customer. Thus, the production of each vehicle requires a sophisticated process of production which takes several years, and numerous stages (Huerta de Soto, 2006). The price system as well as profit and loss accounting guide the production activities through time, allowing the economic actors to focus on those investments which seem economically viable (Hayek, 1931; Kirzner, 1963; Boettke, 2001). However, as we learned from Mises (1940) and the concepts of methodologic dualism and praxeology, the concrete future demand for the planned products is uncertain and cannot be quantitatively forecasted. Huerta de Soto (2009) explains that the production process of a car requires different stages of investment, ranging from the most remote (mining iron ore) to the most immediate (the car dealership). The values of all producer goods at the stages of production derive from the value consumers place on the final consumer good (Huerta de Soto, 1998). Several production plans align goods at these different stages of production into a capital structure which ultimately leads to the production of the final good (Garrison, 2001; Boettke, 2012). Capital goods are neither fully homogeneous nor perfectly substitutable, for which it is not possible that any capital good could be used to simply produce any final product which the consumer desires. For example, an automotive factory is built to make cars, but it cannot quickly shift to an efficient, competitive production of mobile phones. The complex alignment of differing types of capital goods to produce diverse consumer goods and

services is led by price signals and the economic calculations by the investors (Kirzner, 1963; Boettke, 2012). When the price system is distorted, it is likely that investors will commit mistakes in aligning their capital goods (Hayek, 1931; Garrison, 2001).

Mark Skousen (1990) properly indicates that the increasing division of labor (both horizontally and vertically) has caused the stages of production to be further broken down into other stages. This leads companies and economic agents within the automotive sector to further specialize in specific stages of the process, such as research for new vehicle engine technologies, or for new safety features or optimized spare parts and accessories. They may also specialize in the development of more efficient assembly lines, or in optimizing sales and service processes at the dealer network. Some become experts in purchasing parts from suppliers, others in optimizing the supply chain process or in actually selling the vehicles to customers. This increase in the stages in production, combined with the ongoing division of labour and the increase of deepened specialized knowledge of the economic agents, improves the competitiveness of an economy (Skousen, 1990). Thus, the essential difference between rich economies and rather underdeveloped economies can be linked to the fact that richer nations generally possess a more extensive network of well-invested capital goods (Huerta de Soto, 1998). These capital goods generally consist of machines, computers, buildings, semi-manufactured goods and software, and in a free market economy without public interventionism, prior savings are necessary to develop and/or buy these goods (Huerta de Soto, 1998; Garrison, 2001). In regard to the mentioned stages of production, we can generally conclude that the longer the production process, the more productive the process tends to be.

However, these capital goods must be properly preserved and maintained, as wear on capital equipment is not only physical, but also technological and economic. Thus, apart from regularly maintaining and repairing their existing capital goods, entrepreneurs must also constantly produce new capital goods to replace the old ones.

3.4.2 Business Cycles and Fractional Reserve Banking

The evaluation of the impact of expansive monetary policies as well as of artificially low interest rates on the economy and corresponding business cycles is a key objective of this thesis. Thus, key for our methodology will be the proper interpretation and illustration of economic business cycles. Further theoretical details will be shown in Chapter 4 of this study. However, we want to provide further details on our theoretical approach as it is directly intertwined with our methodology. Mises (1934) established a general theory of business cycles, which also included and combined different concepts previously elaborated by Cantillon, Menger, Böhm-Bawerk, and Wicksell.

Mises (1934) showed that if central banks increase the money supply, the market rate of interest will fall below the natural rate of interest ('natural' as this would be the rate without any interventions by governments and the central bank). This interventionism will lead investors to borrow more money, expanding their investments, undertaking riskier projects and more roundabout production processes. Mentioned investors compete between each other for assets, resources, and goods, inevitably leading to a corresponding price inflation and an increase in the rate of interest. This will have a relevant impact on the economy, as in this scenario more roundabout investment projects will be considered as less opportune options. Based on Mises' (1912, 1934, 1940) findings, Hayek (1939, 1941, 1969) expanded the ABC theory, including capital theory and its integration into the structure of production. Unlike the Austrians, Keynes (1936) argued that economic bubbles mainly exist because of psychological instabilities within the economy, not because of coercive public interventions and corresponding misallocations of resources. On the contrary, Keynesianism supports countercyclical policies of the government, to provide monetary and fiscal incentives to the market in order to stabilize the business cycle (Keynes, 1923, 1936; Huerta de Soto, 1998). The Austrian business cycle theory (ABC theory) incorporates 'real' structural changes as well as psychological aspects, but paying particular attention to the harm caused by public interventions, such as monetary policies of central banks.

The ABC theory argues that, if central banks make loans or purchase government bonds from banks, this action causes an injection of bank reserves into the economy (Huerta de Soto, 1998; Garrison, 2011). Banks then have excess reserves which they can loan, but the excess of loanable funds also urges the banks to either reduce the charged interest rate or the credit quality requirements of borrowers, or both. This leads to increased borrowing and investing, particularly in those sectors where the return on investment is expected after a rather long period of time. When central banks drive the market rate of interest below the natural rate of interest, market participants rather refrain from saving assets, as the interest income from savings is likely to be lower than the expected benefits from investing. According to Rothbard (1970), central banks aim to ensure that all the banks within the country are coordinated centrally, and at the will of the government. In line with Mises and Hayek, economists such Garrison (2001) Huerta de Soto (2006, 2009b, 2009c) and Hülsmann (2008) argue that the artificial economic boom before the corresponding bust is the real problem as throughout this period of (artificial) economic growth, resources are being misallocated. Ultimately, due to the unsustainable allocation of resources, this bubble must come to an end.

The ABC theory is not based on inductive research, and does not pretend to prove its general validity based on empiric quantitative evidence. Our praxeological approach cannot provide a precise explanation of each man's time preference, as these are psychologically determined by each person. Generally, praxeology cannot establish exact quantitative laws, only being able to give qualitative predictions. Thus, also in regard to future business cycles, economics can only tell us that a boom caused by credit expansion is not sustainable and can therefore not assure a natural long-term growth, but it cannot tell us at what particular point in time the economic bust will occur. However, by using *ceteris paribus* assumptions, praxeology is able to provide certain truths about time preferences, for example that individuals tend to distinguish and prioritize between actions based on whether they can expect the effects of those actions to be felt sooner or later. At any specific point in time, economic agents wish to attain several different ends, for which they will need to prioritize, primarily focusing on achieving those ends which they identify as priorities according to their individual scale of preferences. In Chapter 4 of this thesis, empirical data will help us to better illustrate the validity of the essential findings of the ABCT. Thus, we will

explain the circulation credit theory of the business cycle, and will also have a thorough look at the recent financial crisis of the early 21st century while also evaluating how the macroeconomic theories of monetarism and Keynesianism have impacted this crisis (Huerta de Soto, 2009b, 2009c). The lack of well-thought monetary and banking theory has hampered the development of the world economy and modern economies have constantly been affected by recurring booms and recessions (Bagus, *et al.*, 2014).

For the first part of the research, which focuses on monetary policies, several macroeconomic models are evaluated. A vector correlation model (Mulligan, 2006) is used as an econometric methodology to interpret the relationship between real consumable output and the interest rate term spread (IRTS). Empirical estimates based on parsimonious specification will be used with historic data to isolate the influences of credit expansion on consumable output. The Johansen-Juselius test (1990) for co-integration is used to identify long-term relationships which existed in the past between real consumable output and the interest rate term spread, while combining it with an evaluation with the unit-root tests by Dickey-Fuller (1979) and the Phillips-Perron (1988) concept. The 'Gross Domestic Expenditure' (GDE) concept developed by Skousen (2010) is used, which is seen as a better indicator for business cycle activities as the generally used Gross Domestic Product (GDP), as GDE measures aggregate spending in the economy, measuring different stages, including intermediate production and final use. Moreover, based on analyses by Nicolás Cachanosky and Peter Lewin, the EVA (economic value added) framework and financial concepts like 'duration to business cycles' were used to show that monetary policies change the relative present value of investment projects (Cachanosky & Lewin, 2016). The VAR model (vector auto-regression, a stochastic process model) is used to evaluate if industrial Gross Value Added (GVA) is linked with changes in short-term interest rates. Cross Correlations based on James P. Keeler is used to illustrate former correlations between money supply, interest rates and the stages of productions (Keeler, 2001). Based on Luther & Cohen (2015) a structural vector auto regression is used to estimate changes in the structure of production (measuring industrial production in early, middle, and late stages of production) immediately after a monetary shock.

Moreover, special attention will be paid to the main aspects which have influenced (and potentially hampered) the sales evolution of alternative fuel vehicles (AFVs). Struben and Sterman (2008) developed the 'Willingness to Consider' concept (WtC) which captures the 'emotional, cognitive, and social processes through which drivers gain enough information about, understanding of and emotional attachment to a platform/ powertrain for it to enter their consideration set.' Harrison and Thiel (2017) studied the impact of incentives and infrastructure on the competitiveness of alternative fuel vehicles within the European automotive market. They combined the WtC with the relative financial attractiveness (based on total cost of ownership), as well as with perceived values and importance of attributes which characterize the different ICE and AFV powertrains. In our analysis, we will also consider the WtC, among other relevant concepts on customer behavior and product innovations.

3.5 Data Collection

In the following, we want to provide further details about the sampling, the data collection method and the analysis process used, while also critically evaluating their corresponding credibility and limitations. The research method describes the way of collecting the data, as well as on how to analyze the data and to interpret the results. Research methods are categorized according to the purpose of the study, by evaluating their advantages and disadvantages. The possible methods are classified into two main categories: qualitative and quantitative research. Benefits and particularities of both quantitative and qualitative research have been studied using specialized literature, such as Boris Blumberg's 'Business Research Methods' (2011), as well as 'The Craft of Research' (2008) and 'A Manual for Writers' (2007) both written by Booth, Colomb and Williams. Our research will be based on the previously mentioned concepts of Austrian School economics. The research intends to detect whether there are 'general, apodictic effects', caused by

mentioned monetary policies and public incentives, to define categorical conclusions while recognizing regional particularities and the limitations of induction. However, apart from economic theory, we also refer to econometrics and specific macroeconomic case studies when considered as helpful to provide empiric illustrations of our general theory. Thus, to illustrate our theoretical approach, quantitative research and analyses based on historic data shall be applied, while assuring a detailed evaluation of diverse viewpoints.

The analysis of specialized websites, automotive journals and academic articles revealed that it will only be feasible to properly solve all mentioned key research questions when using a wide but well-structured set of specialized academic literature. In order to evaluate the amount and quality of available data, an extensive literature review was conducted which had already been explained in further detail in Chapter 2 of this thesis.

Payne and Payne (2004, p. 180) stated that quantitative methods “*seek regularities in human lives, by focusing on empirical components called variables which can be represented numerically.*” Quantitative data should then provide us a ‘picture’ for the analyzed period of time, using the corresponding sets of data. These larger sets of data shall enable us to illustrate our conclusions. Thus, quantitative methods will be used to provide concrete empiric data to support our theory and to confirm our presumptions. Bryman (2012, p. 35) defined quantitative research as, “*a research strategy that emphasizes on quantification in the collection and analysis of data...*” which means that quantitative research denotes amounting something. Thus, automotive sales data (vehicle registrations) is collected from major automotive data providers Polk, IHS and from the association ACEA. This data, which can be split by year, country and OEMs will enable us to illustrate the effects of different public incentive policies on the vehicle sales evolution within different markets. Thus, we will consider cross-sectional analysis, as several other studies on this topic have also used cross-sectional sales and registration data from different countries to examine factors influencing automobile adoption. These studies include Button *et al.* (1993), who used cross-sectional data on car adoption in low income countries; Cao *et al.* (2004), who looked

at car ownership in California, as well as Kahn (2007), who chose census track data to evaluate hybrid registrations in Californian cities.

However, as indicated, our theoretical framework is based on praxeology, methodological dualism and deduction (Mises, 1940, 1957), while rejecting public interventionism. In this context, our ethical approach is based on the non-aggression theorem (Rand, 1964) and the benefits of human cooperation in a free society (Mises, 1912, 1940, 1957; Hayek, 1939, 1944). These aspects clearly differentiate our methodology from purely empiric market research and the concepts provided by mainstream economics.

One main challenge in analyzing automotive sales by using time series data is to truly define the proper correlation between the specific independent variables and the dependent variable, as several intervening, moderating and control variables have also significantly changed over the analyzed period. For example, public incentives for AFVs might have developed in line with other crucial changes such as an optimization of the recharging network, the optimization of the vehicles' driving range and a general consciousness for environmental issues. Moreover, the market share alone can be an unreliable indicator as it can be influenced by several temporary aspects, such as seasonality and supply constraints. We will sufficiently document our research steps and by clarifying the research methods and data resources it should be assured that other researchers can get to similar conclusion when using the same theoretical and analytical approach. As a primary methodology, cross-sectional time-series analysis of vehicle registration statistics over time from different countries is used to illustrate a possible relationship between sales evolutions and the corresponding policy variables. For this we will use and analyze both, primary and secondary data. Different tools of quantitative research are used to provide systematic, standardized empiric comparisons. Primary data from well-known data service providers such as IHS, Dataforce and Polk shall be used, evaluating vehicle registration data from 2001 to 2018. AFV registration data will be evaluated from 2010 to 2018, to calculate the AFV market share (i.e. new hybrids (H-EVs) and/or the share of fuel cell vehicles (FC-EVs) as a percentage of all new vehicle registrations within a certain time period for each analyzed European market. As a primary

methodology, cross-sectional time-series analysis of AFV registration statistics over time from different European countries is used to test the relationship between AFV adoption and the corresponding public policy variables. In addition, also certain aspects of behavioral economics will be briefly evaluated, studying the effects of psychological, cognitive, emotional, cultural and social factors on the economic decisions of automobile customers.

Moreover, Jenkin (2015) insists on the impact of economies of scale, which will help manufacturers to produce cheaper AFVs. Concrete indications for increasing AFV sales volumes would then reassure car manufacturers to invest into larger production facilities for AFVs, leading to lower per-unit-costs. Consequently, particularly for B-EVs, economies of scale will drive down total production costs of electric vehicles, enabling them to achieve much wider-scale adoption. We must also not ignore what is called 'the experience curve' which refers to the effect that the higher the cumulative volume of production (X), the lower the direct cost per new unit produced (C). We shall also look at Gartner's 'hype cycle model' which is meant to explain the process of how new industries emerge, grow, stumble and eventually prosper. Thus, Gartner's concept has also proven to be helpful for the automotive industry, in particular regarding the analysis of consumer behavior and acceptance in regard to AFV technologies.

3.5.1 Documents & OEMs Primary (non-confidential) Data

The author of this thesis has worked for more than 15 consecutive years within the European automotive industry, having been employed by SEAT S.A., General Motors, Hyundai Motor Company and FCA Fiat Chrysler Automobiles. Confidential data will not be mentioned in this thesis, but data from non-confidential analyses as well as documents and institutional reports will be reviewed. These will rarely be 'neutral artifacts', being affected by the subjectivity of those who produced them. However, they can be useful for triangulation. Analyzed documents are the

Annual Reports of the International Monetary Fund, the European Central Bank as well as of several automotive OEMs such as Hyundai Motor Company, Toyota Motor Corporation and General Motors.

The data is systematically searched and analyzed to provide a thorough description of the evaluated phenomena. By using the previously described data sources, we argue that a solid academic research can be properly done. While recognizing regional particularities and the limitations of induction, the ultimate goal of the research is to define general future recommendations for the European automotive industry. Despite political, economic and cultural differences between the European markets, and despite significant differences between the individual automotive OEMs in Europe, it will be evaluated if an inferential empirical validity of the study's outcome can be detected.

3.5.2 Quantitative Research

As stated, we aim to illustrate the appropriateness of our defined theory (the propositions of a *priori* truths) with corresponding empiric data. To assure that a sufficient amount of useful feedback and rich data is received, it is important to use an adequate sampling technique. Quantitative research tools, in particular questionnaires, are used for this thesis, as questionnaires are an efficient alternative to interviews, allowing us to contact a wider sample of people, spread across the globe. We used 2 different questions, for two different topics and target groups. The first questionnaire was meant for 25 economists to evaluate the impact of expansive monetary policies. The second questionnaire is given to automotive experts in regard to their evaluation of the competitiveness of full-electric vehicles (B-EVs) and the effects of corresponding public incentives.

Table N°3: Concept of Used Quantitative Research Component

Research Components	Quantitative Conclusive research
Purpose	Targets to verify specific insights to select the appropriate strategy of action. <i>Descriptive:</i> describe phenomena, cause or element <i>Causal:</i> research relationship between cause and effect
Data needs	To be clearly defined
Form of data collection	Structured
Sample size	Large, participants objectively selected to allow generalization of data
Suggested Data collection procedure	Rigid, clearly defined procedure
Data analysis	Formal, quantitative

(Author's own design)

3.5.2.1 Questionnaire N°1: Opinion of Economists on Recent Monetary Policies

In addition to the usage of methodological dualism, praxeology and other tools such as the Austrian Business Cycle Theory, also quantitative research will be applied by using questionnaires. An interval measurement structure with an itemized rating scale will be used, rating the level of agreement or disagreement. Consequently, an interval 5-point Likert scale, developed by Rensis Likert is applied as a bipolar scaling method. As the raised questions require a thorough knowledge of monetary policies by the interviewee, the sample size is limited to 25 economists. All 25 economists that take the questionnaire have successfully graduated from well-known US-American or European universities, holding a Master's degree in Economics (M.Sc., MEcon. or MA). The questionnaire's outcome shall, among other aspects, show if the majority of participants assume that interventionism by central banks and public governments, applying expansive monetary policies and/ or public incentives, leads to an unsustainable market distortion.

3.5.2.2 Questionnaire N°2: Automotive Experts on the Competitiveness of B-EVs

Following up on the structure of the questionnaire applied on monetary policies, we will use a similar approach in regard to fiscal policies, particularly to evaluate public incentives for the automotive industry. In this context, the following proposition for a praxeologic *a priori* truth had been defined in this thesis: *'Fiscal policies distort the free market process, and will lead to unsustainable misallocations, ultimately lowering people's average standard of living, hampering free entrepreneurship and free consumer choice'*.

Thus, also in regard to the competitiveness of alternative fuel vehicles, quantitative research is applied by distributing a questionnaire. Also in this case, an interval 5-point Likert scale was applied for most of the questions. As the raised questions require a thorough knowledge of the automotive market, the sample size is limited to 30 automotive experts. The scaling method, ranging from "1" (strongly disagree) to "5" (strongly agree) is used to evaluate the sample participants' responses. The raised questions are partially based on gaps after the literature review, but also to get direct responses from market experts to the key research questions and objectives.

3.6 Summary of Chapter 3 (Theory & Research Methodology)

This chapter on 'Theory & Research Methodology' outlined the processes used to assure a coherent and scientific research. Defining a precise research methodology requires a well-structured research process.

The consistency and coherence of our *a priori* theory, as well as the quality of the used data and literature can be assessed by two main questions: (1) Is it likely that other researchers will be able

to come to similar observations, using the same measures? (2) Has the entire research process, including the definition of our *a priori* theory, the corresponding deduction and *a priori* reasoning, as well as the collection and interpretation of the used literature and data been done in a consistent and coherent way?

4 The Impact of Monetary & Fiscal Policies on the Automotive Industry

As indicated, in this chapter we intend to respond to our major research objectives and to prove the validity of our proposed praxeologic *a priori* truths.

We want to clarify how monetary and fiscal policies influenced the sales evolution of automotive OEMs in the USA and Europe within the years 2001 to 2018. Thus, Chapter 4 can basically be split into four sections, or more precisely speaking: into two subject areas which themselves will firstly be elaborated from a theoretical perspective, to then illustrate our findings with empiric data. The first subject area refers to 'monetary policies & business cycles' looking primarily at the period from 2001 to 2010. The second subject area analyses 'fiscal policies', particularly looking at public incentives for alternative fuel vehicles. As indicated, for both of these subject areas we will elaborate a theoretical approach, to then illustrate the theory's validity with historic data.

Consequently, we will now explain in more detail how we intend to demonstrate the impact of credit expansions by central banks as well as of fiscal policies and public incentives on the automotive industry.

Within the first sections of this chapter, we will explain the effects of monetary and fiscal policies on the economy in general. Therefore, we will look at different economic schools of thought, such as monetarism (Friedman, 1953, 1961, 1962, 1969) and Keynesianism (Keynes, 1923, 1936, 2012), but paying special attention to the perspective of the Austrian School of economics. Thus, we will thoroughly evaluate the concept of the so-called Hayekian triangle (Hayek, 1931, 1932, 1941) as well as of the Austrian business cycle theory (Hayek, 1928, 1932; Mises, 1912, 1940; Rothbard, 1962; Huerta de Soto, 1998). We will also pay attention to Roger Garrison's concept of 'capital based macro-economics' (Garrison, 2001), which intends to provide a holistic approach to monetary policies, business cycles and the stages of production from an Austrian school perspective. In regard to the macroeconomic effects of monetary policies, we want to emphasize on an eventual correlation in the analyzed historic events between short-term economic booms,

caused by ultra-loose monetary policies, and the following recessions. In Chapter 1, we used Praxeology (Mises, 1957) to define three propositions which we consider as praxeologic *a priori* truths. In Chapter 4 of this thesis, we want to further elaborate on these propositions. The first *a priori* truth we want to emphasize on is: *'Fiat money, being typically created through bank circulation credit, causes economically detrimental effects on the economy, causing capital consumption and malinvestment'*. The second *a priori* truth we defined based on Praxeology, which is also related to monetary policies, is the following: *'A decrease in the market interest rate (below the natural interest rate) caused by expansive monetary policies of central banks stimulates entrepreneurs to misallocate resources, leading to market distortions and an unsustainable boom'*.

Consequently, we target to evaluate whether during the financial crisis at the beginning of the 21st century, also the automotive industry particularly suffered from the long-term effects of market distortions caused by ultra-loose monetary policies and artificial credit expansions.

As stated, we will also examine the impact of fiscal measures implemented in the years 2008 to 2010, immediately after the visible outbreak of mentioned financial crisis.

In this context, we want to prove that also our third proposition can be seen as a praxeologic *a priori* truth. This praxeologic proposition states: *'Fiscal policies distort the free market process (e.g. by implementing public incentives for some market players while hampering others) and will lead to unsustainable misallocations, ultimately leading to a comparably lower average standard of living than in a free market economy, hampering free entrepreneurship and free consumer choice.'*

Moreover, we will examine the amount and effectiveness of government incentives on the European automotive sector between the years 2010-2018, implemented to promote alternative fuel vehicles (AFVs). By coming to this topic, we will be able to refer to our fourth and final praxeologic *a priori* truth. Based on the ideas of Mises (1940), Rothbard (1962, 1970) and Huerta de Soto (1998, 2005, 2009a, 2009b), we will show that any form of public interventionism must lead to a distortion of the market, and the misallocation of resources.

4.1 Theoretical Approach to Monetary Policies & Business Cycles

As indicated in Chapter 1 and Chapter 3 of this thesis, we will base our research on a proper theoretical concept. We already explained that our research will primarily be based on the methodology and the theoretical concepts developed by the Austrian School of economics. Thus, apart from applying a praxeologic approach (Mises, 1940, 1957) we will also use other 'Austrian School' concepts such as the Austrian Business Cycle Theory as developed by Mises, Hayek, Huerta de Soto and Garrison, as well as the Hayekian triangle (Hayek; 1939, 1941) and the subsequent 'theory of capital-based macroeconomics' (Garrison, 2001). However, before doing so, it is crucial to also understand the business cycle theories of those two mentioned economists whose ideas have been most influential throughout the past decades, namely John Maynard Keynes (1923, 1936, 2012) and Milton Friedman (1953, 1961, 1962, 1969). Thus, the three major economic schools of thought, namely Keynesianism, Monetarism and the Austrian School of economics shall herein be explained. After the proper theoretical approach is explained, we will then use historic data to illustrate our theory within the evaluated period of time.

4.1.1 The Keynesian Equilibrium & Circular Flow-Framework

The British economist John Maynard Keynes (1883-1946) is considered to be the most influential economists of the 20th century and a founder of present-day macroeconomics. In his work 'General Theory of Employment, Interest and Money' Keynes aimed at understanding the causes of business cycles, while assuming that, in the short run, the level of income, output and employment is determined by the level of aggregate effective demand. According to Keynes (1936), all fluctuations in economic activity are caused by fluctuations in aggregate effective demand, and a fall in aggregate effective demand will create the conditions of recession or depression. Or to put it differently, if the aggregate demand is increasing, economic expansion shall take place. Unlike the Austrian School, Keynes (1923, 1936) argued that economic bubbles

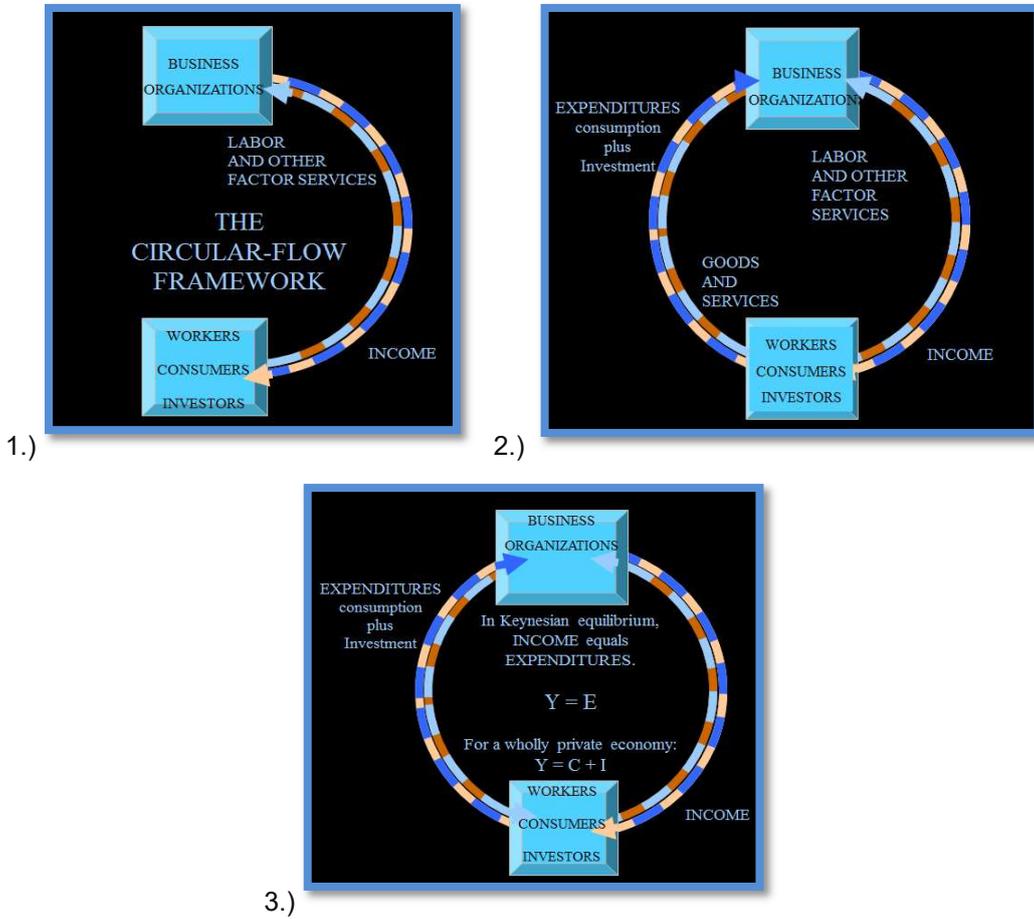
mainly exist because of psychological instabilities within the economy, not because of coercive public interventions and corresponding misallocations of resources. Thus, Keynesianism supports countercyclical policies of the government, to provide monetary and fiscal incentives to the market in order to stabilize the business cycle (Garrison, 2001; Sowell, 2015; O'Driscoll & Rizzo, 1985). Several contemporary notions of monetary and fiscal policy descend from Keynes' concepts, often being followed by several decision makers of major institutions like the International Monetary Fund (IMF), the European Central Bank, as well as by several governments.

Keynes' (1936) vision of the economy proposes a circular-flow framework where spending and earning are brought into balance by changes in the level of employment. The consumption function is an essential component of the Keynesian framework and its presumed stability is crucial for the Keynesian concept (Keynes, 1923, 1936). Among the many differences between Hayek's and Keynes's individual analyses of macroeconomic fluctuations was that Keynes consistently modelled capital as a 'homogeneous' (Garrison, 2001).

Graphically, the circular flow appears as a 'Keynesian cross' where the intersection of mentioned cross identifies the particular state of the economy in which income and expenditures are in balance (Garrison, 2001). Theorizing at a high level of aggregation, Keynes stated that market economies perform perversely— in particular the market mechanisms that are supposed to bring saving and investment into balance with one another. By considering unemployment and resource idleness as the norm, Keynes supported countercyclical fiscal and monetary policies and ultimately asked for a "comprehensive socialization of investment" (Keynes, 1923, 1936).

Based on the explanations of Roger Garrison (2001), the corresponding Keynesian concept with its circular-flow framework, is shown in the following charts.

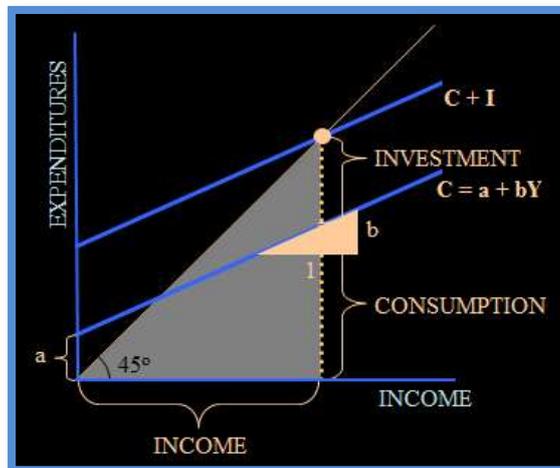
Chart N° 9: The Circular-Flow Framework:



Based on Garrison (2001, pp. 146-162)

As shown below, the economy is in a Keynesian equilibrium somewhere along the 45° line - while the line itself detects all possible income-expenditure equilibrium points. For Keynes, investment does neither depend on income nor on the rate of interest, but it entirely depends on profit expectations (Keynes, 1936; Garrison, 2001).

Chart N° 10: Keynesian Equilibrium



Based on Garrison (2001, p. 131)

Consumption and Investment (as well as Government Spending) are shown as additive components of the total spending. These three components (consumption = C / investment = I / government spending = G) can be differentiated by their stability characteristics:

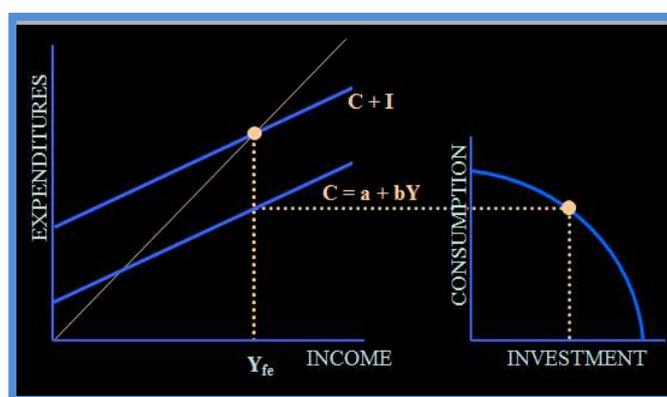
stable (**C**), unstable (**I**), and stabilizing (**G**). The consumption function must always be seen as an essential component in the Keynesian framework. Investments which are unstable and not related to current income, will change with changing profit expectations. Mentioned profit expectations will then depend upon expectations about the future state of demand.

Consequently, a purely private macro-economy would reach an income-expenditure equilibrium if the following state is given: $Y = C + I$.

According to Garrison (2001) and Huerta de Soto (1998), Keynes was mainly concerned about the dynamics of an economic downward spiral - and with defining policies aimed at reversing the spiral's direction. According to Huerta de Soto (1998), Keynesian economics do not properly couple the short term and long-term perspectives of market processes, and do not consider that changes in an economy's growth rate entail investment and consumption magnitudes which initially move in opposition directions.

Keynes did not recognize the significance of the loanable funds market in the context of business cycles, which clearly shows the correlation between savings and the interest rate, as well as between investments and the interest rate: Accordingly, in a free market, the interest rate is influenced by the willingness to save. (Garrison, 2001). For Keynes (1936), saving only depends on income, and investment expenditures are mainly based on psychological considerations, the “animal spirits.”

Chart N° 11: Keynesian Framework - Consumption & Investment



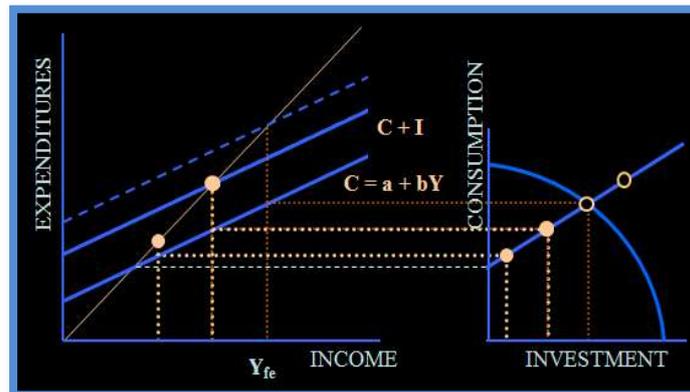
Based on Garrison (2001, pp. 131, 147)

Keynes assumed that the economy could only perform at its full-employment potential by “accident or design” (Keynes, 1936; Garrison, 2001). (However, for explanation and comparison purposes, we need to assume that, at least initially, full employment conditions prevail—if only by accident.) On the contrary, in Hayek’s and Garrison’s capital-based macroeconomics, full employment implies that the economy is operating on its production possibility frontier, the PPF itself being defined in terms of sustainable output levels of consumption and investment goods (Garrison, 2001).

For Keynes (1936), ‘full employment’ implied that the labour market clears at the ‘going wage rate’, the going wage itself having emerged during a period in which the economy was experiencing no macroeconomic problems. For Keynes, labour income ($Y = WN$) is fully representative of total income, meaning that changes in the labour income stand in direct

proportion to changes in total income. Keynes assumed that a collapse of investment activities is the main cause of economic downturns.

Chart N° 12: Keynesian Framework – towards the ideal of full employment:



Based on Garrison (2001, pp. 152, 161)

A 'waning of animal spirits' would cause investment to decrease, leading to a reduction of income and consumption as well. In this case, the economy would fall inside its PPF. Thus, from Keynes (1923, 1936) perspective, if investments fall to zero, the economy will settle onto an income-expenditure equilibrium of $Y = C$. Keeping in mind that in Keynes' (1936) concept, prices and the wage rate are considered to be 'sticky' downward, Keynes concluded that reduced investments and consequently reduced employment opportunities would directly lead to an economic downward spiral towards recession and possibly even into depression. Although Keynes believed that neither saving nor investment would significantly depend on the interest rate, he still argued that both curves would shift together - while leaving the interest rate unchanged. On the one hand, decreased investment should usually put downward pressure on the interest rate, but as the spiraling downward of income implies a decrease of the supply of loanable funds, this situation on the other hand relieves the downward pressure on the interest rate (Garrison, 2001).

Despite the fact that an economy's recovery might be self-initiating, e.g. as there will be the need to replace depreciating capital, Keynes also wanted to 'proactively stimulate the economy',

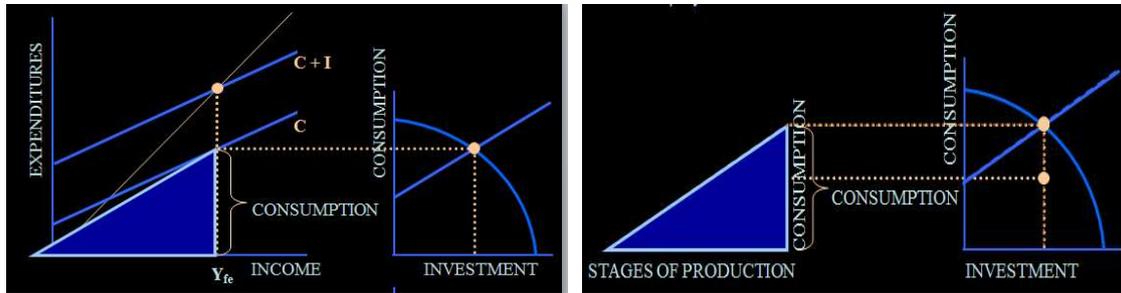
preferring to initiate centrally steered projects, led by central banks and/ or governments, including deficit spending, and other fiscal and monetary stimulations (Keynes, 1936; Garrison, 2001).

One may say that the Keynesian concept gives the academic and moral justification for the ultra-loose monetary policies and governmental interventions we have seen in the past decades (Huerta de Soto, 2009b, 2009c). Consequently, Keynesianism might be able to create short-term economic booms by provoking artificial growth, but it fails in providing a sustainable successful long-term concept (Garrison, 2001; Alonso Neira *et al.*, 2013; Sowell, 2015). It is essential to understand this theoretical background to perceive the origins of the recent financial crisis. As mentioned, for Keynes (1936) it was mainly about short-term solutions, because, as we know from one of his most prominent quotes “*in the long run we are all dead.*”

In this context, we must also refer to the Keynesian Contradiction, the so-called ‘Paradox of Thrift’. Keynes (1936, 2012) argued that reducing consumption by increasing savings will hamper the economy, which will then have a negative impact on income in general. Keynes assumed that “*every attempt to save more by reducing consumption will so affect incomes that the attempt necessarily defeats itself.*” In accordance with the paradox, an increase in saving causes the economy to spiral down to a less-than-full-employment level. Hence, the paradox he described was that by trying to save more today, people would actually earn less tomorrow (Garrison, 2001). To resolve Keynes’s ‘Paradox of Thrift’ we simply need to replace the Keynesian cross (reflecting the economy’s circular flow) with the Hayekian triangle, invented by F.A. Hayek (1941), which depicts means and ends in their temporal sequence. Keynes assumed a “fixed structure of industry,” therefore, he did not properly consider the different stages of production and how their relevance within an economy can change – also due to a change in the rate of interest (Huerta de Soto, 2006). Therefore, Keynes referred to the ‘paradox of thrift’, without properly understanding the derived-demand effect and without considering the corresponding structure of production with its different stages (Huerta de Soto, 1998; Garrison, 2001).

The level of consumption shown in the Keynesian circular flow can also be seen in the capital-based concept as the consumable output of a temporal sequence of production steps.

Chart N° 13: Keynes' Circular Flow & Paradox of Thrift vs Capital-Based Macroeconomic



Based on Garrison (2001, pp. 131, 161, 163)

As stated, Keynes (1936) theorized at a high level of aggregation, arguing that market economies perform perversely, calling for countercyclical fiscal and monetary policies and ultimately supporting a 'socialization of investment'. Regarding the causes for significant economic changes, he considered psychological factors as crucial and saw an 'ideal environment for consumption' as more important than to assure that an increase of investments is the result of previous saving (Garrison, 2001). To summarize, it is argued that Keynesianism has been a popular economic theory in particular for governments and other institutions which are interested in positive visible short-term results. Keynesian concepts are able to create short-term booms by 'steering and stimulating the economy' through interventionist fiscal or monetary policies, often by either using tax payers' money or by simply increasing the money supply (Hülsmann, 1998; Garrison, 2001; Huerta de Soto, 2006). According to the findings of Hayek (1941, 1990), Huerta de Soto (2006) and Bagus *et al.* (2012), we strongly reject the Keynesian logic, that 'governments and central banks constantly need to stimulate the economy' to increase consumption. This interventionist concept has often been exploited for several politically motivated policies which over the long run have distorted and weakened the markets even further. We may ironically refer to the French maxim '*honi soit qui mal y pense*', as we argue that the focus on Keynesianism in most western public universities throughout the past decades can easily be explained. In line with Huerta de Soto (2009a), Baader (1991), Block (2009), and Hoppe (1993, 2006), we conclude that democratically elected governments are interested in immediate positive economic effects to maintain their popularity. The Keynesian approach of expansive monetary policies and stimulating fiscal policies can assure such economic growth, even if it is only short-term and unsustainable

(Bagus *et al.*, 2012; Sowell, 2015). Thus, we argue that Keynesianism provides populist governments a recognized economic theory to ultimately implement popular (even though short-sighted and unsustainable) politico-economic policies.

4.1.2 Friedman's Monetarism

The US-American economist Milton Friedman (1912-2006) received the 1976 Nobel Memorial Prize in Economic Sciences for his research on consumption analysis, monetary history and theory, and the complexity of stabilization policy. Friedman was one of the intellectual leaders of the second generation of Chicago price theory,

However, in regard to business cycles, significant differences can be seen between F.A. von Hayek's "Monetary Theory and the Trade Cycle" (1928, 1975) and Milton Friedman's "The Optimum of Money and Other Essays" (1969). Their different views on monetary policy were the consequence of their very different judgements about the macroeconomic significance of money in a market economy. What is often ignored is the fact that Friedman's monetarism (1953, 1962, 1969, 1987) was based on an even higher level of aggregation than the Keynesian concept. Friedman's equation of exchange ' $MV=PQ$ ' used an all-inclusive output variable (Q). However, as Friedman saw no problem emerging from the market itself, he focused on the correlation between the government-controlled money supply and the overall price level (Friedman, 1961, 1962, 1969).

For Friedman, a business cycle analysis consisted mainly of an empirical accounting of the depression's depth and length (Garrison, 2001).

Just like Keynes, also Friedman did not recognize the significance of the loanable funds market in the context of business cycles. Friedman, ignored the key issue which is the relationship between the money supply/ the total amount of money and the price level (Huerta de Soto, 1998; Garrison, 2001). For Friedman (1953, 1962, 1969, 1987), the focus was mainly on the total output (Q, as in $MV=PQ$), which includes the output of both consumption goods and investment goods.

Chart N° 14: Friedman's equation:

$$\bar{M} \bar{V} = \bar{P} \bar{Q}$$

with a lag of 18-30 months.

Redesigned from Garrison (2001, p. 239), based on Friedman (1972)

Friedman (1961, 1972) stated that with a nearly constant velocity of money (V), and an Output (Q) which is only growing slowly, the price level (P) moves almost in line with the money supply (M). Thus, he defended the equation: “MV = PQ” – with a lag of 18-30 months. For him, if the increase in money supply occurs at a slow and steady rate, this can lead to a long-run price-level constancy. Moreover, from the perspective of classical liberalism there is another contradiction in Friedman’s concept, as for Friedman a laissez-faire economy performs at its best only if there is relevant and constant intervention on the monetary supply (interventionism on the “Output / Q”). Friedman stated that “inflation is always and everywhere a monetary phenomenon.” Friedman (1963) declared the 1920s as the ‘Golden Years of the Federal Reserve’, ignoring that interest rates during the 1920s did not change much. In Friedman’s eyes, the monetary policy throughout this period was highly efficient.

The Federal Reserve simply met each demand increase for credit with a corresponding increase in supply, and consequently keeping the interest rate from rising. However, one cannot deny that during the 1920s crucial technologic advancements also increased the demand for loanable funds, putting an upward pressure on interest rates. Unfortunately, by not seeing any changes in interest rates throughout that time, Friedman simply dismissed interest rates as a potential independent relevant variable in his econometric equations (Garrison, 2001).

Friedman believed that a significant monetary contraction (M) would put downward pressure on the price level (P) and the Output (Q). By assuming that prices (P) are sticky downward, Q would need to fall dramatically, showing Friedman’s (1953, 1962, 1987) conviction of a strong correlation between movements in the money supply and movements in total output. In Friedman’s view, the effect of interest-rate changes on relative movements of consumption and investment and on the

pattern of investment is not crucial and does not need to be included in his equation (Garrison, 2001).

In summary, we can say that from a long-term perspective, Friedman's ideas might be seen as less dangerous for the economy than the Keynesian approach. The Monetarist approach is much more critical towards ultra-loose monetary policies which aim to achieve economic increase by increasing the money supply (Friedman, 1962, 1969, 1987). However, we argue that Friedman failed to understand the significant effects of interest rates and did not properly realize the heterogeneous structure of capital and the importance of the different stages of production (Huerta de Soto, 1998; Garrison, 2001).

4.1.3 An Alternative to Keynes (?): Minsky & the Endogenous Crisis of Capitalism

The collapse of the recent US subprime mortgage market raised the interest of several economists, politicians and journalists for the ideas of Hyman Minsky (1919–1996), a prominent member of the post-Keynesian school of economics, assuming that his framework of thinking accurately anticipated the current financial crisis. Minsky was a US-American economist, a professor of economics at Washington University in St. Louis, as well as a distinguished scholar at the Levy Economics Institute of Bard College. Minsky's main intention was to properly detect the characteristics of financial crises, for which he considered 'swings in a potentially fragile financial system' to be the main cause (Minsky, 1986). He supported some government intervention in financial markets, while also stressing the importance of the Federal Reserve as a lender of last resort, arguing against the over-accumulation of private debt in the financial markets. Minsky's (1986) central idea is the Financial Instability Hypothesis, which states that the periodic crises of 'capitalist' economies are endogenous to the capitalistic financial system.

Minsky believed that even in the absence of external shocks to the economy, the capitalistic economy has a general natural tendency to develop instability, ultimately causing economic crises. It is the accumulation of debt which pushes the economy towards a crisis. Minsky argues that in stable economic times, companies operating in profitable areas of the economy are actually

rewarded for raising their level of debt. As the economy is stable or even growing, and borrowers' financial health seems to be improving, this incentivises lenders to lend more. Long booms tend to result in excessive risk-taking and 'Ponzi finance', where investors buy assets with borrowed money in the hope of quick capital gains. Consequently, the pace of debt accumulation starts to rise much faster than borrowers' ability to serve their debts, which can be seen as the starting point for the next economic bust. Minsky's *Financial Instability Hypothesis* (FIH) is only applicable to a modern capitalist economy, it is not a general theory as such but it is institutionally specific. It must be critically stated that from our perspective, it is not the expansion of credit as such that leads to economic busts but the expansion of unsustainable, unbacked credit, as consequently real savings will be partially diverted from productive activities to non-productive activities, which then weakens the process of real wealth expansion (Blumen, 2007). Consequently, from our perspective, Minsky's Financial Instability Hypothesis does not prove that the capitalistic system as such is inherently unstable. It only proves that the current financial system, in which central banks are able to cause expansionary monetary policies and credit expansions, generally operating within fractional-reserve systems, is unsustainable. One must therefore conclude that it was the loose monetary policy of the Federal Reserve between December 2000 and June 2004 that caused the emergence of various non-productive investments when the federal funds rate target had been lowered from 6.5% to 1%. Therefore, we consider Minsky's ideas as economically less harmful than those of Keynes. However, in line with Huerta de Soto (2006) and Alonso Neira *et al.* (2013), we insist that neither Friedman nor Minsky were able to properly explain the concrete origins of the recent boom and bust cycles, as both did not realize the harmful effects of public interventionism and the Fiat money system. Thus, we will now emphasize on the findings of the Austrian School of economics to elaborate on their findings in regard to monetary policies and business cycles.

4.1.4 The Austrian School Approach

In previous chapters, we have already highlighted some of the main concepts of the Austrian School of economics, primarily in regard to monetary and fiscal policies.

In the 19th century, only a few economists were able to define a thorough and structured approach to deduce a business cycle theory from general economic analysis, of which according to Rothbard the two most important and consistent approaches came from Hayek and Mises (Rothbard, 1962). Unlike Hayek and Mises, most economists had used aggregative models with no relation to a general economic analysis of individual actions. Rothbard (1962), Hoppe (1995), Huerta de Soto (1998, 2009a), Hülsmann (1998, 2008), O'Driscoll & Rizzo (1985), as well as Benegas Lynch (2011) agree that all of these models, generally based on conceptual realism, must be considered as incorrect as aggregative concepts which ignore the basic concept of individual human actions cannot provide useful general explanations of the real world.

Mises (1912) established his general theory of business cycles, which also included and combined different concepts previously elaborated by Cantillon, Menger, Böhm-Bawerk, and Wickseil. Mises showed that if central banks increase the money supply, the market rate of interest will fall below the natural rate of interest ('natural' as this would be the rate without any interventions by governments and the central bank). This interventionism will lead investors to borrow more money, expanding their investments, undertaking riskier projects and more roundabout production processes. Mentioned investors compete between each other for assets, resources, and goods, inevitably leading to a corresponding price inflation and an increase in the rate of interest (Huerta de Soto, 1998). This will have a relevant impact on the economy, as in this scenario more *roundabout* investment projects will be considered as less opportune options (Garrison, 2001). Based on Mises' (1934) findings, Hayek (1939, 1941) expanded the ABC theory, including capital theory and its integration into the structure of production

All major economists of the Austrian School of economics, such as Hayek (1932, 1940), Mises (1912, 1940), Rothbard (1962), Huerta de Soto (1998, 2005) and Hülsmann (1998) have proven that the current fiat money system as well as public interventionism is inefficient, causing

misallocations of resources and consequently distortions within the economy. As properly explained by Mises (1940), Rothbard (1962), Huerta de Soto (1998), Garrison (2001), as well as O'Driscoll & Rizzo (1985), external factors such as political interventions can heavily affect a market's framework and even distort its core structure. Mises stated that "*credit expansion can bring about a temporary boom. But such a fictitious prosperity must end in a general depression of trade, a slump*" (Mises, 1951, p. 531)

In the complex monetary economy, the rate of interest plays a crucial role in the system of production (Garrison, 2001; Reimers, 2018). Rothbard pointed out that the rate of interest is not only the price of loans on the loan market, but that instead "*the rate of interest pervades all time markets, and the productive loan market is a strictly subsidiary time market of only derivative importance*" (Rothbard, 1962, p. 371). Böhm-Bawerk elaborated on the time-preference theory of interest, arguing that the passage of time and the preference for the present over the future are the crucial and sufficient conditions for the emergence of interest. The capitalist's function is a time function, and the capitalist's income is therefore an income which represents the *agio* of present as compared to future goods. Thus, this interest income is not derived from the concrete, heterogeneous capital goods, but from the generalized investment of time (Böhm-Bawerk, 1891). The level of the pure rate of interest (PRI) is defined by the market for the exchange of present goods for future goods. It is the "*advance of time that the capitalists supply to the owners of factors, and for which the latter voluntarily pay in the form of the interest rate*" (Rothbard, 1962, p. 376). Thus, based on the law of time preference, future money (referring to 'present expectations of money in the future') will always ex-change at a discount compared to present money, and this discount is represented by the rate of interest. Based on previous findings of Böhm-Bawerk (1891), Mises (1949), and Hayek (1939), Rothbard further developed his approach regarding the equilibrium rate of interest in an evenly rotating economy (ERE). The equilibrium rate of interest refers to the 'pure' rate of interest which would occur in the evenly rotating economy, being only determined by "*the time preferences of the individuals in the society, and by no other factor*" (Rothbard, 1962, p. 389). The relation between consumption and investment reflects individual time preferences, as consumption reflects the desire for present goods, while investments reflect

the desire for future goods. Thus, according to Rothbard, the equilibrium net rate of return *is* the interest rate, the natural rate to which the bond rate conforms.

Based on Menger's marginal utility theory, which clarified that price determines cost and not vice versa (Hayek, 1941), Hoppe (1993) added that the price setting of entrepreneurs is constrained by the actual given demand. Hoppe clarified that any price set by the entrepreneur is based on the expectation that an even higher price would ultimately yield a lower total revenue, as the volume sold would then clearly decrease. Or to explain it differently, as long as an entrepreneur expects the consumer demand for his goods or services to be inelastic within the region of any price-range under consideration, he will take advantage of this and ask for a higher price (Rothbard, 1962). The price of any good on the free market place is determined by supply and demand schedules, which themselves are determined by the value scales of the individual consumers in the market (Hayek, 1939; Boettke, 2001; Benegas Lynch, 2011). As individual value scales, technological progress and the variety of available means constantly change, also consumer demand may quickly shift from one good to another. Moreover, time preferences can change which will have an impact on interest and capital formation (Rothbard, 1962). It is not about changes in the interest rate which could potentially cause changes in investments, but it is about changes in the time preference which are reflected in changing consumption-investment decisions. Thus, changes in the interest rate and in investment behavior are directly intertwined, both shaped by individual valuations and time preference. In a free market, a fall in the pure rate of interest tends (PRI) to lead to an increase of invested capital, while such decrease of the interest rate also reflects a general decline in time preferences (Huerta de Soto, 1998). Thus, in line with Rothbard (1962), Huerta de Soto (1998) and Boettke (2001), we argue that an economy is expected to become more competitive, and the long-term purchasing power of its market participants is likely to increase, if time preference naturally decreases.

Several macroeconomic tools can be used to evaluate the impact of expansionary monetary policies and credit expansions on the automotive industry, of which mentioned 'Hayekian Triangle' with its stages of production, in combination with the so-called Production Possibility Frontier (PPF) and the Loanable Funds Doctrine will get a special attention throughout this research.

In this context, we will pay special attention to Garrison's (2001) concept of capital-based macroeconomics, which illustrates how sustainable growth is achieved when investment exceeds depreciation while mentioned investment is financed by prior savings of the economic agents. Such growth is sustainable if it is consistent with the demands of consumers and with the availability of resources, and within a sound money environment it tends to lead to falling prices. In line with Garrison (2001) and Rothbard (1962) on this topic, also Kirzner (1973) argued that in a progressing economy with increases in gross savings and investments, money wages and basic rents may well fall, while real wages and rents can still rise. If the supply of consumer goods increases, while money wage rates decrease, there can certainly occur a rise in "real" wage rates and "real incomes" (in regard to the purchasing power), if correspondingly the prices of consumer goods decrease even more significantly. This increase of the marginal physical productivity of factors results from an increase in saving and investment. Thus, a progressing economy may lead to falling wages and rents (in numeric money terms), but there can still be a rise in regard to the real purchasing power. Net savings increase gross investment in the economy (Kirzner, 1973). To conclude, the prices of factors can decline while gross income may remain the same and gross investments can even increase, as the increase in investment also leads to an increasing number of stages of production. This increase in the number of stages and the use of longer production processes leads to an increasing '*roundaboutness*'. With mentioned increase of the *roundaboutness*, the increase in capital (also along with a potential increase of technological knowledge) leads to higher physical productivity per original factor (Rothbard, 1962). Kirzner (1963) argues that an increase in gross investment raises the prices of capital goods at the highest stages, leading to new stages while encouraging entrepreneurs to shift factors into this new and growing area.

These analyses will help to see the impact of money supply on the maximum possible production level of goods, as well as on the impact that the demand for and supply of loanable funds has on the interest rate (Garrison, 2001). The 'Hayekian Triangle', being part of the concept of capital-based macroeconomics', mainly developed by Friedrich August von Hayek (1932, 1941) and further developed by Austrian economists such as Roger Garrison (2001), will be used and

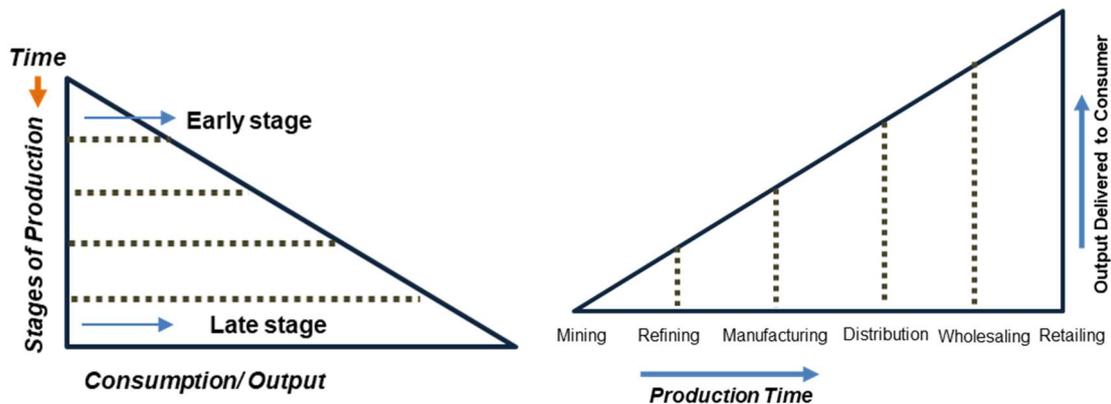
critically analyzed, comparing it with the concepts developed by the neo-classical school and the monetarists. Hayek's (1932) approach of defining 'capital' as heterogeneous and multi-specific, looking at the temporal capital structure as well as appreciating the dynamic market processes created by creative and alert entrepreneurs, should be evaluated as an interesting alternative to the monetary policies followed by most governments and central banks since the early 20th century. In a capital-based macroeconomics, sustainable growth is achieved when investment exceeds depreciation while mentioned investment is financed by prior savings of the economic agents (Garrison, 2001). Such growth is sustainable if it is consistent with the demands of consumers and with the availability of resources, and within a sound money environment it tends to lead to falling prices. The described customer preference-induced growth is very different to policy-induced growth. Such policy-induced growth, caused by public interventions, is unsustainable, as it is not based on the preferences of consumers and/ or the natural availability of resources (Huerta de Soto 1998; Garrison, 2001).

4.1.4.1 Introduction to the Hayekian Triangle

Since Hayek (1931) first used the geometrical figure of a triangle to explain the Austrian Business Cycle Theory (ABCT), it has become a crucial aspect of Austrian School economics and its capital theory. Hayek (1931, 1941) showed in his Hayekian Triangle, that credit expansion caused by an increase in money supply, leads to an artificial growth of the early stages of production (e.g. the automotive industry), which to a high degree needs to be seen as mal-investment. However, the first economist which placed the structure of production at the centre-stage of macroeconomic analysis was Hayek's teacher von Mises (1912) who himself was strongly influenced by Eugen von Böhm-Bawerk (Huerta de Soto, 2006). Mises (1912) further elaborated on Carl Menger's findings regarding the subjective theory of value and explained how it can be integrated with Mises' theory of money.

Chart N° 15: The Stages of Production

Two different illustrations of the Hayekian Triangle and its focus on the capital's heterogeneity



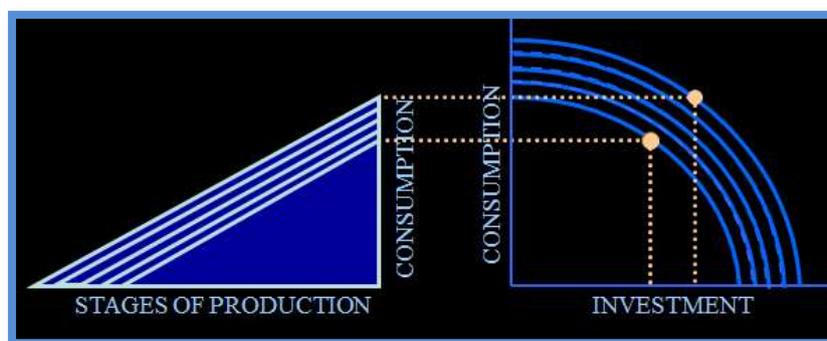
Redesigned, based on Hayek (1935) and Garrison (2001, p. 47))

When discussing Hayek’s views on economics, pricing and monetary policies, it is absolutely crucial to fully understand the Hayekian triangle. This triangle is a diagram first presented by Hayek in 1935, intending to show all spending within an economy. It shows production in different stages, early (higher-order) to late (lower-order), ending with the final consumer good (Hayek, 1939, 1941). Time, being a significant factor in economics, is represented vertically within the original diagram (shown on the left). In recent replications (shown on the right), the triangle has been turned 90 degrees counter-clockwise, so that time is represented horizontally, left to right. We shall also mention that several Austrian School economists, such as Hülsmann (2010) as well as Block & Barnett (2006) have listed different objections to the Hayekain triangle, which we will follow-up on at a later stage, in Chapter 4.1.5, of this thesis.

The earliest stages of production include the first processes involved for the production of a good, which can be mining and steelmaking, or the initial product development of a new good. This stage may then be followed by the actual manufacturing process of certain goods (Hayek, 1941; Garrison, 2001). Consequently, automobile manufacturing can be seen as a perfect example for these early stages in which product development activities on the one hand and steelmaking on the other hand may actually occur several years before the final vehicle is being sold to the end

customer. Late stages include the final steps, the distribution, and ultimately putting the final item out for sale (Hayek, 1941; Huerta de Soto, 1998; Garrison, 2001). If consumption decreases and more money is saved, real interest rates are lowered. With lower interest rates, entrepreneurs have more stimulation to invest in earlier stages of production as consumers spend less on retail goods, and moreover, lower interest rates allow entrepreneurs to borrow more cheap money for investments (Hayek, 1941). Thus, lower interest rates encourage entrepreneurs to invest in industries and actions which are more interest rate sensitive, typically the indicated more durable capital goods (Huerta de Soto, 2006). This effect makes Hayek's triangle expand vertically and become more narrow (when considering its original orientation, as indicated above on the left), with the earlier stages receiving more funding and with less spending on the lowest-order goods. Thus, in a growing economy, the 'number' of stages will increase, meaning that the triangle increases in size along with the outward expansion of the production possibilities frontier (Huerta de Soto, 1998; Garrison, 2001).

Chart N° 16: A Growing Economy in the Hayekian Triangle:



Based on Garrison (2001, pp. 54, 59)

Mises (1934) tried to demonstrate that fractional-reserve banking is the root cause of business cycles, stating that a fiat currency system with uncovered money titles reduces the interest rate in the credit market below its natural level, that is, below the level it would have reached in the absence of public interventionism. Mises (1940) explained the origins of money by using his "regression theorem", as according to him, certain commodities have historically been accepted

as money, only if there had been a demand for the money commodity in a barter economy. Based on mentioned previous findings by Menger, Böhm-Bawerk and Mises (1912, 1940), the Austrian capital theory was then developed and constantly enhanced by Hayek (1931, 1941, 1969) and several other Austrian School economists, such as Lachmann (1977). Also Rothbard (1962) defined a systematic and unified treatment of the structure of production, the theory of capital and interest, factor pricing, and the role of entrepreneurship in production. Moreover, he presented production theory as a core part of economic analysis, developing a capital and interest theory which integrated the temporal production-structure analysis of F.A. Hayek and Knut Wicksell with the pure-time-preference theory expounded by von Mises (Salerno, 1993). Rothbard (1962, 1970) explained the essential aspects of economics, indicating how the exchange of goods and services enables people to cooperate toward their mutual betterment, while defining entrepreneurship as the driving force of the market

However, it is also crucial to recognize the indicated ideas of Roger Garrison (2001) in regard to the concept of capital-based macroeconomics. Garrison combined the intertemporal structure of production with the production possibilities frontier and the loanable funds market to develop a comprehensive framework in order to explore the operations of an economy in time. To understand Garrison's (2001) concept, it is crucial to properly understand the origin and concept of the Austrian Business Cycle Theory. To explain the ABCT in nutshell, we can say that boom-and-bust cycles are caused by expansionary monetary policies initiated by central banks, using its interventionism to distort the market by lowering the market rate of interest below the natural rate of interest (Mises, 1940; Huerta de Soto, 1998; Alonso Neira *et al.*, 2011). Consequently, banks are able to provide credits at low rates which motivates market participants to ask for credits in order to either invest or consume, rather than to increase savings (Bagus *et al.*, 2012). This additional (artificial) credit flow into the economy stimulates economic activity and investments into projects which had previously seemed unprofitable, and which will ultimately lead to a distortion of the market by creating *malinvestment* (Garrison, 2001; Huerta de Soto, 1998). Once the banks stop this artificial credit extension, the corresponding unsustainable boom will come to an end. Thus, to prevent such an economic bust (and the resulting collapse of prices), banks are urged to intensify their harmful 'vicious circle' by creating even more credit to assure that prices

keep rising - or at least that they (appear to) remain stable. These damaging expansive monetary policies by most central banks have been based on the incorrect assumption that (in line with the Keynesian economic theory) deflation must generally be seen as a hazardous risk for any economy (Bagus *et al.*, 2012). However, such credit expansion certainly cannot continue forever, since there is neither additional capital nor new labour; but instead there is only more money and more debt (Hülsmann, 1998). The artificially cheap credit creates the mentioned boom period, which potentially lasts for several years (Garrison, 2001).

During this boom, prices often begin to rise, which may shift the entire yield curve up, but may increase long-term rates even more, due to the uncertainty over future (price) inflation. As stated, this boom is unsustainable and no matter what the banks do, the economy must crash (Huerta de Soto, 1998, 2009). However, in the past, banks have often stopped the inflationary policies several months before the crash, so that the rise in short-term rates is, erroneously, considered by several politicians, journalists and mainstream economists as 'the actual cause of the bust' (Alonso Neira *et al.*, 2011, 2013; Bagus *et al.*, 2012).

4.1.4.2 Mises, Hayek and the Capital-based Macroeconomics

Capital-Based Macroeconomics can be seen as an outgrowth of the Austrian business cycle theory initially set out by von Mises (1912, 1934), then further developed in the 1930s by Hayek (1931, 1932, 1939) and later on by Huerta de Soto (1998), and Roger Garrison (2001). Mostly based on the findings of Hayek, Garrison then showed how changes in the market for loanable funds lead to capital restructuring, and how such changes can lead to unsustainable capital structures and macroeconomic fluctuations. As we had previously stated, the Austrian business cycle theory (ABC theory) incorporates 'real' structural changes while also paying particular attention to the harm caused by public interventions, such as expansive monetary policies of central banks (Hayek, 1990; Huerta de Soto, 1998).

The ABC theory argues that, if central banks make loans or purchase government bonds from banks, this action causes an injection of bank reserves into the economy. Banks then have excess reserves which they can lend, but the excess of loanable funds also urges the banks to either reduce the charged interest rate or the credit quality requirements of borrowers, or both. This leads to increased borrowing and investing, particularly in those sectors where the return on investment is expected after a rather long period of time. When central banks drive the market rate of interest below the natural rate of interest, market participants rather refrain from saving assets, as the interest income from savings is likely to be lower than the expected benefits from investing. Austrian School economists such as Mises (1934, 1940), Hayek (1939, 1990), Garrison (2001) and Huerta de Soto (1998, 2009b) argue that the artificial economic boom before the corresponding bust is the real problem as throughout this period of (artificial) economic growth, resources are being misallocated. Ultimately, due to the unsustainable allocation of resources, this bubble must come to an end. The interest rate indicates to entrepreneurs which new productive stages or investment projects are profitable, and which are not (Bagus *et al.*, 2012; Benegas Lynch, 2011; Boettke, 2001). Although in a free market process, no exact developments are precisely foreseeable, the evolution of a free rate of interest can be used as an orientation by savers, consumers, and investors, and can prevent the different productive stages from remaining unnecessarily short or becoming too long.

Consequently, the theory of Capital-Based Macroeconomics reveals the crucial differences between sustainable economic growth based on accumulated real savings on the one hand, and unsustainable booms caused by government interventionism and/ or monetary policies on the other hand. Mises defined a precise business cycle theory in his work '*Theorie des Geldes und der Umlaufmittel*' (1912), basing his concept on the Wicksellian distinction between the natural rate of interest defined by supply and demand of loanable funds in equilibrium, and the money rate of interest prevailing within the market at a certain point in time.

Mises stated that "*the money rate of interest must sooner or later come to the level of the natural rate of interest... if the rate of interest on loans is artificially reduced below the natural rate ... then*

entrepreneurs are enabled and obliged to enter upon longer processes of production." (Mises, 1934, pp. 360–361).

Roger Garrison (2001) states that Capital-Based Macroeconomics basically consists of four elements:

1. The Production Possibilities Frontier
2. The Loanable-Funds Market
3. The Structure of Production
4. Stage-Specific Labour Markets

Garrison's (2001) opus magnum is largely based on ideas developed by Hayek in 'Prices and Production' (1931). Agreeing with the Wieserian line of Austrian monetary theorists (which includes Hayek, Machlup, and Strigl), Garrison argues that "money has no market of its own" (p. 51).

In this thesis, we will apply capital-based macroeconomics to detect the difference between sustainable growth (supported by saving) and unsustainable growth (which is mainly due to credit creation, due to ultra-loose monetary policies). In the concept of capital-based macroeconomics, consumption and investment represent *alternative* uses of an economy's resources. Referring to the findings of Böhm-Bawerk (1891) and Hayek (1941), Garrison (2001) explains that production can be divided into several stages, depending on the distance of the product from consumption goods. In line with Huerta de Soto (1998), Garrison shows that in a free market, independent of potential movements in the general price level, "*the adjustment of relative prices within the capital structure can bring the intertemporal allocation of resources in line with intertemporal consumption preferences without idling labor or other resources.*" (Garrison, 2001, p. 53). However, in the case central banks increase the supply of bank credit to 'stabilize the economy' while driving the interest rate below the 'natural rate', investors can be misled and the entire economy might be severely hampered in the long run (Huerta de Soto, 1998, 2009b, 2009c).

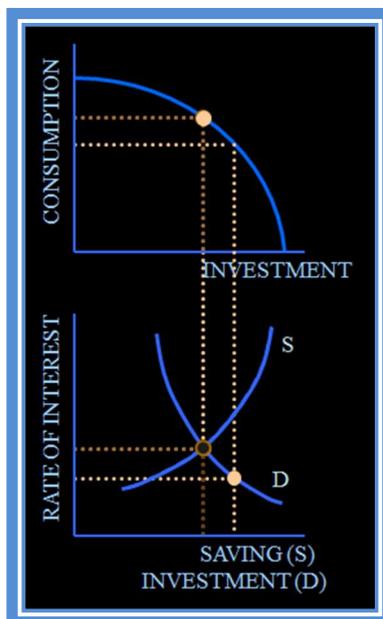
4.1.4.3 The Production Possibilities Frontier

In capital-based macroeconomics, the Production Possibilities Frontier (PPF) is used to evaluate the trade-off between consumption and investment, providing a helpful alternative to Keynesianism where these two macroeconomic magnitudes are treated as additive components of private-sector spending (Garrison, 2001). A change in saving preferences affects the rate at which the PPF expands outward. Garrison argues that if people become more future-oriented, they reduce their consumption and save instead. Garrison argues that without an initial increase in saving, consumption and investment will only increase quite modestly from period to period. On the contrary, with an initial increase in saving, investment will first of all increase at the expense of consumption, but afterwards both consumption and investment will increase dramatically from period to period. One main question remains which is: How can intertemporal preferences, and more importantly changes in intertemporal preferences, be properly evaluated and considered when it comes to decisions within the investment community? The loanable funds market, which illustrates the interaction of borrowers and savers within the economy, must be considered, while the rate of interest must be seen as a crucial price signal (Huerta de Soto, 1998; Garrison, 2001).

4.1.4.4 Loanable-Funds Theory

The demand for loanable funds reflects the business community's willingness to borrow and undertake investment projects. As indicated, the loanable-funds theory allows a supply-and-demand analysis with the interest rate serving as 'the price'. Hayek (1939, 1941) and Garrison (2001) based their theorizing on the interest rate, saving, and investment on the loanable-funds framework. As stated, when market participants become more future-oriented, they increase their saving, which will lead to a falling interest rate, encouraging entrepreneurs to undertake more investment projects. It explains how the interest rate brings saving and investment in line with each other (Huerta de Soto, 1998; Bagus *et al.*, 2012; Alonso Neira *et al.*, 2013).

Chart N° 17: Saving-induced decrease in interest rate & ‘movement along the PPF’:



Based on Garrison (2001, p. 164)

The lower interest rate establishes a new equilibrium in the loanable-funds market, as the economy moves along the PPF in the direction of more investment and less (current) consumption.

Capital-based macroeconomics can be distinguished by its disaggregation, focusing on the problem of inter-temporal resource allocation (Garrison, 2001). Hayek (1939, 1941) proved that a coordination of saving and investment decisions can be achieved by free-market movements in interest rates while he also highlighted the vulnerability of the market when interest rates are being manipulated by central banks.

Hayek's view was the opposite of Keynes' 'Paradox of Thrift' which stated that a reduction in consumer spending results in excess inventories, causing production cutbacks, worker layoffs, and a spiralling downward of income and expenditures (Keynes, 1936). Consequently, Keynes believed, the economy would go into recession, and the business community would commit itself to less, not more, investment.

Garrison (2001) argues that Keynes ideas could partially be right for retail inventories. In this case the derived-demand effect dominates as reduced consumer spending does often lead to a reduced inventory replacement, confirming that late-stage investments move with consumer spending. However, as precisely shown by Huerta de Soto (1998), we must clearly differ between late-stage and early stage investments, between high-order and low-order goods. The interest-rate effect dominates in long-term, meaning early-stage, investments and consequently a lower interest rate can lead to a significant stimulation in several business sectors, for example regarding industrial construction or product development projects.

Thus, to truly understand the actual pattern of investment activities, the structure of production and the stage-specific labour market need to be evaluated (Huerta de Soto, 1998). Consequently, capital-based macroeconomics disaggregates capital inter-temporarily as consumable output is produced by a sequence of stages of production, where the output of an early stage may be seen as the input for a later stage. This can perfectly be seen in the Hayekian Triangle, defined by Friedrich A. von Hayek. Hayek's (1941) vision of the economy is based on a means-ends framework—in which means of production are transformed over time into a consumable output.

For Hayek (1941), the role of the economist is to identify those features of the market process which are not obviously visible in the first place. In his acceptance speech at the Nobel Memorial Prize in Economic Sciences, Hayek (1978) argued that *“there may well exist better ‘scientific’ evidence, i.e. empirically demonstrated regularities among ‘key’ macroeconomic magnitudes, for a false theory, which will be accepted because it is more ‘scientific’, than for a valid explanation which is rejected because there is no significant quantitative evidence for it.”*

We conclude that the theoretical and conceptual framework of Capital-based macroeconomics as developed by von Mises (1912, 1940), Hayek (1939, 1941) and Garrison (2001), must be seen as the most accurate and precise concept to differentiate between phases of sustainable economic growth and periods of unsustainable growth which are only stimulated by bank credit expansion.

4.1.4.5 Derived Demand Effect vs Time Discount Effect (?)

Thus, if people choose to save more, they send out two seemingly conflicting signals to the market:

1.) The Derived Demand Effect: Meaning that a reduction of consumption reduces the demand for investment goods which are in close temporal proximity with consumable output.

2. The Time-Discount, or Interest-Rate, Effect. A reduction of the interest rate means lower borrowing costs, which directly increases the demand for investment goods of the early stages of production.

However, to actually consider the 'derived demand' and the 'time discount' to be in conflict, one needs to follow the Keynesian perception that 'investment' is a simple aggregate ($C + I + G$). Keynes (1930, 1936) thought that any reduction in consumer spending would result in excess inventories, which would then lead to production cutbacks, worker layoffs, and a mutual decrease of income and expenditures, leading the economy into recession, consequently minimizing investments. To conclude, we support Hayek's approach, who properly claimed that "*Mr. Keynes's aggregates conceal the most fundamental mechanisms of change.*" (Hayek, 1931, p. 227). Keynes argued that changes in the rate of interest would not have a significant effect on the rate of profit for the investment sector as a whole. Hayek's point was that a change in the rate of interest leads to rising profit prospects for some industries, while profit prospects for other sectors would fall. Thus, from Hayek's perspective, systematic differences in profits rates among different industries cause relevant structural economic changes, not the average or aggregate of those rates (Hayek, 1939, 1941).

In a free market, interest rates are determined by people's desire to save or consume, and the market interest rate is generally based on people's time preferences (Huerta de Soto, 2006). A lower time preference indicates that people prefer to save instead of spending the money on consumption (Mayer, 2018; Rothbard, 1962). On the other hand, in a free market, increased saving certainly also increases the supply of loanable funds and hence lowers the market interest rate, as indicated by Hayek (1931, 1939, 1941), Huerta de Soto (1998) and Garrison (2001). Consequently, we argue that such a natural process in a free market would allow market

participants to borrow more money for their capital investment, resulting in more sustainable investments in long-term projects, which will then increase the supply of goods in the future. To simplify this process in one phrase: if there is more saving today, consumption will significantly be increased in the future.

Thus, in reality, an increase in saving simply results in a reallocation of resources among the stages of production and both, the derived demand effect as well as the time discount effect, will have separate and complementary effects on the capital structure (Huerta de Soto, 1998; Garrison, 2001).

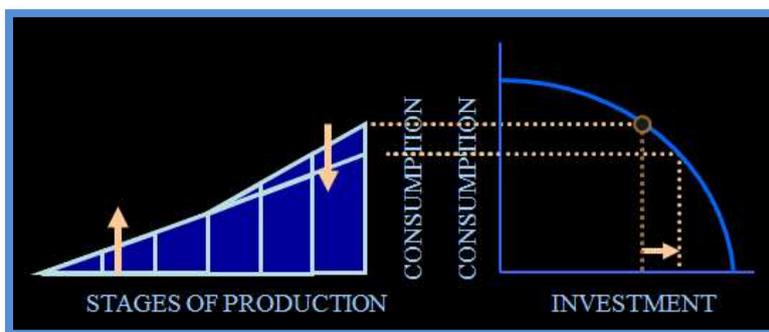
Derived Demand Effect: A reduced demand for consumption goods dampens investment activities only in the late stages of production, which reduces the height of the Hayekian triangle.

Time-Discount Effect: A reduction of the interest rate will actually stimulate investment activities in the early stages of production, which increases the base of the Hayekian triangle.

4.1.4.6 Sustainable Growth: The Economy's Response to an Increase in Saving

An increase in saving affects the magnitude of the investment aggregate as well as the temporal pattern of capital creation. To follow up on our first findings based on Mises (1912, 1934, 1940) and Hayek (1932, 1939, 1941), it is undeniable that more saving ultimately permits more investment in the future, which must be seen as the natural and sustainable process for economic growth.

Chart N° 18: Investment Aggregates & Stages of Production with an Increase in Savings



Based on Garrison (2001, p. 62)

The Hayekian triangle confirmed that capital creation in the later stages, such as retail inventories, decreases while simultaneously capital creation in the earlier stages, such as product development, is increased as the structure of production is becoming more future-oriented (Hayek, 1941). Market participants save more in order to increase their future spending power (Rothbard, 1962).

If, for whatever reason, the opposite occurs, and consumers increase their spending on final, lower-order goods, and less money is saved, then interest rates are increased and less investment occurs in the earlier stages of production. In this case, the triangle will become shorter & “fatter”, with less resources being used for production and more resources going toward consumption (Huerta de Soto, 2006). A society that engages in this trade-off over a longer period sacrifices current investment and future consumption (Bagus *et al.*, 2012). This structure can be seen as the main problem of several economically less developed countries in which, for example, the research and product development sectors and highly sophisticated industries (such as the automotive, maritime and aviation industries) have been underrepresented (Huerta de Soto, 1998; Alonso Neira *et al.*, 2011).

4.1.4.7 The ABCT in Times of Expansive Monetary Policies

We showed how a sustainable process within a truly free market would work, minimizing the misallocation of resources and the risk of boom and bust cycles. In such scenario the Hayekian triangle would naturally adjust to the needs of the market participants. Production takes time and can only be successfully finalized if enough consumer goods and consumer-goods-producing capital goods are available throughout the production process. Consequently, any extension of the structure of production requires a foregoing increase of savings. However, as explained by Hayek (1941), Huerta de Soto (1998, 2009b) and Garrison (2001), **the triangle becomes distorted when interest rates are being controlled by a central bank**, as central banks can put downward pressure on interest rates by increasing the money supply. **When this happens, Hayek's triangle loses its straight hypotenuse** (Huerta de Soto, 1998). Hülsmann (2001) argues that the Austrian business cycle theory (ABCT) is essentially a theory of the causes, symptoms, and implications of mass error; illustrating clusters of errors within the market economy.

In a relevant speech on economics, Huerta de Soto (2012) stated that "*el opio del pueblo es la expansión crediticia*", calling credit expansions 'the opium of the people'. Thus, the previously described customer preference-induced growth is very different to a policy-induced growth. Such policy-induced growth, caused by public interventions and or expansive monetary policies, is unsustainable, as it is not based on the preferences of consumers and/ or the natural availability of resources (Garrison, 2001; Mayer, 2018). Such artificial market distortion is harmful as resources will not have been allocated through a real, market-dictated interest rate (Rothbard, 1962; Garrison, 2001). Mentioned process and the corresponding triangle are the basis of the Capital Based Macroeconomics Theory. Increases in the money supply enter the economy through credit markets as the central bank literally 'lends money into existence'. Garrison (2001) shows that the capital-based macroeconomic model is able to bridge the gap between the short run and the long run, while being able to explain the long-run growth trend, and fluctuations around the trend (cycle phenomena).

Our praxeologic approach cannot provide a precise explanation of each man's time preference, as these are psychologically determined by each person. Generally, praxeology cannot establish exact quantitative laws, only being able to give qualitative predictions. Thus, also in regard to future business cycles, economics can only tell us that a boom caused by credit expansion is not sustainable and can therefore not assure a natural long-term growth, but it cannot tell us at what particular point in time the economic bust will occur. However, by using *ceteris paribus* assumptions, praxeology is able to provide certain truths about time preferences, such as the fact that the increase in a man's real income shall lower his time-preference.

Generally, credit expansions by central banks lower the interest rate below what it would have been in the free market, consequently creating distortion and *malinvestment*. Huerta de Soto (2006), Hülsmann (2008), Benegas Lynch (2011), Bagus (2014) and Azevedo Alves (2014) argue that this form of credit expansion causes investment errors, credit squeezes and bank crises, ultimately leading to economic recessions. To fully understand the economic impact of the banks' concession of loans not derived from a previous increase in voluntary saving, we ought to analyze the theory of capital and the productive structure of a real economy. Rothbard (1970), Huerta de Soto (2006), and Hülsmann (2008) state that the legal concept of a monetary bank-deposit contract combined with a fractional reserve causes significant harm, being the principal root of recurring economic recessions.

Moreover, Huerta de Soto argues that, in order to secure capital to support political objectives via a variety of public interventions in economic life, governments have legitimized financial practices by banks which can be considered as morally problematic and as contradictory with market principles.

Due to the resulting lower interest rate, people will save less and consume more (Hülsmann, 2008; Bagus *et al.*, 2014). The new money drives a wedge between saving and investment, also resulting in a market disequilibrium which, at least initially, will be 'successfully hidden' by the infusion of loanable funds (Garrison, 2001). These lower interest rates lead to less saving and more consumption and the mentioned 'wedge between saving and investment' actually translates into a 'tug-of-war' between consumers and investors. Consequently, the credit expansion pushes

the economy toward a point that lies beyond the PPF. Mentioned conflicts within the structure of an economy can be seen as a direct result of monetary interventionism by central banks, often in agreement with the corresponding state governments (Huerta de Soto, 2006).

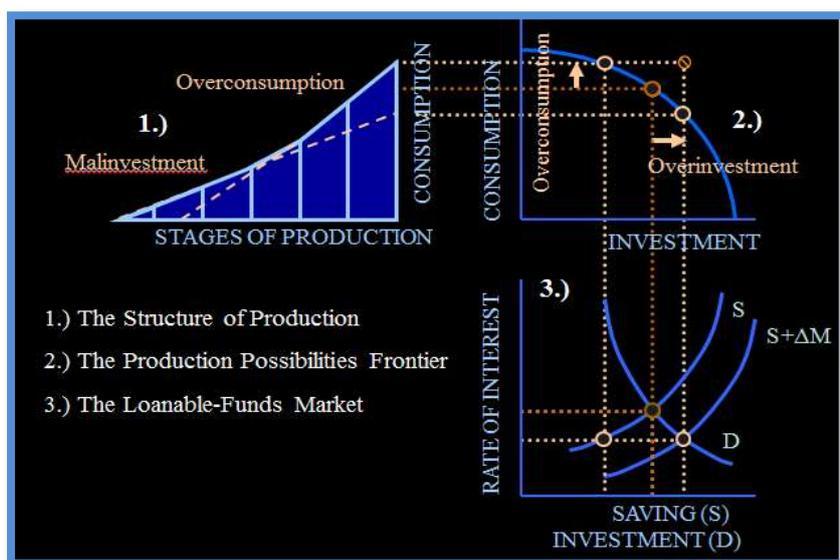
Thus, as explained, the bankers' use of demand deposits enables them to create bank deposits and consequently also loans (purchasing power transferred to borrowers) 'from nothing'. As indicated, these deposits and loans do not result from a real increase in voluntary saving by social agents, for which such credit expansion must ultimately lead to economic crises and recessions. Mises (1949) highlighted the disruptive effects of loans unbacked by actual savings, and criticized fractional-reserve banking for enabling such loan creation by generating deposits or fiduciary media. Thus, the fractional-reserve banking system as a whole generates ex nihilo significant volumes of deposits, bringing about notable credit expansion (Bagus, 2014). While referring to "*the legally corrupt origin of fractional reserves in monetary bank deposits*" (2006, p. 37), Huerta de Soto generally criticizes governments for constantly maximizing their powers, while inducing monetary expansion. Accordingly, governments have established central bank control over the commercial banking system by granting the bank a monopoly of the note-issuing within the country or the corresponding currency union (Huerta de Soto, 2006). By consequently nationalizing the note-issue business, the commercial banks are forced to go to the central bank in case their customers ask to exchange demand deposits for paper notes (Rothbard, 1962). To provide notes to their clients, commercial banks must buy these notes from the responsible central bank. (Huerta de Soto, 2006).

In the following chapters, and to illustrate the appropriateness of our economic theory for the analyzed period, we will use historic data on the evolution of the rate of interest in the USA throughout the first decade of the 21st century.

Artificially low interest rates increase the 'future orientation' of market participants, stimulating investment activities in the early stages (Hülsmann, 2008). In addition, these ultra-loose monetary policies also increase consumer demand, drawing further resources toward the late stages, which

distracts the economy even more (Huerta de Soto, 2006). Thus, these ‘dynamics of boom and bust’ are shaped by both overinvestment (as shown in the PPF diagram) and *malinvestment*, represented in an unsustainable lengthening of the Hayekian triangle (Garrison, 2001).

Chart N° 19: Malinvestment & Overconsumption in Capital-Based Macroeconomics

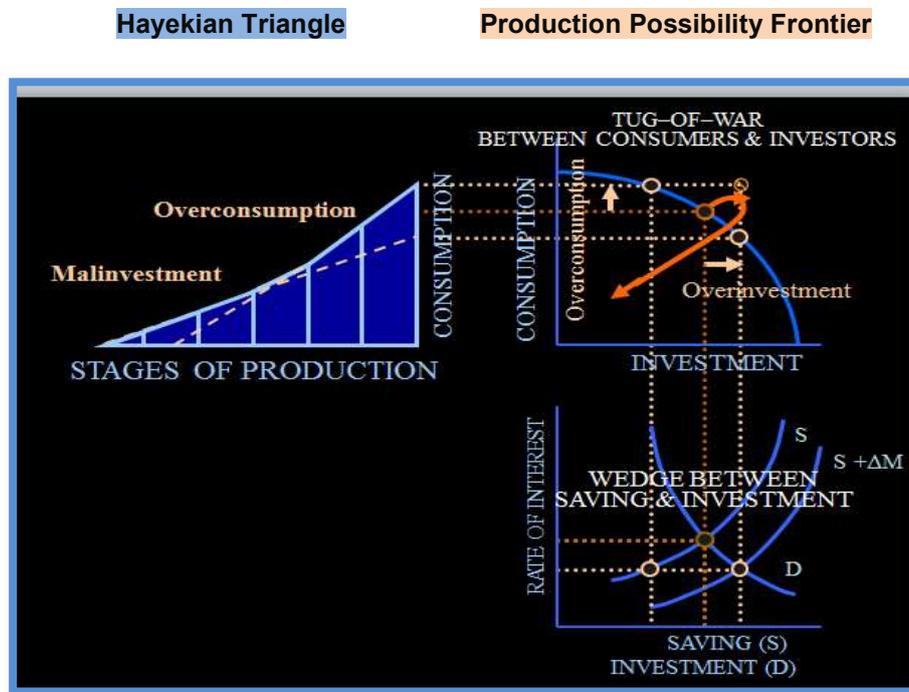


Based on Garrison (2001, p. 69)

4.1.4.8 Malinvestment, Dueling Triangles-& Consumption-Investment-Ratio

According to Garrison (2001), the situation of ‘dueling triangles’ occurs within the Hayekian Triangle, in case of a conflicting structure of production, in which mal-investments in the early stages of production (e.g. capital goods) are accompanied by the overconsumption in the later stages of production (e.g. consumer goods).

Chart N° 20: Towards the Economic Bust: Dueling Triangles & Tug-of-War



Based on Garrison (2001, p. 69)

The conflicting stages of production, the wedge between saving and investment as well as the ‘tug-of-war’ between consumers and investors lead to a distortion of the market with significant mal-investments, eventually turning booms into busts, causing recessions and potentially depressions (Hayek, 1941).

By increasing the money supply and the availability of loans in the market, the central banks’ policies lead to an artificial reduction of interest rates which is not backed by prior savings (Bagus *et al.*, 2014; Alonso Neira *et al.*, 2013).

Consequently, according to Huerta de Soto (2006), the following steps are expected to be seen throughout the business cycle, focusing in particular on the impact of the early ‘stages of production’:

1. Because of the mentioned artificially low interest rates and sudden increase of requests for credit opportunities, businessmen can be misled, believing that there is a large amount of savings that will be spent in the future.
2. Therefore, capital investment and investments into 'earlier stages of production' (higher order goods) will consequently increase, leading to a 'lengthening' of the capital structure, by raising the relevance of investments into mentioned 'early stages of production'.
3. Entrepreneurs take advantage of the low interest rates, investing into capital. In other words, they shift investments from consumer goods to capital goods. This however, leads to increased prices of capital
4. This phase marks the boom period of the business cycle. Mentioned investments into capital goods also stimulate more employment in these industries. However, as this growth in the 'longer processes of production' is not sustainable, the corresponding investments must be seen as '*malinvestment*'.
5. The corresponding long-term projects often turn out to be unprofitable as an actual, natural demand (without the ultra-loose monetary policies and the artificially low interest rates) would never have existed. Asset prices begin to fall and labour that was employed in these capital goods industries must soon get laid off, initiating the following bust period.
6. Throughout this crisis, capital goods industries are the ones which will suffer the most.
7. Asset prices fall while consumer confidence decreases. Economic growth keeps decreasing while unemployed increases and more business will have to file for bankruptcy

8. Ultimately, this economic bust detects all *malinvestment* affected throughout the time of the artificial boom. If governments and central banks do not intervene further, this will lead to a liquidation of unprofitable enterprises, while leading to a reallocation of capital according to real consumer preferences. The more significant the misallocation has been, the more violent will the readjustment process be.

Hayek: stated: *“Booms have always appeared with a great increase in investment, a large part of which proved to be erroneous, mistaken. That, of course, suggests that a supply of capital was made apparent which wasn’t actually existing. The whole combination of a stimulus to invest on a large scale followed by a period of acute scarcity of capital is consistent with the idea that there has been a misdirection due to monetary influences. And that general schema, I still believe, is correct.”* (Hayek, 2010, p. 146)

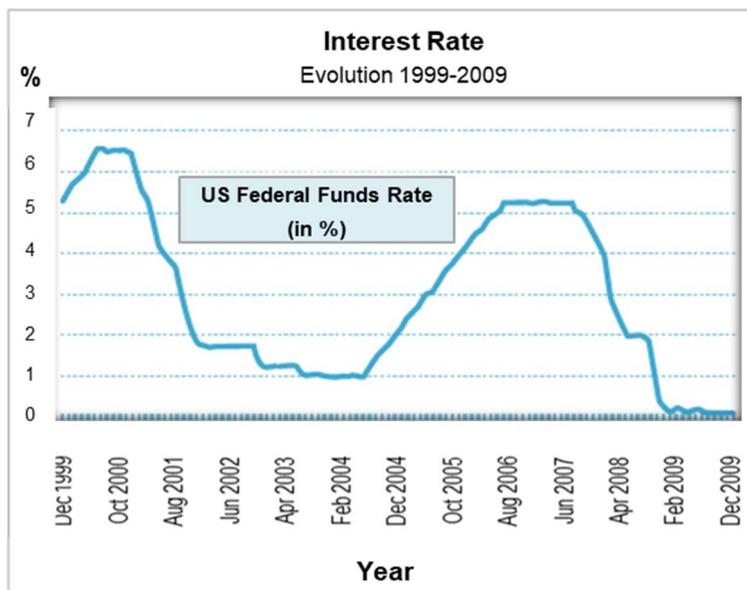
Based on our praxeologic approach we had defined three propositions which we consider as a priori truths. One of these is the proposition that a decrease in the market interest rate (below the natural interest rate) caused by expansive monetary policies of central banks stimulates entrepreneurs to misallocate resources, leading to market distortions and an unsustainable boom.

Consequently, one of our key research questions is whether the extremely low interest rates in the period from 2002-2004 caused an artificial boom of automotive sales in the USA and Europe.

In our ongoing analysis, we will use historic data to illustrate the appropriateness of our economic theory. In this specific case, we want to use historic data on the evolution of the rate of interest in the USA throughout the first decade of the 21st century.

Chart N° 21: Illustrating our Theory with Empiric Data:

USA: Short-Term Interest Rate Evolution, 1999-2009



(Author's design. Source: U.S. Federal Reserve, 2010)

As shown in the chart above, the economic boom occurred while the rate of interest defined by the U.S. Federal Reserve was at a low level (below 5% per annum, simultaneously with a general significant increase in the monetary base/ M3 growth). In line with Alonso Neira *et al.* (2013), we argue that to really understand the origin of the latest economic crisis, we must talk about the events and political actions which had led to it. In the recession of 2001, after the information technology bubble (the 'dot-com bubble') and after the '9/11' attacks in the USA, the Federal Reserve aggressively expanded the M2 money supply even further, while simultaneously cutting the federal-funds rate, which started in 2001 at 6.25% and ended in the same year at only 1.75% (Shostak, 2003). Within the period from 2003 to 2005, the rate was at a historic low of 1%, resulting in a negative real interest rate, as the nominal interest rate was lower than the price inflation rate (Ferrara, 2011).

Thus, the expansive monetary policies, and particularly the artificially low interest rates increased the 'future orientation' of market participants, stimulating investment activities in the early stages, while also increasing consumer demand. This also drew resources towards the later stages, distracting the economy even more (Huerta de Soto, 2006). Thus, these 'dynamics of boom and bust' are shaped by both overinvestment (as shown in the PPF diagram) and *malinvestment*, represented in an unsustainable lengthening of the Hayekian triangle (Garrison, 2001).

4.1.4.9 The Theory of Capital Based Macroeconomics and the Automotive Industry

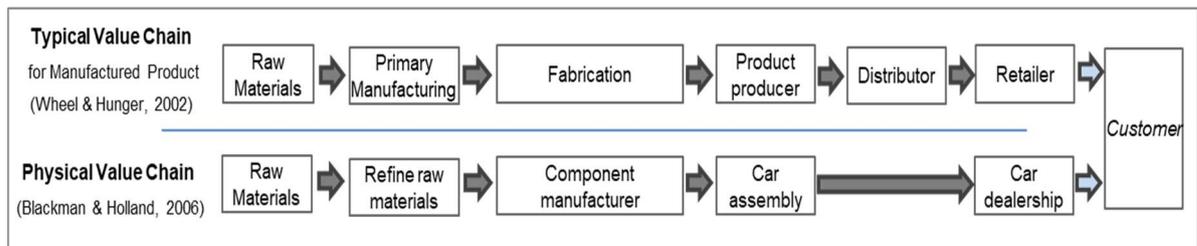
As we have seen, the Hayekian vision can be considered as much more detailed, realistic and long-sighted than the Keynesian view (Huerta de Soto, 1998; Garrison, 2001; Alonso Neira *et al.*, 2011, 2013), being able to illustrate three main advantages:

1. Division of the structure of production into stages.
2. Stage-specific labour markets - in which wage rates adjust to changed market conditions.
3. Appreciate the long-term relevance of a sustainable growth

One industry which covers all stages of production is the automotive industry, starting from the process of gaining raw materials such as iron ore up until the production, sales process and delivery of the final vehicle to the end customer. Consequently, we argue that apart from the real estate business, no other major industry sector serves as a better example to explain capital-based macroeconomics and the Hayekian triangle.

Chart N° 22: 'Physical Supply Chain vs General Value Chain for Manufactured Products'

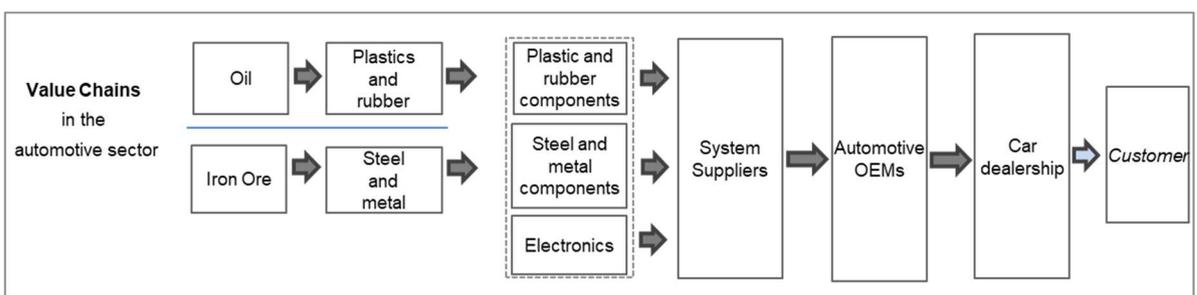
First of all, based on the concept of Wheelen and Hunger (2002), we want to illustrate the typical value chain for the production and selling of common manufactured products, in direct comparison to the physical supply chain of the automotive industry, as shown by Blackman and Holland (2006).



Source: Lind et al. (2012), author's own design

Blackman and Holland (2006) indicated that the supply chain process starts with gaining and refining the required raw materials, then starting the actual production/ assembling. However, the first stages of production can be explained in more detailed, referring more specifically to the main raw materials and components of the analyzed sector. Thus, to be more precise, the value chain of the automotive sector can be split into the following phases:

Chart N° 23: Value Chain in the Automotive Sector:



Source: Lind et al. (2012), author's own design

In the first phase, the pure raw materials, such as oil and iron ore are shown, followed by refined raw materials and primary manufacturing such as plastics, rubber, steel and metal. In the third

phase, goods produced by component manufacturers are shown, such as metal components, as well as electronics. At a later stage, the actual car assembly is then done on car manufacturer level.

4.1.5 Criticism to Hayek's and Garrison's Business Cycle Approach

We carefully studied the business cycle theories of different schools of thought, including monetarism, Keynesianism and the Austrian School of economics. From all analysed concepts, we consider the Austrian School approach as the most sophisticated and logic one. Particularly the contributions of Hayek (1931, 1932, 1939, 1941) need to be highlighted, while also appreciating his findings related to the so-called "Hayekian Triangle". However, current Austrian School economists such as Hülsmann (2010) have highlighted specific aspects of Hayek's concept which needed to be further discussed.

4.1.5.1 Jörg G. Hülsmann on the Hayekian Triangle

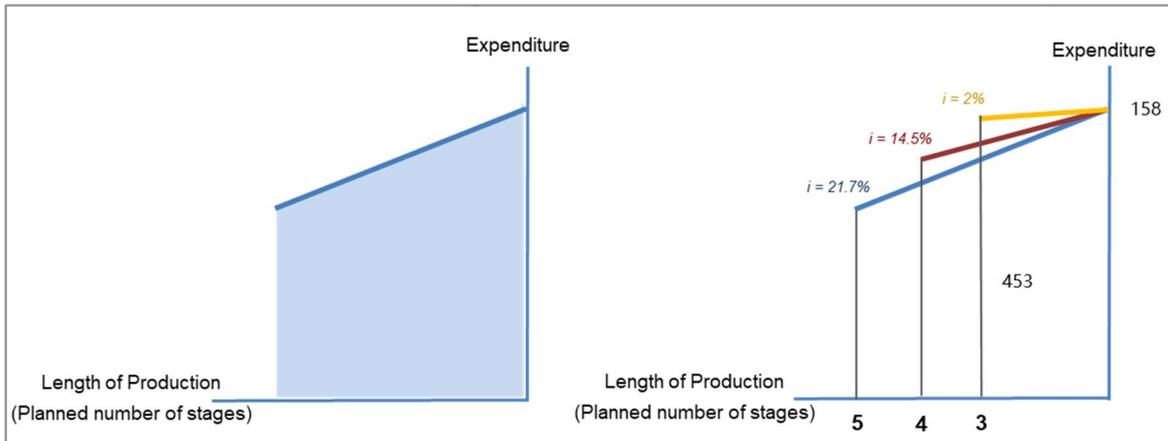
Also the German economist Hülsmann (2010) added relevant value to the discussion about business cycles, developing on the basis of initial ideas by Rothbard (1993) and Fillieule (2005) a revised analysis of the relationship between savings, the interest rate, and the length of the structure of production. Hülsmann (2010) points out that the approach of von Mises (1940), Hayek (1941) and Garrison (2001) has been too restrictive in its focus on one single scenario of modifications of the structure of production. Hülsmann's critique focuses on the impact that variations of the demand for present goods have on the structure of production as well as on his argument that the conventional model suffers from a basic misconception pertaining to the relationship between the 'Pure Rate of Interest' (PRI) and the *roundaboutness* or length of the structure of production. He criticised the Hayekian Triangle, stating that it is not entirely correct because spending in the last stage is not zero, even if only original factors are used.

Hülsmann proposes to use the concept of Rothbard who had modified the Hayekian Triangle into a trapezoid. Rothbard had integrated Hayek's intermediate-goods trapezoid and Jevon's capital-values trapezoid, adding monetary considerations to the concept. In line with Huerta de Soto (1998, 2009b), Hülsmann states that in reality, cost expenditure in the last stage of production are positive, and these expenditures can be quite substantial from an aggregate point of view, in particular in highly industrialized markets. Hülsmann (2010) explains that the economy can and should grow based on higher savings, whereas expansive monetary policies can only hurt the natural economic development. Thus, Hülsmann and Huerta de Soto consider Rothbard's trapezoid representation of the time structure of production as preferable to the Hayekian triangle.

Hülsmann (2010) focuses on the impact that variations of the demand for present goods have on the structure of production. Hayek's conventional model focuses on the impact of an increase of the supply of present goods (savings) on the time structure of production, assuming that the demand for present goods remains constant, which is not always the case in the real world. An increasing demand for present goods (savings) at a given supply of present goods will lead to a higher 'Pure Rate of Interest' (PRI) and a higher volume of savings causing, a higher volume of investment expenditure.

Chart N° 24: Hülsmann’s Trapezoid:

Hypothesis: “a lower interest rate (with fixed total spending) shortens production”



(Redesigned by the author. Source: Hülsmann, 2010)

Hülsmann (2010) argues that the conventional model suffers from a misconception regarding the relationship between the PRI and the length of the structure of production. Hayek’s conventional theory of interest assumes that an increase of the PRI tends to lead to a shortening of the structure of production. Hülsmann argued that in the case of fixed total spending (fixed money supply with unchanged demand for money), falling interest rates will actually lead to a shorter production process. In other words, increases of the pure interest rate tend to lengthen the structure of production. Hülsmann argues that if money supply is stable - and with an unchanged demand for it - a lower discount rate will be followed by less money being available in the early stages and more spending in the final stages, for which the mentioned scenario of lower interest rates would decrease the length of production processes. What needs to be critically mentioned is that in this scenario the monetary conditions remain stable even though changes in the demand for money or in the money supply can certainly affect the distribution of revenues and therefore also the structure of production. We recognize Hülsmann’s ideas but do not fully follow his approach. We conclude that it cannot be proven that there is always a direct causal effect of interest rates on the length of production, since several other factors can also significantly affect the process. However, the main purpose of this thesis is not to evaluate in detail different interpretations of the

Hayekian triangle and the ABCT from a purely theoretical perspective. Instead, we want to evaluate the impact of monetary and fiscal policies on the automotive industry within a specific period of time, using empiric data to illustrate the general appropriateness of the ABCT (as defined by Hayek) for the analysed period. Thus, we conclude that several specific concerns regarding Hayek's definition of the ABCT, such as those raised by Hülsmann (2010) and Rothbard (1962), shall be evaluated in later academic researches, not minimizing the significant relevance of Hayek's findings.

4.1.5.2 The Impact of Shadow Banking, Savings Banks & Money Market Funds

Moreover, one might argue that the impact of shadow banking on credit expansion and the business cycle has not been fully evaluated, neither by Garrison (2001) nor by Hayek (1935, 1939, 1941). As this thesis already covers a rather wide range of topics we will not be able to go into the interesting but complex details of shadow banking, savings banks and money market funds. Moreover, there is only a limited number of thorough academic papers on these subjects among Austrian School economists. In particular these economists related to the Austrian School of economics define *credit expansion conducted by commercial banks, on the basis of fractional reserve* as the decisive cause for business cycles. We argue that the two main functions of the shadow banking system, namely securitization and collateral-intermediation, have not been sufficiently discussed among Austrian School economists. The most relevant works on shadow banking from mentioned 'Austrians' are likely those of Gertchev (2009), as well as Giménez Roche and Lermyte (2016). Securitization enables traditional banks to expand their credit activity, while collateral-intermediation allows the shadow banks to create new money by themselves. Thus, commercial banks are no longer the only institutions which can create credit (Sieron, 2016). Shadow banking allows non-banking institutions to also conduct credit expansion, generating the business cycle. The history of shadow banking development confirms von Mises's original thesis (1949) that each government intervention leads to some unintended consequences. Thus, it must be seen as relevant who exactly injects new money and who creates credit in an economy, as

this may lead to different outcomes. Moreover, the effect of shadow banking is relevant as it affects the quality of credit. It is therefore suggested that more economists should further incorporate changes within the banking system in their business cycle theories, taking into consideration how shadow banking has activity changed the conduct of credit expansion.

4.1.5.3 The Multiplicity of Interest Rates versus the 'Natural' Rate of Interest

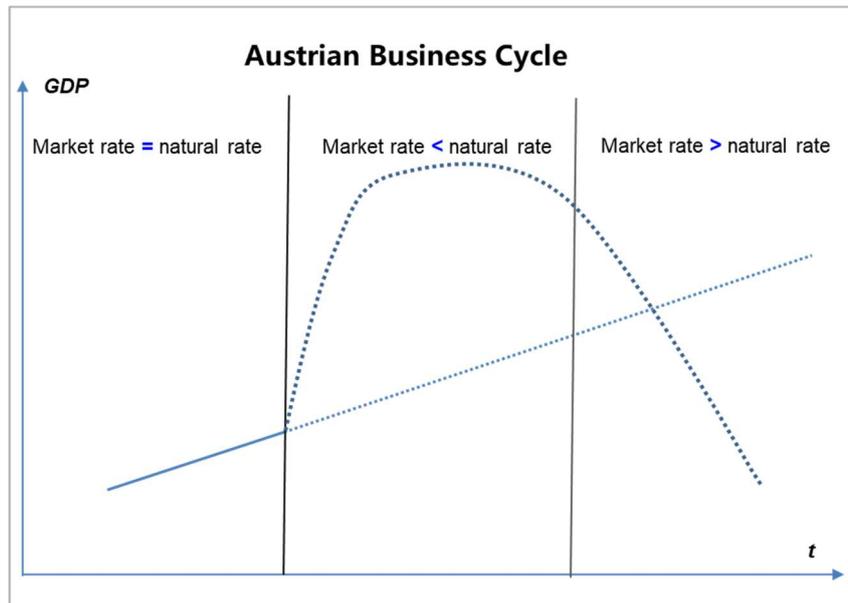
As indicated, one of our key research questions in this thesis is: Did the extremely low interest rates in the period from 2002-2004 cause an artificial boom of automotive sales in the USA and Europe? Thus, a key objective is to analyze the impact of artificially low interest rates (below the 'natural rate of interest') on the automotive sales evolution in Europe and the USA. To do so, we need to take a closer look at economic theory, and the main concepts of key economists such as von Mises (1922, 1929, 1940) and Hayek (1931, 1939, 1941, 1944). Hayek's *Prices and Production* (1931) was an elaboration and extension of von Mises' theory on the trade cycle. Following von Mises, Hayek argued in his *'Prices and Production'* that unsustainable boom periods are caused by banks charging a money rate of interest lower than "the natural rate" of interest (Murphy, 2010). In its well-known standard form, Hayek's business cycle theory has generally focused on the distortions in the structure of production related to lowering "the market rate of interest" below "the natural" rate.

As we have discussed, low interest rates stimulate the borrowing of money from banks, while the expansion of credit causes an expansion of money through the banking system (Huerta de Soto, 1998; Garrison, 2001). This unsustainable credit-fueled boom in investment is artificially stimulated, leading to overinvestment in certain sectors of the economy, misallocating money into areas which would not have been attractive to investors without the artificial credit expansion. Huerta de Soto (1998) argues that this artificial boom will turn into bust once credit creation cannot be sustained, leading to a 'credit crunch' and possibly into recession. However, without any further public interventionism and ultra-loose monetary policies, such economic bust, could be seen as

a chance to allow the economy to naturally restructure itself, becoming more efficient and sustainable in the future (Huerta de Soto, 2009b). This position is also mainly shared by R. Garrison (2001).

As initially stated, economists such as Salerno (2016) highlight that it is crucial to distinguish between a so-called 'natural rate of interest' that reflects the return on investment, and a 'market rate', which reflects the borrowing costs of funds charged by the banks. If the market rate is below the natural rate, more companies are expected to borrow in order to invest, which leads to an (unsustainable) expansion of the economy (Huerta de Soto, 2006; Rothbard, 1962).

Chart N° 25: ABCT & the Market Rate of Interest versus the Natural Rate



Source: Own elaboration, based on Murphy (2010b)

Based on this concept, Hayek then stated that low interest rates stimulate borrowing from the banking system, leading to an expansion of credit.

Already back in 1932, Piero Sraffa criticized this simplified explanation, arguing that there is no such thing as “the” natural rate of interest in any economy outside of a (so-called) ‘steady-state equilibrium’. Consequently, Sraffa stated that Hayek’s idea, that banks shall set the money rate of interest equal to “the” natural rate of interest, was incorrect.

Thus, one may ask how Hayek and Mises could claim that the boom-bust cycle is mainly caused by a money rate of interest lower than “the natural” rate, if outside the ‘Evenly Rotating Economy’ (ERE) there are a variety of “natural rates”, meaning that there are as many natural rates as there are commodities.

In this regard, Sraffa paved the way for economists like Robert Murphy. Murphy (2010b) argued that an equilibrium construct would need to be considered which is more robust than von Mises’ “evenly rotating economy” (ERE) - while using a more general notion of dynamic equilibrium, considering that consumer preference and technologies, as well as the supply of resources can certainly change over time while still being properly anticipated. Consequently, Murphy stated that

by loosening its equilibrium construct allowing changing conditions, the Hayekian business cycle theory could potentially be further improved. In Murphy's 'dynamic equilibrium' the spot prices of most goods and services may change over time, which means that economists cannot refer to "the" natural or "real rate of interest in the economy" (Murphy, 2010). In this suggested dynamic equilibrium construct, variables such as spot prices and quantities change over time, but in a predictable manner which does not allow pure profits. The 'real' interest rate so computed, would consequently differ depending on the consistence of the corresponding commodity basket. We understand Murphy's concerns, but we argue that the focus should not be given to potentially different linguistic terms which ultimately refer to the same economic process. In other words, the ABCT as defined by Mises and Hayek states that credit expansion by central banks leads to interest rates which are '*artificially low*' in the sense that these implemented rates are lower than what they would be in a truly free market (Huerta de Soto 1998; Garrison, 2001). These essential findings are seen as absolutely correct, whereas the discussion about one or several potential 'natural rate(s) of interest' is not crucial for the findings of this thesis.

"Credit takes various directions, and the effects of inflation can only be measured best at those points in the business structure where the use of credit has been most active".

H.F. Fraser (1933, p. 81)

We argue that the business cycle model developed by Hayek and its further enhancement by Garrison (2001), called 'capital-based macroeconomics', is the most accurate concept to illustrate the causes, evolution and effects of the 2008 financial crisis. Von Hayek's and Garrison's approach focused on explaining the cyclical behaviour of real interest rates, changes in the capital structure, and the endogenous nature of expansion and contraction phase as well as on the relation of short-term and long-term interest rates.

4.1.6 Fiat Money & Public Interventionism vs the Benefits of Free Prices

Already in the 14th century, the mathematician, musicologist, physicist, philosopher, and economist Nicole Oresme wrote a groundbreaking treatise on money called 'De Moneta', which provides a detailed account of the function of money and the effects of inflation. In it, Oresme described the immorality of a government monopoly over money (Hülsmann, 2008). In this section we will look at the effects of monetary policies on the overall economy, while particularly analyzing the direct and indirect impact on the automotive industry in the USA and Spain.

Thus, throughout this chapter we will see that there is an undisputable connection between the inefficiency of interventionism (e.g. via centralized public planning structures), the unsustainable artificial fixing of prices by public institutions and the economic bust most economies in Europe and North America had to face in the year 2008. According to Huerta de Soto (1998, 2005, 2009a), no central public institution can control all the necessary information to successfully steer an economy, and all market prices would need to be developed freely without any coercive interventionism, if a sustainable market development should be achieved.

To properly understand the intentions, limitations and failures of modern monetary and fiscal policies, it seems important to have a closer look at the ideas of von Hayek, the winner of the 1974 Nobel Memorial Prize in Economic Sciences, who must be seen as one of the most relevant economists of the 20th century. Based on previous findings by Mises (1922, 1929, 1940), his works have been particularly essential in proving the economic inefficiency of interventionist centralized public planning structures. Some of Hayek's (1939, 1941, 1944) most important works focused on money and credit conditions and their impact on business cycles in the 1930s, but one must certainly also mention his analysis of the comparative efficiency of socioeconomic systems (1948, 1973). Hayek stated that humanity, without central planning and without any conscious central designing, naturally and gradually moved towards capitalism since it represents the most efficient order. He argued that *"...our civilization depends... on what can be described as the extended order of human cooperation, an order more commonly, if somewhat misleadingly,*

known as capitalism" (Hayek, 1990, p.6). Hayek was convinced that people are not as good at centrally designing as they often think they were, suggesting that "*the curious task of economics is to demonstrate to men how little they really know about what they imagine they can design*". Hayek, 1990, p.76). Consequently, Hayek defined as the 'fatal conceit' the illusion that "*man is able to shape the world around him according to his wishes*" (Hayek, 1990, p.27).

Hayek stated that central planning can never anticipate market needs as in the marketplace unintended consequences are common, as the "*distribution of resources is affected by impersonal processes in which individuals, acting for their own ends... literally do not and cannot know what will be the net result of their actions*" (Hayek, 1990, p.71). Hayek not only detects the major disadvantages, inconsistencies and threats of any form of central-planning, he also synthesizes all free market theory into one concise concept of 'spontaneous order'. It was Hayek's study of the Scottish Enlightenment philosophers and other liberal and Austrian-school thinkers, including Carl Menger, and von Mises, as well as the context of the socialist calculation debate, which led him to further investigate on the topic. Hayek stated that complex social problems were solved spontaneously in a way that could not be duplicated or surpassed by methods of rational control (Hayek, 1948, 1973). The concept of spontaneous order, on which Hayek later built his theory of cultural evolution, shows obvious similarities to Michael Polanyi's (1940, 1948, 1951) corresponding writings.

In regard to the concept of spontaneous order, the mutually reinforcing but still independent nature of both Hayek's (1948) and Michael Polanyi's (1948) arguments have provided a thorough basis for proving the inefficiency of central planning. M. Polanyi's and Hayek's ideas on the impracticality of centrally planned economies may slightly differ to some extent, but they both seem absolutely valid and accurate to properly criticize today's public interventionism as both interpretations individually detect the main problems caused by public coercion. The basis of the spontaneous order is that a stable and effective form of relationship can develop from evolved rules (Infantino, 1998, 2008). These rules shall develop without any conscious central planning and steering. Taking the examples of money, law and language, all major aspects which have shaped most civilizations throughout decades or centuries were caused by the spontaneous order

process (Hayek, 1979). Hayek (1990) considered it a fatal conceit to think individuals, no matter how intelligent they are, could fully understand and efficiently guide other individuals. Hayek's thesis is that political/economic systems evolve just as organisms do, that the fittest will survive, and that consequently such spontaneous orders cannot arise from rational planning (Infantino, 2008).

Based on the findings of Mises (1936), Hayek (1944, 1948, 1973, 1990) proved a key contradiction in socialist thought, which believes that whatever is consciously and purposefully designed by humans shall be more-efficient than any unplanned 'extended order'. Hayek explored how the theories of Keynes (1923, 1936) are amoral, criticizing Keynes for being opportunistic and short-sighted while explaining that truly free markets are actually more moral than centrally steered markets. Hayek (1990) criticized Keynes famous quote that the "*long run is a misleading guide to current affairs. In the long run we are all dead*" (Keynes, 1923, p.80) for being a proof of Keynes' lack of long-term planning, claiming that Keynes was not interested in the possible long run damage his interventionism could do to economics. In Hayek's opinion Keynes' approach was driven by the implementation of actions which could be popular from a short-term perspective, while being extremely harmful over the long run (Infantino, 1998; Boettke, 2001). From the end of the Great Depression to the mid-1970s, Keynes provided the main inspiration for economic policy makers in most European countries and the USA. Consequently, Hayek considers Keynes' theory of economics as the main reason for the massive economic challenges and inflation seen in the 1970.

Similar to von Mises (1936, 1940, 1951), also Hayek (1948, 1990) argued that in a socialist system, the allocation and use of means of production will always be less effective than the free market, as there is no rational, valid means of economic calculation to allocate scarce resources efficiently. Knowledge must never be coercively concentrated into a single entity at the hierarchical top, but it should be naturally distributed within society and used effectively by free market participants (Infantino, 1998). In line with Mises and Hayek, Huerta de Soto (1998, 2005, 2009a) agreed that central government never has rational means of figuring out which goods and services are the

most crucial and desired ones for the population, nor about what amount of time and money to invest in developing them.

Table N°4: Definition & Types of Knowledge

Types of Knowledge		
Source/ defined by:	Type A (entrepreneurial)	Type B (scientific)
Oakeshott	Practical	Scientific / technical
Hayek	Dispersed	Centralized
M. Polanyi	Tacit	Articulated
Mises	Individual events	Categories / groups

Source: Huerta de Soto (2005), author's own design

As stated, F.A. Hayek (1931, 1939) and the US-American economist Israel Kirzner (1963, 1973) both emphasized on the fact that prices serve to communicate economic changes and scarcities. Hayek also indicated the importance of free pricing, as price signals are the only means to enable the economic decision makers to communicate tacit knowledge or dispersed knowledge between each other, helping to solve the economic calculation problem (Boettke, 2001).

The development of the price system started to allow us to decide rationally about the allocation of scarce resources. Prices must be seen as signals on the relative scarcity of goods and resources. Moreover, both Hayek (1939, 1945) and Kirzner (1963, 1973) argued that economic profits must be seen as the reward for removing maladjustments from an economy, for 'coordinating' the market. Prices also help to coordinate human activities, as "*prices can coordinate separate actions of different people in the same way as subjective values help the individual to co-ordinate the parts of his plan*" (Hayek 1945).

4.2 Historic Illustration of Economic Impact of Expansive Monetary Policies

Unlike commodity money which is generally created from a good, often a precious metal such as gold, the use of fiat money has been enforced by government regulations (Mises, 1949; Huerta de Soto, 1998; Bagus *et al.*, 2012).

Historically, governments have often paved the way for significant credit expansions, for example by expansive monetary policies and by targeting the establishment of a low rate of interest via the corresponding central banks, clearly below the natural rate of interest (Hülsmann, 2008). In the late 19th century, the concept that central banks must act as the “lender of last resort,” lending money freely to banks threatened with failure, gained increasing popularity (Rothbard, 1970).

To understand the actual causes of the recent economic boom-and-bust cycles, it is essential to understand the historic roots of the current fractional reserve banking system (Huerta de Soto, 1998). In the second half of the 19th century, the so-called ‘gold standard’ - in which the standard economic unit of account is based on a fixed quantity of gold - was established as the monetary system in most industrialized countries. However, this system ended in the early 20th century, in particular with the beginning of World War I. Under a fiat money standard, governments (or the corresponding central banks) have been able to bail out banks with increased issues of standard money (Bagus, *et al.*, 2012). Huerta de Soto (2006), agrees on this, arguing that in such fiat money system, banks create loans and deposits from nothing with the economically unsustainable effect that loans granted by bank do not need to be backed by voluntary saving, for which “*the real productive structure is inevitably distorted and recurrent economic crises and recessions result*” (Huerta de Soto, 2006, p. 167). Simultaneously, since World War I and despite the constant increase of competitiveness seen in most industrial and technological sectors through the past century, the purchasing power of major currencies such as the US-Dollar and the British Pound significantly decreased (Hülsmann, 2008; Schnabl *et al.*, 2016). Thus, it is relevant to understand whether the significant reduction of the purchasing power of major western currencies related to the simultaneous increase of money supply is originally caused by the end of the gold standard and the further spread of fractional reserve banking. More specifically, the

negative effects of expansionary monetary policies and fractional reserve banking on the automotive industry in the period from 2000 to 2017 will be analyzed. We will focus in particular on the industry's latest significant crisis in the period from 2008 to 2010. However, it must also be taken into consideration that expansionary monetary policies and a consequent devaluation of the local currency can provide a competitive advantage for export driven companies, business sectors and entire economies. Consequently, while exporting to markets outside of their own currency union, automotive brands are benefitting from a corresponding local currency devaluation. Therefore, if the local currency of the market in which an automotive OEM produces its vehicles is devaluated, the OEMs global cost competitiveness is expected to increase (Schnabl, 2016).

In 2017, the U.S. Federal Reserve Chair Janet Yellen assumed there would not be another financial crisis for at least as long as she lived, thanks to the recent reforms of the banking system since the 2007-09 crash. We will strongly question this assumption, arguing that from our perspective the fundamental causes of previous and potential future crisis have not been eradicated. Based on the findings of Huerta de Soto (1998, 2009b), Alonso *et al.* (2011, 2013), McMaken (2018) and Salerno (2015), we argue that the recent expansive monetary policies as well as the increase in public spending to stabilize economies throughout the Covid-19 pandemic, will have negative economic effects from a long-term perspective and could intensify the risk of a new global financial crisis.

The US-American economist Paul Anthony Samuelson stated that economics is not an exact science, but a combination of an art and elements of science (Samuelson, 2009). He considered economics to be a choice between alternatives all the time. In this thesis, we want to show that throughout the past decades, 'economics' as seen by many neoclassical economists, has often been (mis-)used to justify politically motivated policies which ignore the *a priori* truths of the human action axiom as defined by von Mises (1940).

We will illustrate the circulation credit theory of the business cycle with data from the recent financial crisis of the early 21st century while also evaluating how the macroeconomic theories of monetarism and Keynesianism have impacted this crisis.

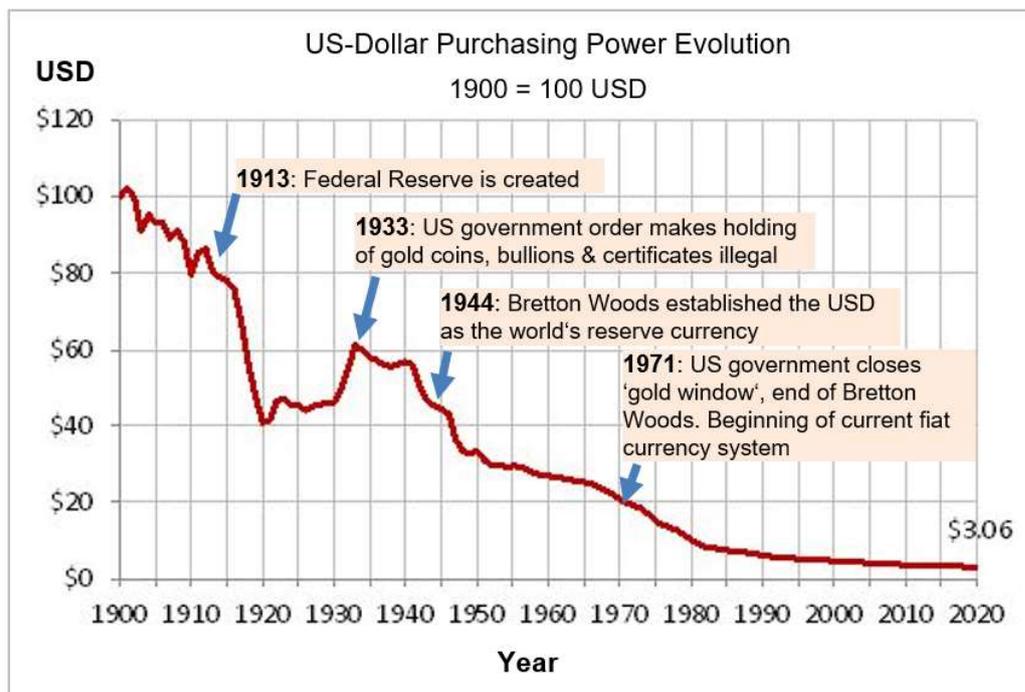
4.2.1 The Effects of Expansive Monetary Policies: The US-Dollar Evolution

In 'The Fatal Conceit' Hayek (1990) criticized the ignorance shown by many socialists and self-proclaimed intellectuals regarding the indispensable role of money in making possible the extended order of human cooperation and the general calculation in market values. As indicated by von Mises, the concern for profit is exactly what makes the more effective use of resources possible. Prices and profits can be seen as a "telescope", enabling producers and traders to serve more effectively the needs of (often unknown) customers. Hayek (1990) argued that, just like morality, law, and language, also monetary institutions result from spontaneous order. Financial institutions can be seen as some of the most abstract institutions of an advanced civilization, on which trade heavily depends when the traditional barter trade system is being replaced by an indirect exchange mediated by money. Hayek stated that money can be seen as both, the "*most powerful instrument of freedom and as the most sinister tool of oppression*" (Hayek, 1990, p. 102). He pointed out that also between currencies there should exist competition, stating that in the fiat money system "*selection by evolution is prevented by government monopolies that make competitive experimentation impossible*" (Hayek, 1990, p. 103). Hayek argued that money is not different from other commodities and that it should be supplied by competition between private issuers. Ultimately, he proposed that individual firms could issue 'pieces of paper' which are not necessarily backed up by any good/ commodity. On the contrary, Rothbard (1962) argued that Hayek's concept violated Mises's (1940) 'regression theorem' which demonstrated that all money - even government fiat currency - must ultimately derive its purchasing power from a historical tie to a commodity that had been valued in a state of barter. However, what all three – Hayek (1990), von Mises (1940) and Rothbard (1962) - agree on, is that under government control, the current monetary system has become more artificial, not being driven by true offer and demand. When looking back, one has to consider that money has been abused by governments almost since its first appearance. All three urged to end the government monopoly of (fiat) money, which from their perspective stopped the market economy from developing its true potential.

Hayek (1990), as well as Hayek's teacher and mentor von Mises (1940) argued that the neo-classical approach on economics, the abolition of the Gold Standard, the introduction of the so-called "fiat money system", the fractional reserve banking as well as other monetary policies in its combination all play a major role in creating economic busts.

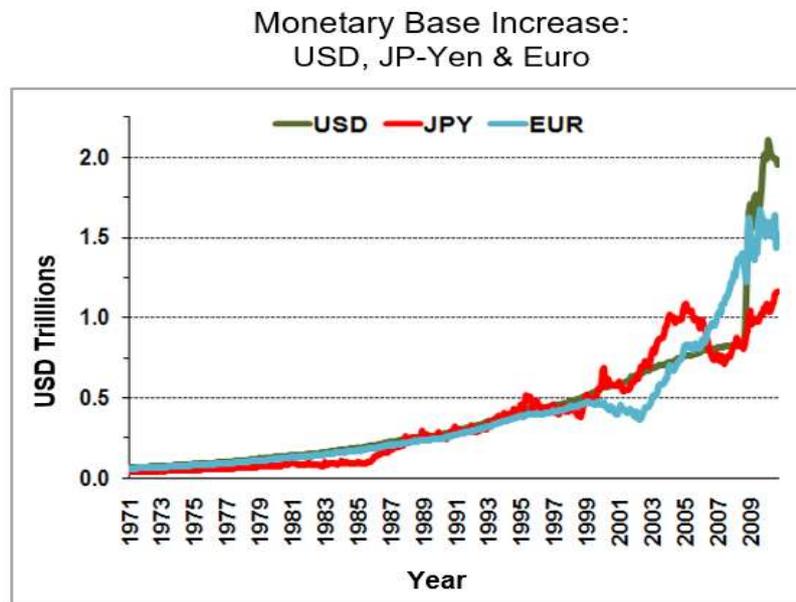
Moreover, these actions, in particular in their recent intensified combination, have also caused the significant devaluation of several currencies, such as the U.S. Dollar, which will be shown in the following chart.

Chart N° 26: Evolution of US-Dollar Purchasing Power



Own elaboration, based on data from: US Bureau of Labour Statistics (2021)

Chart N° 27: Global Monetary Base Increase of Major Currencies



Own elaboration, based on data from: US Bureau of Labour Statistics (2011)

As shown by J.G. Hülsmann (2011), the significant reduction of the purchasing power of several of the most influential currencies, such as the US Dollar and the Euro, is clearly linked to the simultaneous increase of money supply, which in its current extent has been possible after the implementation of the present fiat currency system in combination with the current fractional reserve banking system.

The effects of fractional reserve banking and of the latest expansionary monetary policies on the US-economy - and ultimately on the global financial markets - cannot be ignored, which partially led to the boom at the beginning of the 21st century and ultimately ending in the financial crisis of 2008 (Huerta de Soto, 2009b).

Huerta de Soto criticized governments for granting exemptions and privileges to the banking sector referring to *“the intimate complicity and solidarity traditionally present.... in relations between state and bank institutions”* (Huerta de Soto, 2006, p. 37). Huerta de Soto points out that in modern economies, traditional legal principles have primarily been infringed by granting privileges to pressure groups within two main areas: in labor legislation as well as in the field of

money, banking and finance. The lack of well-thought monetary and banking theory has hampered the development of the world economy and modern economies have constantly been affected by recurring booms and recessions (Bagus, *et al.*, 2014). The bankers' use of demand deposits has enabled them to create bank deposits and consequently also loans (purchasing power transferred to borrowers) literally 'from nothing'. As indicated, these deposits and loans do not result from a real increase in voluntary saving by social agents, for which such credit expansion must ultimately lead to economic crises and recessions.

4.2.2 Fractional Reserve Banking and its Impact on Booms and Busts

A standard definition of Fractional Reserve Banking (FRB) is to consider it as the practice by which a bank maintains available reserves which only represent a portion of its customers' deposits while lending out or investing the rest (McElroy, 2014). Fractional reserve banking and the related fiat paper monetary system may also critically be referred to as 'a debt-based monetary system' or 'credit-based monetary system' while the money created in parallel with debt can be considered as 'debt money' as virtually all new money is being created by people, businesses or governments that are further indebting themselves to banks. Mises (1949) had already highlighted the disruptive effects of loans unbacked by actual savings, and criticized fractional-reserve banking for enabling such loan creation by generating deposits or fiduciary media. Thus, the fractional-reserve banking system as a whole generates *ex nihilo* significant volumes of deposits, bringing about notable credit expansion (Bagus, 2014). While referring to "*the legally corrupt origin of fractional reserves in monetary bank deposits*" (2006, p. 37), Huerta de Soto generally criticizes governments for having constantly maximized their powers while inducing monetary expansion. Accordingly, governments have established central bank control over the commercial banking system by granting the bank a monopoly of the note-issuing within the country or the corresponding currency union (Huerta de Soto, 2006). By consequently nationalizing the note-issue business, the commercial banks are forced to go to the central bank

in case their customers ask to exchange demand deposits for paper notes (Rothbard, 1962). To provide notes to their clients, commercial banks must buy these notes from the responsible central bank (Huerta de Soto, 2006).

Ultimately, under the current system of fiat money, the central banks hold the monopoly over the production of base money and central-bank money (Mayer, 2018; Hülsmann, 2008). They are able to increase the base-money supply at any time and any amount, whenever it seems to be economically or politically desirable. Thus, eventually it is the central bank that decides if or not banks can meet their payment obligations. Moreover, banks that engage in fractional-reserve banking in a fiat-money regime create contractual obligations which they cannot fulfill, as fractional-reserve banking constantly leads to a legal impossibility, in which the borrower and the depositor both become owners of the same money through bank lending. Fractional-reserve banking distorts and confuses property rights over money, for which according to Rothbard (1962) and Huerta de Soto (2006) it should be considered embezzlement. Moreover, the 'pyramid-like' dynamics inherent in fractional-reserve banking allow early participants in financial bubbles to profit at the expense of genuine savers. In line with von Mises (1940) and Rothbard (1962), Huerta de Soto (2006) stated that fractional-reserve banking under commodity money leads to significant economic problems, as banks are encouraged to engage in circulation-credit expansion - as they issue money through lending that is not backed by real savings. As explained in more detail in this thesis, circulation bank credit often leads to inflation and excessive indebtedness of the private sector, causing economic disequilibria and "boom-and-bust" cycles. Thus, fractional-reserve banking aggravates the economic risks and consequences of fiat money.

Rothbard (1962) defined the current banking system as one huge monopoly bank which is guided and coordinated by the central bank, and in this framework other banks can simply be regarded as branches of the central bank. Ultimately, the central banks support the existence of fractional-reserve banking and the corresponding creation of money 'out of thin air'. Thus, we argue that in a truly free market economy without any chance of 'socializing' corporate losses, without any

public bailout programs and without incentives to support companies which are seen as 'too big to fail', the bank system will have to become more sustainable and more robust.

Accordingly, we insist that from a long-term perspective, it can be expected that in such a completely free market, without any other forms of public interventionism, bank customers themselves will view banks practicing fractional-reserve banking more critically, as these banks would constantly run the risk of not being able to assure liquidity and consequently of not being able to honor checks.

4.2.2.1 Cantillon and 'Monetary Inflation' versus 'Price inflation'

First of all, we need to point out the findings of Cantillon in regard to the 'Profiteers & Losers of Inflation' (Hülsmann, 2008). Thus, to understand the purpose of interventionism, we also need to understand '*cui bono*' (Latin for "*to whom is it a benefit?*").

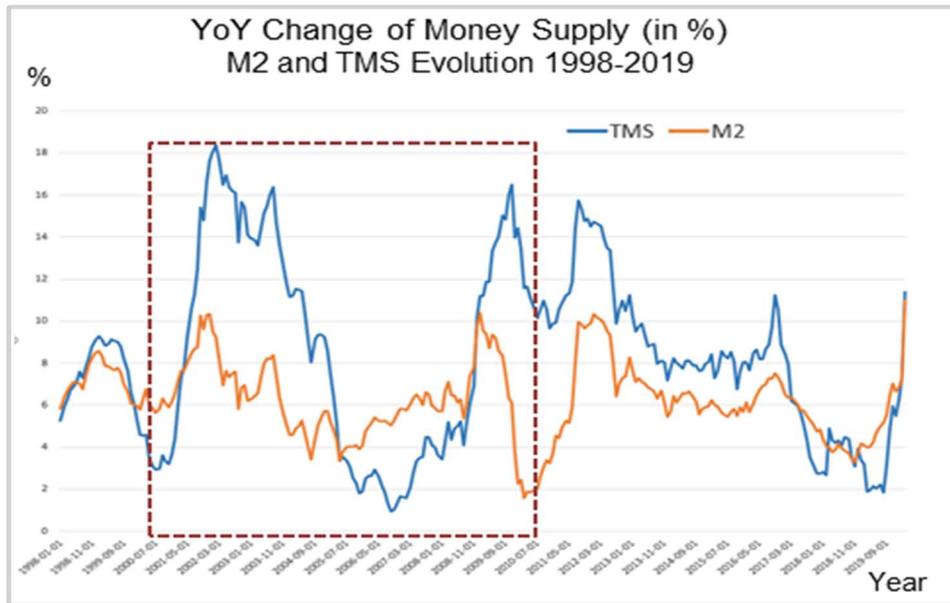
An increase in the money supply, often leads to a rise in prices. With more money and no change in money demand, people are expected to allocate a greater amount of money for all goods and services. Consequently, to properly understand the difference between the cause and the effect of several economic events, one needs to properly distinguish between 'monetary inflation' and 'price inflation'. More precisely, monetary inflation can be seen as the increase in the volume of money and bank credit. When the volume of money and bank credit increases more significantly than the amount of produced (and available) goods and services, a corresponding price inflation is likely to occur. Mentioned monetary inflation hampers the value of the monetary unit, reducing the value of past savings and discouraging people from increasing future savings. At the Conference on the Economics of Mobilization, held in 1951 at White Sulphur Springs, West Virginia, Mises said: "*Inflation, as this term was always used everywhere and especially in this country, means increasing the quantity of money and bank notes in circulation and the quantity of bank deposits subject to check. But people today use the term 'inflation' to refer to the*

phenomenon that is an inevitable consequence of inflation, that is the tendency of all prices and wage rates to rise... Those who pretend to fight inflation are in fact only fighting what is the inevitable consequence of inflation, rising prices." (Mises, 1951)

Moreover, monetary inflation does not affect all prices equally or at the same time, as it is strongly depending on the spending behavior of money holders all along the channels of monetary flows. This effect was well-analysed by Ricard Cantillon (1680s–1734) and later on by Knut Wicksell, Ludwig von Mises (1912, 1934, 1940), and F.A. Hayek (1931, 1941). His 'Cantillon effect' shows the impact which changes in the money supply can have depending on where within the economy the money is injected. Money does not enter the economy evenly as stated in Friedman's (1957, 1969) concept of 'helicopter money' (Hülsmann, 2008). Instead, the first recipients benefit because they will have higher amounts of money while prices have not yet changed – leading to a higher real purchasing power. Based on Jesus Huerta de Soto (2006) and Hülsmann (2008) and the mentioned previous findings by Mises and Hayek, we argue that in a fiat money system, governmental institutions and banks benefit most from an increase in the money supply, as they are expected to receive the 'new' money (monetary inflation) at the earliest stages, when general price increases (price inflation) are still not visible within the economy.

Therefore, it is mainly governments, other public institutions and banks which benefit most from the effects of inflation.

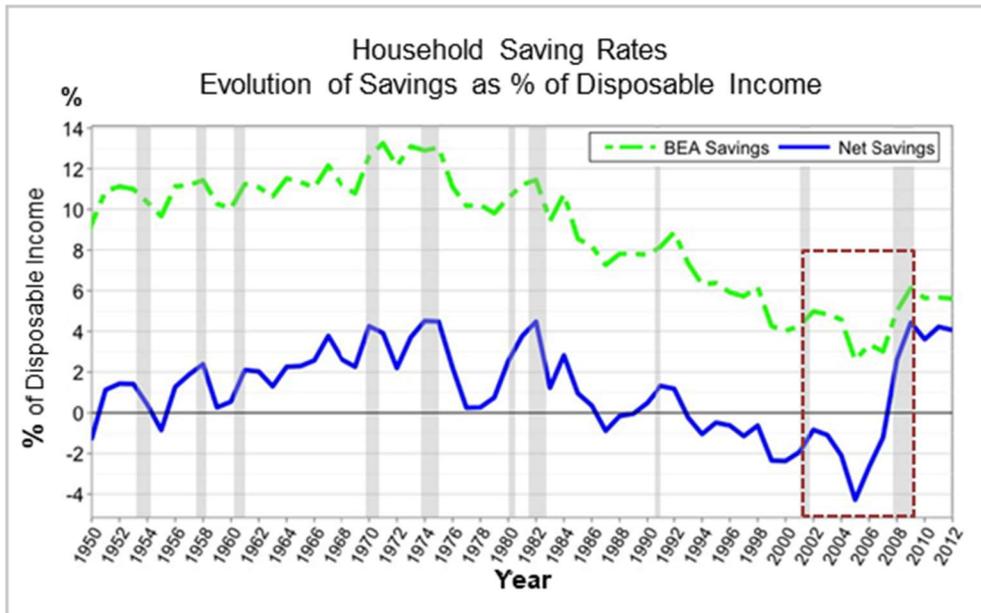
Chart N° 28: M2 & TMS Money Growth Rate



Own elaboration, based on data from: US Bureau of Labour Statistics (2021)

The indicated money supply measure 'TMS' is a metric developed by Murray Rothbard and Joseph Salerno, to provide a more useful measure of money supply fluctuations than M2, as it includes Treasury deposits at the Fed (and excludes short-time deposits, traveler's checks, and retail money funds).

Chart N° 29: Household Saving in Industrialized World



Own elaboration, based on data from: OECD Report (2013)

Analyses on the depth of the financial crisis, the reasons for its appearance and on why the recovery process is so time-consuming have been carried out by several economists belonging to different economic schools, such as DeLong (2009, 2011), Krugman (2009), Mankiw (2009) or Cochrane (2012).

In line with Bagus *et al.* (2012), Huerta de Soto (2009b, 2009c), Ravier (2011) and Thornton (2009), we consider the credit expansion which had led to the recent global financial crisis and which was mainly visible in the period from 2008-2010, as a *prime example* of *malinvestment*. As thoroughly explained by Bagus *et al.* (2012) and Huerta de Soto (2009b), the European central bank (ECB) played a central role by maintaining interest rates too low for too long, causing an artificially high money supply within the European Monetary Union (EMU), while adding to the worldwide credit bubble which had been initiated by the US-American FED.

Initially, the founding nations had officially agreed on an inflation target of 2%, and a growth rate of the total money supply (M3) of approximately 4.5% to guarantee a certain financial stability of the EMU. However, in reality, over the first eight years the average money supply in the Euro area

reached 6.9% which is more than 50% above the initial target. According to Garrison (2001) and Huerta de Soto (2006), such significant amount of new money in circulation, which is not finding new goods and services to buy in the real economy, must consequently be spent on the available stock of consumer goods or on larger investment opportunities, such as automobiles or real estate property.

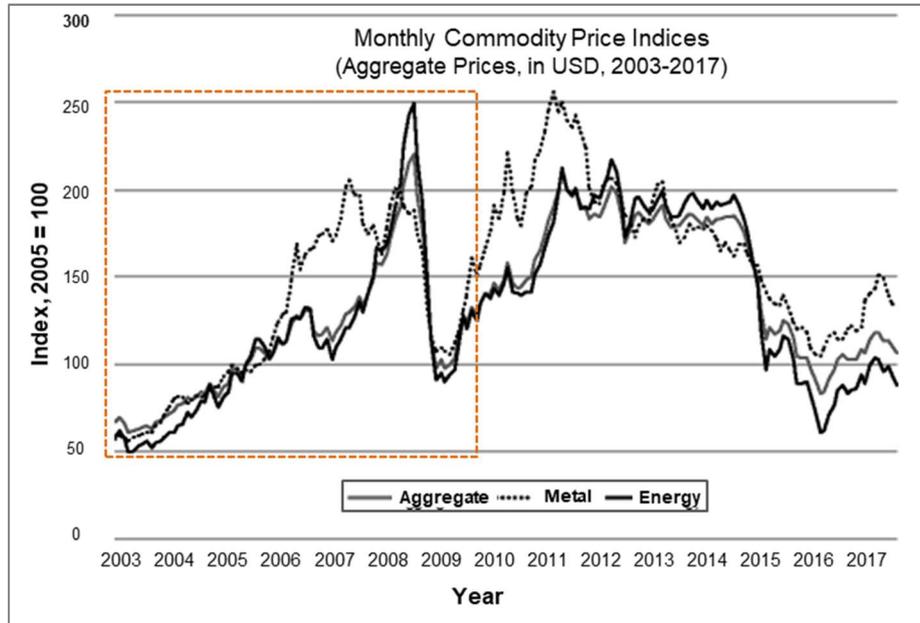
As a result, particularly in the period from 2002 to 2008, automobile sales volumes (ACEA, 2010) and even more so house prices increased significantly more than local salaries in several European countries. The most negative consequence of the corresponding 'easy money policy' was that the historically low interest rates discouraged market participants from saving money. In several European countries, the net real interest after costs, taxes and real inflation were actually close to zero - or even negative - for several years.

4.2.2.2 Commodity Price Indices – Price Evolution from 2005 to 2017

Also for the automotive industry, the evolution of commodity prices is certainly of relevance, as it has a direct impact on the ultimate final pricing of the produced vehicles. The following chart indicates a selection of monthly commodity price indices between January 2005 and September 2017. The commodity price index is shown in constant US\$, with the year 2005 representing the index of 100. The aggregate commodity price index increased significantly from 2003 onwards until reaching its peak at 220 (2005 = 100) in July 2008, a view months before the visible outbreak of the financial crisis. Also, the energy index reached its peak in July 2008, at an even higher level.

Chart N° 30: Commodity Price Index - Evolution of Aggregate Prices 2003-2020

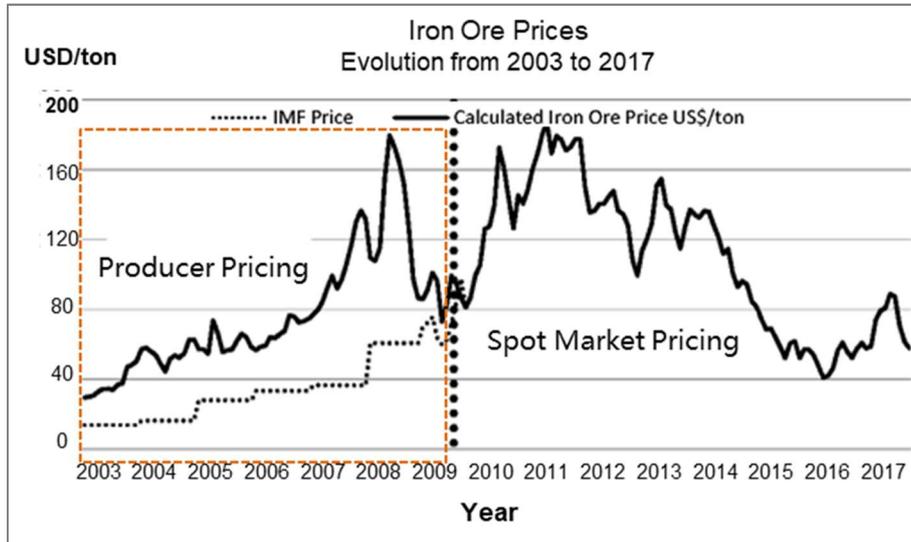
(in US Dollar)



Own elaboration, based on data from: IMF commodity prices (2018)

Our empiric quantitative analysis of iron ore prices is performed between January 2003 and June 2017, also considering structural breaks in the iron ore price series, when both exogenously as well as endogenously determined breaks had a relevant impact. The index decreased from 175 in August 2008 to a low of 106 in March 2009, while then rising again to reach an even higher peak in early 2011 (at 256 in February that year). For a more realistic understanding, the price series should be divided in two subsections, before and after the introduction of spot prices. The price data represents monthly prices of Chinese imported iron ore fines, indicated in US\$ per metric ton. The price series represents import prices including the cost of transportation.

Chart N° 31: Iron Ore Prices - Evolution from 2003 to 2017

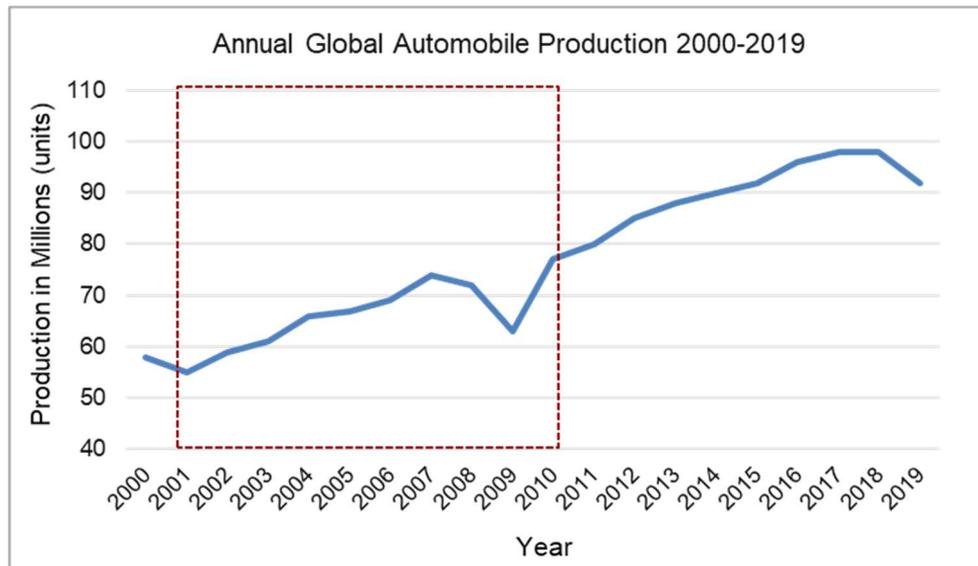


Own elaboration, based on data from: IMF commodity prices (2018)

The significant increase of iron ore prices between 2003 and 2008 and its abrupt decrease in 2009 is almost identical to the global evolution of new vehicle production. The global economic boom within the mentioned time period, induced by the expansive monetary policies, led to an increase of both, the shown commodity prices and vehicle production, but also to a significant misallocation of resources (IMF, 2018; ACEA, 2018).

The following chart illustrates the global annual production of automotive vehicles, between 2000 and 2019. The shown numbers clearly indicate how the vehicle production kept growing from 2000 to 2007. This growth was strongly related to the expansive monetary policies, which then led to the visible economic bust in the third quarter of 2008. However, quickly after the mentioned bust, vehicle production volumes recovered, also thanks to fiscal stimulus packages such as the scrappage campaigns in several countries.

Chart N° 32: Annual Global Automobile Production 2000-2019



Own elaboration, based on data from: Statista (2020)

4.2.3 Empiric Illustration of the Austrian Business Cycle Theory

The economist Xavier Sala i Martín argued: *“Hay dos tipos de economistas; los que no saben hacer profecías y los que no saben que no saben hacer profecías”* (Sala i Martin, 2005, p.9). Ironically, Sala i Martin stated that there are two types of economists: those who realize that they do not know how to predict future events - and those who still do not know that they do not know how to predict the future.

In regard to statistics, empiricism and econometrics, several famous quotes are constantly heard, indicating the difficulties in properly analysing historic events and more so in drawing the proper conclusions for the future. One relevant advice in this respect is that correlation does not imply causation. Many statistical tests calculate correlations between variables, often falling for the fallacy that an event that followed another was necessarily a consequence of the first event (also called the *“post hoc ergo propter hoc”*.) Thus, we need to accept the fact that in social sciences, and in particular in regard to macroeconomic aspects, correlations do not automatically imply

causations. Moreover, economists like Hayek (1944, 1948), Kirzner (1973), Huerta de Soto (1998, 2009a) and Garrison (2001) argue that economics is mostly subjectivist in the sense that human action depends upon the perception of the world held by each individual actor. This subjectivist approach explains the general scepticism of all major Austrian School economists such as Mises (1940, 1957), Hayek (1944, 1948), Rothbard (1962, 1979), Hoppe (1983) and Huerta de Soto (1998, 2009a) in regard to empiricism.

Ludwig von Mises once claimed that “*the impracticality of measurement is not due to the lack of technical methods for the establishment of measure. It is due to the absence of constant relations... Statistical figures referring to economic events are historical data. They only tell us what happened in a particular, non-repeatable historical case*” (Mises, 1949, p. 55). Consequently, empirical data can help to explain historical episodes, but the outcome of empiric studies cannot be considered as timeless general evidence to prove the permanent accurateness of an economic theory. Thus, our approach to focus on the concepts of subjective economic behaviour, dynamic markets, and microeconomic structures of production over time presents problems to fully trust econometric models which are purely based on aggregated macroeconomic data.

We share these concerns, agreeing with Mises (1949, 1957), that for a proper interpretation of statistical data, a thorough theory is needed and that empiric data cannot provide any precise quantitative forecast for future events. However, empiric data can certainly help to illustrate specific historic events. It should not be denied that also in regard to monetary policies, several thorough and careful empirical researches have been done, such as Larry White’s and George Selgin’s (2012) empiric analysis on the understanding of central banking and financial regulation. However, in his 1988 paper ‘*Against Mechanism. Protecting Economics from Science*’ Philip Mirowski criticises that in several aspects, the mathematical concepts of neoclassical economics can be seen as the direct continuation of 19th century mechanical physics. In particular throughout the 20th century, the idea of ‘dynamic efficiency’, seeing the market as a dynamic continuous process of individual market players, became less relevant due to the increase of mechanical physics rationality in economics. In 1909, Leon Walras, stated in his ‘*Economics and Mechanics*’ that mathematical formulas used in his book ‘*Elements of Pure Economics*’ were

actually identical to those applied in mathematical physics. In line with Mises, Mirowski (1988), Walras (1909), and Hayek (1944), we agree that analyses in social sciences must differ to those done in physics or mathematics as each human's behaviour is unique and societies constantly change. Moreover, resources and technology are not 'given constants' in the real world, but both can significantly change due to entrepreneurial actions. In particular the economists Israel Kirzner (1973) and Huerta de Soto (2009a) emphasized on seeing competition as a constant process in which alert and creative entrepreneurs intend to detect market niches and other business opportunities to optimize customer satisfaction, market share, turn-over and, most importantly, profit. Churchill is often cited for his ironic famous quote "*I only believe in statistics that I doctored myself*". Even if meant ironically, we argue that empiric data can only be useful if a proper theory had been defined in the first place.

Morgenstern (1950) stated that facts related to economic life cannot be properly described by statistics. He believed that in regard to "*the use of mathematics in economics... there is an abundance of formulas where such are not needed. They are frequently introduced, one fears, in order to show off. The more difficult the mathematical theorem, the more esoteric the name of the mathematician quoted, the better*" (Morgenstern, 1963, p. 18). He stated that man's knowledge of dynamic processes is clearly inferior to man's ability to describe temporary conditions and stationary events. We consider Morgenstern's concerns on the limitations of empiricism as correct, particularly when it comes to the challenges related to aggregate macroeconomic measures. Moreover, we support the findings of Mises (1957) that statistical correlations shall be seen as historical data, and their usefulness is limited to econometrics to analyse individual historic events. Accordingly, such historic data does not give us precise indications on how to tackle future events, as in dynamic markets preconditions constantly change (Huerta de Soto, 2009a). However, as indicated, we want to use empiric data to illustrate our theoretical approach. Historic data can well be used to illustrate the appropriateness of the ABCT in regard to historic events such as the global financial crisis in 2008. In the specific case of this thesis and the analysed aspects, we argue that econometric analysis must consider the often significant deviation of the natural interest rate(s) from the market rate(s). For this, two measures are

commonly used. One is the term spread, illustrating the difference between short and long-term rates, as shown by Keeler (2001), Mulligan (2006), and Anker (2011). The other is the savings-consumption ratio, as evaluated by Carilli & Dempster (2008), as well as by Selleby and Helmersson (2009). As indicated, we believe that specific empiric data can neither confirm nor refute a general theory. However, we argue that empiric data can illustrate the validity of our economic theory for the specific analysed case in the corresponding temporary setting. Therefore, instead of concentrating our research on extensive econometrics to elaborate entirely new mathematical 'masterpieces', we consider that the works of Keeler (2001), Mulligan (2006), and Anker (2011), as well as of Cachanosky & Lewin (2016), of Luther & Cohen (2015), of Carilli & Dempster (2008), and of Selleby and Helmersson (2009) provide a sufficiently solid basis to illustrate that several previous academic papers support our general theory and our corresponding findings.

4.2.3.1 Keeler, Mulligan and the Relationship between Real Consumable Output and the Interest Rate Term Spread (IRTS)

Mises (1934), Hayek (1941), Rothbard (1962), Kirzner (1963), Huerta de Soto (2006) and Hülsmann (2008) all agreed on the fundamental difference between ordinary changes in time preference and policy-induced changes in interest rates. They agreed that only a decrease in the interest rate which is caused by natural credit expansion can sustainably drive the business cycle. In 2006, Robert F. Mulligan published a paper, using a vector error-correction model based on U.S. macroeconomic data from 1959-2003 to interpret the relationship between real consumable output and the interest rate term spread (IRTS). The used term spread represents the ten-year constant maturity Treasury bond rate minus the three-month Treasury bill secondary market rate (TB3MS). Mentioned spread is often used to measure the real interest rate (Keeler 2001). A 10-Year Treasury Constant Maturity is an index published by the Federal Reserve Board and can be seen as a sign of investor sentiment about the economy. If the term spread decreases, the

structure of production is turning less roundabout since entrepreneurial managers reallocate resources from producers' goods towards consumers' goods.

As stated, annualized personal consumption expenditures and the corresponding chain-type price index were observed on a monthly basis from January 1959 to March 2003, based on data reported by the U.S. Department of Commerce Bureau of Economic Analysis. Mentioned price index was used to show real personal consumption expenditures, via natural logarithms to measure real consumable output. Sometimes, the monthly-observed index of industrial production is used to proxy GDP, which is seen as less appropriate for this analysis as we intend to explain fluctuations in real consumable output. Different data has been used for econometric estimation.

Also James P. Keeler (2001) used standardized quarterly data for a total of eight U.S. business cycles to illustrate that monetary shocks caused cycles which had been propagated through relative price changes, including nominal interest rates. Keeler (2001) evaluated U.S. data for the time period from 1959 to 2001 and in his research, several variables are the target of analysis. Keeler used mentioned variables to a unit root test, the Augmented Dickey-Fuller test (ADF). The ADF is generally used to test the null hypothesis that a unit root is present in a time series sample. It is an augmented version of the Dickey–Fuller test for a wider and more complicated set of time series models. Herein, the null hypothesis of unit root was rejected for income, slope of yield curve, and resource allocation, but not the Strongin's measure of monetary policy. Most of the series illustrated autocorrelations which quickly decrease to zero. We will refer to Keeler in more detail at a later stage.

Afterwards, Mulligan (2006) finalized a study, using interest data taken from the Federal Reserve Bank of St. Louis (Federal Reserve Economic Data 'FRED-II', USA), analyzing the corresponding three-month secondary-market rate and the ten-year constant maturity rate for the same period. As stated, the term spread is computed as the ten-year constant maturity rate minus the three-month secondary-market rate. The term spread increases with tight monetary policy, and is often

used as a measure of the real interest rate (Keeler 2001, pp. 338-340). The annualized rate (a) is used to define the monthly rate (m), by taking the twelfth root:

$$m_t = (1+a_t)^{1/12} - 1$$

However, the corresponding term spread could not have a co-integrated relationship with a nonstationary process such as real consumable output, while being itself a stationary process.

Thus, the cumulative sum of the term spread (r) was defined in estimation:

$$r_t = \{ \prod_{i=1}^t (1+m_n) \} - 1$$

The term spread is interpreted as a measure of the real interest rate and therefore the cumulative term spread can be interpreted as the real return over time.

The error-correction model is used as an econometric methodology. Particularly econometricians consider ECMs as useful to estimate both short-term and long-term effects of one time series on another. Thus, ECMs are often used to estimate the speed at which a dependent variable returns to equilibrium after a change in other variables. It provides estimates of both a structural or equilibrium process towards which adjustment is generally affected, as well as the error-correction or disequilibrium adjustment process for adjustment toward the hypothesized equilibrium. The error correction model is based on two parts: a structural equation to define the long-term equilibrium process as well as on a short-term disequilibrium adjustment process. As for consumption, the structural equation considering the long-run relationship between the cumulative real interest yield and consumption is:

$$C_t = AR_t^b E_t$$

(A = scaling constant , b = weighting exponent , E = multiplicative residual/ error)

If shown in logarithms yields: $c_t = a + br_t + e_t$

(c and r = natural logarithms of consumption and the cumulative term spread,

in the antilog structural equation: $C_t = AR_t^b E_t$). The vector error correction model is:

$$\Delta c_t = \Theta (c_{t-1} - a - br_{t-1}) + \Delta c_{t-1} + \Delta c_{t-2} + \Delta c_{t-3} \dots + \Delta r_{t-1} + \Delta r_{t-2} + \Delta r_{t-3} \dots + u_t$$

$$\Delta r_t = \Psi (c_{t-1} - a - br_{t-1}) + \Delta c_{t-1} + \Delta c_{t-2} + \Delta c_{t-3} \dots + \Delta r_{t-1} + \Delta r_{t-2} + \Delta r_{t-3} \dots + v_t$$

As explained by Mulligan (2006), the equilibrium represented by this structural equation is usually not achieved, and if it is achieved, it is only short-term. Whenever the residual in the structural equation is non-zero, the system is in disequilibrium and the nonzero residual in period t leads to an adjustment towards equilibrium in the period $t+1$, which is represented by the error-correction processes.

Empirical estimates based on parsimonious specification will be used to isolate the influences of credit expansion on consumable output. The intertemporal coordination of productive resources is facilitated by interest rates by clearing the loanable funds market (Garrison 1986). Used error-correction models estimate a regression in first differences augmented by error-correction terms, the lagged difference between the estimated and actual value of the 'left-hand variable', called the error-correction process or disequilibrium adjustment process. Johansen-Juselius (1990) established a procedure to identify long-term relationships between real consumable output and the interest rate term spread. The following table refers to the unit-root tests by Dickey-Fuller (1979) and Phillips-Perron (1988) for each of these variables. Generally, in statistics, the Dickey-Fuller test tests the null hypothesis that a unit root is present in an autoregressive model, The Phillips-Perron test builds on the Dickey-Fuller test of the null hypothesis. It is a unit root test, which particularly neo-classical econometricians consider as robust in regard to unspecified autocorrelation and heteroscedasticity in the disturbance process of the test equation. Consumption expenditures tend to rise as the economy grows. This however is not the case for interest rates, for which the term spread usually is expected to be $I(0)$ *a priori*. For our empirical illustration, we used the Dickey-Fuller test, by which the cumulative term yield was treated as $I(1)$. In contrast, Mulligan (2002, 2006) found the interest rates $I(1)$ with the Phillips-Perron test, indicating both the cumulative term yield and the term yield are $I(0)$.

Table N° 5: Unit Root Tests

(data from January 1959 – March 2003)

Augmented Dickey-Fuller Tests								
24 Lags								
Variable	Levels				First differences			
	Intercept		Intercept + Trend		Intercept		Intercept + Trend	
In consumption		-2.0083	*	-3.1785	***	-4.7783	***	-5.0474
Term spread	**	-3.3285	**	-3.7654	***	-5.8408	***	-5.8424
Cumulative term spread		0.3041		-2.6624	***	-4.5022	***	-4.4574
In critical values	1%	-3.4456	1%	-3.9805	1%	-3.4456	1%	-3.9805
	5%	-2.8675	5%	-3.4207	5%	-2.8675	5%	-3.4207
	10%	-2.5700	10%	-3.1327	10%	-2.5700	10%	-3.1327
Phillipps-Perron Tests								
5 lag truncation for Bartlett kernel (Newley & West 1987)								
Variable	Levels				First differences			
	Intercept		Intercept + Trend		Intercept		Intercept + Trend	
In consumption		-1.5698		-2.0846	***	-27.6197	***	-27.6900
Term spread	***	-4.0010	***	-4.2686	***	-17.6879	***	-14.6700
Cumulative term spread	***	-3.7480	***	-8.6765	***	-25.4000	***	-25.1331
In critical values	1%	-3.4450	1%	-3.9797	1%	-3.4450	1%	-3.9797
	5%	-2.8673	5%	-3.4203	5%	-2.8673	5%	-3.4203
	10%	-2.5696	10%	-3.1325	10%	-2.5698	10%	-3.1325

(Redesigned by the author, Data source: Dickey Fuller Test by Robert Mulligan, 2006)

Based on the results, the logarithms of real consumption expenditures and the cumulative term yield are I(1) processes, whereas the term yield is I(0).

Robert Mulligan (2006) points out that an I(1) process like consumption must not be co-integrated with an I(0) process such as the term spread. Cumulative summing the term spread was used as a procedure, and used unit root tests confirm the cumulative term spread is I(1).

Table N° 6: Co-integration between Cumulative Term Spread & Consumption:

Referring to the findings by Mulligan (2006)¹, we continue our illustration. The shown Johansen-Juselius test for co-integration confirms a co-integrated relationship between cumulative yield spread and the real consumable output.

Consumption & Cumulative Term Spread:				
Co-integration based on data from December 1959 – March 2003				
Hypothesized # CE(s)	Max. Eigenvalue	Trace Statistic	5% Critical Value	1% Critical Value
None*	0.039698	18.21093	15.41	20.04
At most 1	0.001452	0.630509	3.76	6.65

(Redesigned by the author, Source: Robert Mulligan, 2006)

- 434 observations after adjusting endpoints with 96 lag intervals
- Critical values based on Osterwald-Lenum (1992)
- * = rejection of the hypothesis at the 5% (1%) level
- Trend assumption: no intercept or deterministic trend in co-integrating equation or disequilibrium adjustment process.

¹ As our thesis is based on an Austrian School approach, we only use empiric data to illustrate the appropriateness of our theory for the specific analysed events in the corresponding period of time. Accordingly, we consider the illustration of findings by other economists such as Keeler (2001), Mulligan (2006), as well as Cachanosky & Lewin (2016) as an appropriate additional endorsement to support our academic approach.

Table N° 7: The OLS Estimate

OLS shows an estimate of the structural relationship or co-integrating equation, consistent with the one provided by the error-correlation model.

The OLS also allows to evaluate the connection between a lower interest rate and the level of real consumable output.

OLS Estimate				
Co-integration Equation				
January 1959-March 2003				
Number of included observations = 531				
Variable	Coefficient	Standard Error	t-Statistic	Probability
Constant	6.862534	0.009921	691.7204	0.0000
In-cumulative term spread	0.165032	0.001270	129.9966	0.0000
R-squared	0.969647	Mean of dependent variable		8.079763
Adjusted R-squared	0.969589	S.D. of dependent variable		0.433241
S.E. of regression	0.075551	Akaike info criterion		-2.308147
Sum squared residual	3.019538	Schwarz criterion		-2.308147
Log likelihood	619.0879	F-statistic		16899.12
Durbin-Watson statistic	0.013518	Probability (F-statistic)		0.000000

(Redesigned by the author, Source: Robert Mulligan, 2006)

The adjusted R square is 97 percent, the coefficient values of 0.162 for the slope and 6.862 for the intercept state that an increase of the interest rate by 1% significantly raised the consumption expenditure (Jarque-Bera, 1980). Moreover, a one-percent decrease in the cumulative term spread decreased real consumable output over the long run. Thus, the results of the t-test on the cumulative term spread, based on analyses by Garrison (1996), Keeler (2001); and Mulligan (2006) provide strong empirical approval of our theory. Moreover, Alonso *et al.* (2013) defined a

thorough empirical illustration of the Austrian business cycle theory in regard to the economic evolution of the United States in the period from 1988 to 2010. His findings are in line with the econometric illustrations of Mulligan (2006) and Keeler (2001), and confirm the general theoretic concepts of Mises (1912, 1949), Huerta de Soto (1998), and Garrison (2001).

Table N° 8: Term Spread Decrease versus Real Consumable Output Evolution

The following chart, based on Mulligan, reflects the impact of a 1% Decrease in Term Spread in Billions of Chained 1996 Dollars of Real Consumable Output.

The literal implications of the coefficient estimates can be seen in the following chart. If the term spread was lowered significantly below its average value, the real consumable output is also lowered significantly.

OLS & VECM Comparison						
Time	OLS			VECM		
	mean -1 s.e.	Mean	mean +1 s.e.	mean -1 s.e.	Mean	mean +1 s.e.
1 month	1.18	1.18	1.18	1.14	1.15	1.16
1 year	7.14	6.99	7.36	4.58	5.11	5.66
2 years	50.92	48.81	54.12	20.99	26.15	32.08
3 years	363.37	341.04	398.17	96.16	133.75	181.72
4 years	2593.01	2382.70	2929.23	440.53	683.97	1029.29
5 years	18503.59	16647.04	21549.76	2018.24	3497.84	5830.05

(Redesigned by the author, Source: Robert Mulligan, 2006)

The shown figures present evidence of a co-integration between real consumable output and the cumulative interest rate term spread. Thus, we agree with Mulligan that there is an obvious

relationship between the change in real consumable output and the term spread, but also in regard to the real interest rate it proxies. Thus, in line with the general theory of Mises (1912, 1934, 1940), Hayek (1944) and Huerta de Soto (1998), we conclude that a sustainable, market-determined interest rate is always preferable to an interest rate coercively introduced by a central bank. Interferences by central banks distort the free market, leading to *malinvestment*, while destroying the natural definition of the equilibrium (Hayek, 1976).

After the 2008 subprime crisis, several economists such as Borio & Disyatat (2011), Cachanosky (2014), Garrison (2001), Leijonhufvud (2009), Ohanian (2010) and Young (2012) turned to the Wicksel effects, suggesting that, all else being equal, loose monetary policies will have a greater effect on industries which are more capital-intensive and more forward-looking. Moreover, several papers including those of Borio & Disyatat (2011) as well as Schularick & Taylor (2012) detected that credit and asset market booms have been strongly associated with periods of low interest rates. Wainhouse (1984) carried out an empirical study clearly illustrating the impact of credit expansion on the productive structure. Wainhouse (1984) empirically illustrated that within the analysed period of time, modifications in the supply of credit gave rise to changes in the interest rate, also showing that both aspects are inversely related. He used statistical series from January 1959 to June 1981. His data evaluation confirmed that in the initial expansion process the prices of goods closest to final consumption tend to decrease in relation to prices of intermediate goods, while in the final stage of expansion prices of consumer goods increase more rapidly than those of intermediate goods. These results confirm the discussed approach of F.A. Hayek. Mark Skousen (1994) concludes that inventories closest to consumption have the most stable prices and therefore vary the least throughout the business cycle. Skousen distinguishes between finished consumer goods, intermediate products and simple material factors for production. Skousen states that from 1976 to 1992, the prices of products of the early stages of production varied from +30 % to -10%, while intermediate goods only varied from +14% to -1%, and final consumer goods remained relatively stable, only changing by +10% to -2%. Thus, Skousen concludes, prices of inventories become more sensitive the further they are from the final stage of production.

4.2.3.2 Stages of Production and the Difference between GDP and 'Gross Domestic Expenditure' (GDE)

In national income and product accounts, GDP (Gross Domestic Product) is usually recognized as the most relevant indicator for economic development. GDP estimates the total market value of all final goods and services produced within a country during a specific calendar year. As personal consumption expenditures are so significant, many economists conclude that the economy must be evaluated mainly based on consumer spending. However, we argue that the general understanding of 'GDP' over-emphasizes the relevance of consumer spending, rather than focusing on savings, business investment and technologic innovation. GDP simply measures the final output, not allowing a truly balanced evaluation of the production-consumption process. GDP leaves out the gross sales of mentioned intermediate production or goods-in-process, such as the sales and services in earlier stages of production.

Mathematically, GDP is calculated in the following way:

$$\text{GDP} = C + I + G + (X - M)$$

C = personal consumption expenditures

I = Gross private domestic investment

G = Government consumption expenditures & gross investment

Michael Parkin (2005) defined GDP in the following terms: "Real GDP is the value of the total production of all the nation's farms, factories, shops, and offices measured in the prices of a single year." Huerta de Soto (2006) criticized that even though the term 'gross domestic product' contains the word "gross," it does not reflect the true gross income spent during the year throughout the entire productive structure. Huerta de Soto (2006) argues that the GDP ignores the value of circulating capital goods and intermediate non-durable products, as well as of capital

goods which are not fully finished. Thus, Huerta de Soto urges that instead, a “gross” value must consider all capital goods, whether completed or unfinished, fixed, durable or circulating, as well as all consumer goods and services produced during the corresponding financial year.

As a proposal for improvement, and based on the ideas of Hayek, Garrison and Huerta de Soto, Mark Skousen (2010) developed a ‘Gross Domestic Expenditure’ (GDE) concept as a new national aggregate statistic which measures sales at all stages of production. It is used to measure aggregate spending in the economy, measuring different stages, including intermediate production and final use, and is therefore seen as a better indicator for business cycle activities.

Chart N° 33: Skousen’s GDE with Stages of Production

Stage	Area
#1	Resources
#2	Production
#3	Distribution
#4*	Final output (GDP)

(Redesigned by the author, based on Skousen, 2010)

* = stage #4 -> GDP measurement (only as a measure of final output)

Skousen (2010) suggests his GDE model as an additional national aggregate which should not fully replace GDP, but which shall be integrated into standard economic analysis. GDE is seen as the value of all transactions (sales) in the production of all new goods and services, at all stages of production. Double counting should be excluded from the value of final output, but should be included in measuring economic activity within the entire production process.

To calculate GDE, we combine the first three stages into an aggregate number called ‘Intermediate Expenditures’ (IE), or goods-in-process before ultimately considering the final (#4) output stage.

$$\text{GDE} = \text{IE} + \text{GDP}$$

$$\text{GDP} = \text{C} + \text{I} + \text{G} + (\text{X} - \text{M}) \quad \rightarrow \quad \text{GDP} = \text{C} + \text{I} + \text{G} + \text{NX}$$

$$\text{GDE} = \text{IE} + (\text{C} + \text{I} + \text{G} + \text{NX}) \quad \rightarrow \quad \text{GDE} = \text{C} + (\text{I} + \text{IE}) + \text{G} + \text{NX}$$

Consumption is a significant aspect of all major economies, but it is not the only relevant indicator for an economy's status and development. Moreover, GDE appears to be significantly more sensitive to business cycles than GDP, as the early stages of production are proving to be clearly more cyclical. Barnett & Block (2016) criticise Skousen's model for double-counting the produced goods throughout the stages. We partially understand Barnett's & Block's concern but support Skousen's approach to use GDE as an additional aggregate. As stated, we do not suggest to fully replace GDP analyses by GDE, but mainstream econometrics must no longer ignore the different stages of production and consider GDE as a helpful counterbalance to the Keynesian focus on aggregate demand based on consumption. Not only final goods and consumption but also the quantity and value of intermediate goods should be included in national income statistics, which would also help to better detect the causes and timing of business cycles.

4.2.3.3 Roundaboutness & the EVA framework

We also want to refer to the correlation of interest rates and the time of production for capital-intensive industries.

Caballero (2010, p. 85) points out his doubts regarding the 'core of macroeconomics', namely the dynamic stochastic general equilibrium framework (DSGE), arguing that the idea must be "*to place at the center of the analysis the fact that the complexity of macroeconomic interactions limits the knowledge one can ever attain*". Hume and Sentence (2009, p. 1438) state that "*the*

orthodox model" (i.e. DSGE) cannot provide a proper mechanism to appreciate credit as being a driver of business cycle fluctuations.

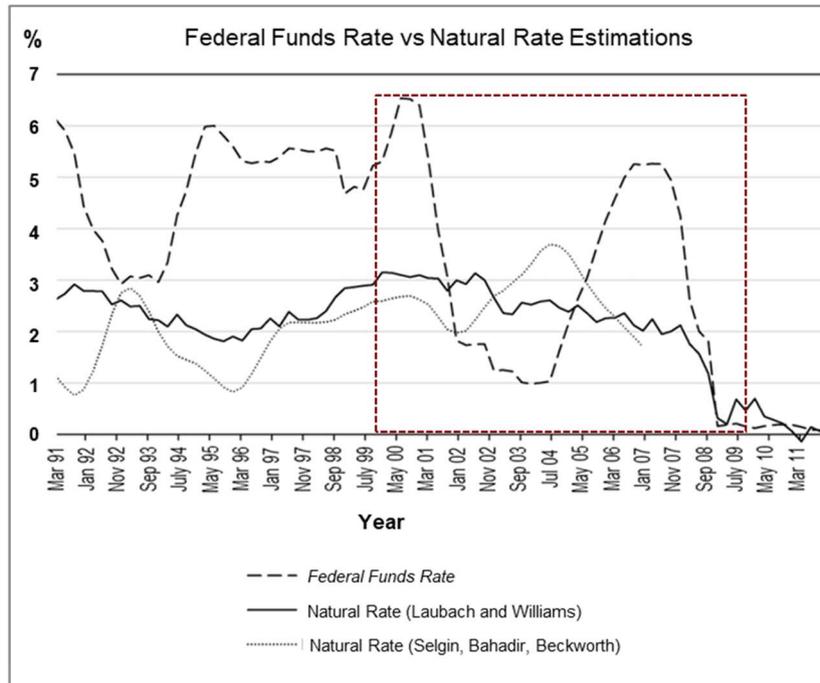
Even Leijonhufvud (2009) insists that the future needs to be used to define "*a dynamic conception of monetary theory*" which focuses on issues of process and systemic stability. Leijonhufvud states that "*the Fed was lured into keeping interest rates far too low for far too long, leading to an inflation of asset prices and a general deterioration of credit quality.*" W.R. White (2012) agrees that ultra-loose monetary policies can have negative consequences, causing "*malinvestments in the real economy...threatening the functioning of the financial markets and redistributing income and wealth in a regressive fashion*". The recipient of the Nobel Memorial Prize in Economic Sciences Vernon L. Smith argued in regard to the latest financial crisis "*the Federal Reserve decided to pursue an exceptionally expansionary monetary policy ... Such financing unintentionally encouraged momentum buying. But the liquidity that sustained subprime and ARM lending was about to evaporate*" (Gjerstad and Smith, 2009, p.278).

As the traditional macroeconomic model-setting which is exclusively composed of aggregates has not been able to fully explain the 2008 crisis, several relevant economists such as Borio & Disyata (2011), Calvo (2013), Hume & Sentance (2009), as well as Leijonhufvud (2009) have turned to the ideas of Mises, Hayek, Huerta de Soto and Garrison to explain it more properly. However, the challenges to provide empirical evidences based on the so-called Austrian Business Cycle Theory (ABCT) are well-known, as macroeconomic data often ignores the different stages of production. Consequently, it has been challenging to provide 'accepted' empiric evidence to illustrate that during specific periods of ultra-loose monetary policy, marginal investment occurred in projects which would have had a too long investment period to be sustainable at a 'natural rate of interest'". From Skousen (2010) we already learned that during the period 1976-1992, the prices of products from the stages furthest from consumption varied from +30% to -10%, the prices of intermediate goods only differed between +14% and -1%, and the prices of final consumer goods varied from +10 to -2%, proving that in the analysed periods the more capital-intensive industries expanded and contracted the most.

We now want to estimate the impact of interest rate movements on projects which are more or less 'roundabout'. With 'roundabout' we here mean that they are capital-intensive with a long investment period. More precisely the term "duration" captures the two central concepts of 'roundaboutness' which are the average period of production and interest rate sensitivity. Thus, the EVA (economic value added) framework and financial concepts like duration to business cycles were used by Nicolás Cachanosky and Peter Lewin (2016) to show that monetary policies change the relative present value of investment projects. Based on the Macaulay duration (D) concept, which is a measure of the average time needed to ultimately earn a dollar from the investment in a particular project, Cachanosky & Lewin (2016) distinguish between high-D (HD) and low-D (LD). It is argued that if different projects have different expected cash-flows, and therefore different values of D, then a lowering of the discount rate will favour projects with a higher D (meaning: more roundabout). In other words, the relative present-values of high-D (HD) investment projects increase relatively more than the present value of low-D (LD) investment projects.

Based on the findings of Skousen (2010) as well as of Cachanosky & Lewin (2016), the gap between the (artificially low) federal funds rate and the (higher) natural rate would tend to be extremely high during the times of unsustainable economic growth, then leading to the subsequent economic bust. The below chart shows the federal funds rate and the natural rate estimations by Laubach and Williams as well as by Selgin, Backworth and Bahadir (2015), assuming that during the 'boom' the federal funds rate was clearly below the natural rate estimation.

Chart N° 34: Federal Funds Rate versus the Natural Rate Estimations



Own elaboration, based on data from: Cachanosky & Lewin (2016)

For their calculation, Cachanosky & Lewin used the following formula:

$$V = \sum_{t=0}^{\infty} \frac{FCF_t}{(1 + WACC)^t} \quad \rightarrow \quad V = K_0 + \sum_{t=1}^{\infty} \frac{(ROIC_t - WACC) \cdot K_{t-1}}{(1 + WACC)^t} = K_0 + \sum_{t=1}^{\infty} \frac{EVA_t}{(1 + WACC)^t}$$

The first formula represents the free-cash-flow (**FCF**) calculation in discrete time.

V represents the market value of the expected cash-flow, **t** shows the time period, and **WACC** states the weighted average opportunity cost of capital.

For simplicity it was assumed that **WACC** is the same for each period of the evaluated projects.

In the second formula shown, **ROIC** represents the rate of return over invested capital while **K** is the financial capital invested by the company.

MVA is the market value added, the expected value added for the investors.

EVA, stands for economic value added, ultimately being another term for economic profit.

$$MVA = \sum_{t=1}^{\infty} \frac{(ROIC_t - WACC) \cdot K_{t-1}}{(1 + WACC)^t} = \sum_{t=1}^{\infty} \frac{EVA_t}{(1 + WACC)^t}$$

The shown EVA framework enables us to track economic profit by period, being a clean estimate of firm performance by not only looking at the present value. Cachanosky & Lewin (2016) ran an ARMAX (1,0) model. As investment is expected to depend on long-term interest rates (LTR), while the Federal Reserve targets a short-term interest rate (STR), both series (STR & LTR) were used.

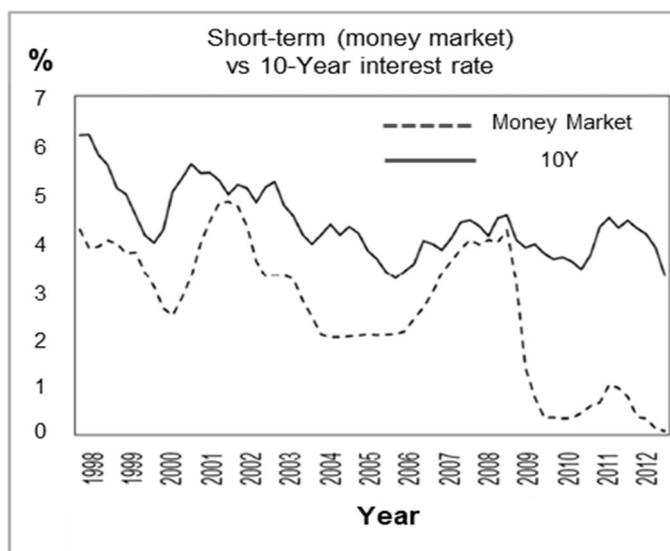
To summarize the key finding of their analysis: Cachanosky & Lewin provide an empirical illustration which supports the theory that capital-intensive projects with a long investment period, increase relatively more if the actual market interest rates is clearly below the natural interest rate. We argue that these historic figures illustrate the appropriateness of the ABCT in regard to the analysed aspects within the specific period of time.

Based on our initial hypotheses, the economic bust of the year 2008 was shaped by those central banks which steered the globally most influential currencies while following a monetary policy which was keen on increasing the money supply and minimizing the market interest rate. We may now also look at specific countries and industry sectors and how they have historically reacted to expansive monetary policies and a change in the market interest rate. More specifically, we intend to see if/ how the industrial quarterly gross value added (GVA) reacts to changes in short-term interest. Ahrend *et al.* (2002) detected that during the financial crisis at the beginning of the 21st century, countries in which the interest rates deviated strongly from the so-called ‘Taylor rule’ experienced the largest housing and credit bubble. According to Taylor’s original version of the rule, the nominal interest rate should respond to divergences of actual inflation rates from target inflation rates and of actual Gross Domestic Product from potential GDP. (Taylor rule: $i_t = r_t^* + \pi_t + 0.5(\pi_t - \pi_t^*) + 0.5(y_t - y_t^*)$). To follow up on Ahrend’s conclusions, Cachanosky (2016) studied the effects of monetary policy in Europe by analysing if the industrial quarterly gross value added (GVA) reacts to changes in short-term interest levels in a total of ten chosen countries: Belgium, Czech Republic, Denmark, France, Germany, Italy, Latvia, Netherlands, Poland and Portugal.

GVA and interest data was taken from Eurostat NACE Rev. 2. The observed period starts in 1999 and ends in 2008.

Figure 1 illustrates the 'short-term' (money market) and long term-interest rates in those 6 of the analysed markets which belong to the Euro zone. It confirms that from 2001-2005, long-term (10 years) interest rates had a relevant downward trend. Figure 2 shows the interest rate evolution for Czech Republic, Latvia and Poland, showing that short-term interest rates fell toward the interest rate level of the Euro area, while from 2001-2005 interest rates also dropped substantially.

Charts N° 35: Short-Term Interest Rate vs 10-Year Interest Rate



Own elaboration, based on data from: IMF International Financial Statistics (2012)

Cachanosky (2016b) evaluated if industrial GVA is linked with changes in short-term interest rates. The VAR (vector auto-regression) model is used, while the differences of the log of GVA of the four top industries in each country are used as the endogenous variables. The exogenous variables are short term interest rates, the difference in the exchange rate, difference of exports over imports, difference of the log of US GDP, difference of a composite of commodity prices and

quarterly dummies. The result of Cachanosky's analysis was that while in France, Germany and Denmark the change of GVA was rather small, in emerging markets such as Latvia and Poland seen changes were more significant.

4.2.3.4 The Impact of Interest Rates on the Production Structure - based on Keeler

Interest rate behaviour has been analysed in several previous academic papers, by focusing on nominal, ex-post real or ex-ante real measurements, or as a spread between interest rates on securities of different maturities. Lionel Robbins (1934), Burns & Mitchell (1946) and Mishkin (1981) already examined short-term and long-term rates in different periods within the first half of the twentieth century. Wainhouse (1984) identified nine hypotheses, six of which were tested by using monthly data from January 1959 to June 1981, while granger causality tests defined a sequence of events from monetary shocks to changes in interest rates and output levels. The Granger causality test was used as a statistical hypothesis test to determine if one time series is useful in forecasting another. Null hypotheses, that monetary shocks do not affect interest rates, and that interest rates do not affect output, were rejected in all cases, ultimately providing substantial support of the later 'capital-based macroeconomics' concept of Garrison.

Similar to the previous studies by Wainhouse, also Bernanke (1990) surveyed several interest rate models, suggesting that changes in short-term rates and the interest rate spread are strongly influenced by monetary policy and default risk conditions. Bernanke analyzed the eight complete post WW II U.S. business cycles, quarterly from 1950 to 1991, using the National Bureau of Economic Research business cycle reference dates. This study was further enhanced by James P. Keeler (2001). The overall measure of the business cycle activity, namely the ratio of real GDP to 'natural real GDP', is herein denoted 'INCOME'. The monetary shock was measured by the

compound growth rate of the money supply over three periods (referred to as MONEY). The interest rate behavior was measured by the slope of the yield curve (referred to as YIELD). Resource allocation is based on the ratio of the plant capacity utilization rate in highly capital-intensive industries versus the ratio in less capital-intensive industries (referred to as CAPACITY). Bernanke's econometric model showed that the interest rate spread and the slope of the yield curve are strongly correlated with monetary policy measures.

Levels of short-term interest rates are more significantly correlated with the money supply than long-term interest rates (0.29-0.33 versus only 0.06-0.20). In the shown data set, the slope of the yield curve indicates the highest correlation with the money growth at 0.55. Bernanke's analysis shows that short-term rates are volatile and directly influenced by the credit market conditions, while there is no consistent evidence that long-term rates notably respond to monetary shocks (Bernanke, 1990).

Keeler (2001) examined the patterns of interrelation reflecting on cyclical behavior with cross-correlations, which will be shown in detail in the following chapter. He detected that percentage changes in the real money supply are positively and strongly correlated with changes in the slope of the yield curve for the current as well as the following two periods. For this, Moody's AAA-rated corporate bond and 4-6 months Commercial Paper interest rates were used. The cross correlations do not constantly show crucial reversals of correlation in the cycle. However, a steeper yield curve can be clearly correlated with a higher capacity utilization in primary production processes. Moreover, a steeper yield curve confirms a strong correlation throughout the cycle with growth of income relative to the natural real GDP.

Changes in MONEY therefore have immediate effect on YIELD, and changes in YIELD affect CAPACITY and INCOME with a certain delay.

4.2.3.5 Empirical Illustrations of Cross Correlations

We further want to look at finalized empiric studies which can help us to properly illustrate the ABCT based on concrete historic events. As stated, the following chart is based on Keeler's (2001) analysis on the correlations between money supply, interest rates and the stages of productions. Keeler (2001) showed that percentage changes in the real money supply are correlated with changes in the slope of the yield curve for the current as well as the following two periods. As stated, the steeper yield curve can be clearly correlated with a higher capacity utilization in primary production processes.

Table N° 9: Correlations between Money Supply, Interest Rates & Stages of Productions

Lead	MONEY & YIELD	YIELD & CAPACITY	YIELD & INCOME	CAPACITY & INCOME
0	0.4125	-0.1209	-0.4004	0.3475
1	0.2867	0.0270	-0.2048	0.3537
2	0.2011	0.1421	-0.0180	0.2714
3	0.1210	0.2237	0.1443	0.1789
4	0.0404	0.2838	0.2784	0.1049
5	-0.0269	0.3236	0.3603	0.0383
6	-0.0604	0.3228	0.4159	-0.0378
7	-0.0470	0.2905	0.4485	-0.1156
8	-0.0114	0.2425	0.4361	-0.2122
9	0.0251	0.2167	0.3967	-0.3249
10	0.0406	0.2039	0.3534	-0.4481
11	0.0664	0.1698	0.2944	-0.5429
12	0.0783	0.1203	0.2092	-0.5606
13	0.1009	0.0814	0.1181	-0.5385
14	0.1257	0.0578	0.0330	-0.4896
15	0.1433	0.0313	-0.0311	-0.3999
16	0.1292	0.0176	-0.0835	-0.2638

(Redesigned by the author, based on Keeler, 2001)

The indicated findings are in line with the ABCT. The chart illustrates that changes in MONEY have immediate effect on YIELD, and changes in YIELD affect CAPACITY and INCOME with a certain delay. The cross-correlation between INCOME and CAPACITY supports the idea that resource reallocation is unable to sustain income growth. The expansion phase generates the forces which ultimately lead to recession. Keeler illustrates that for the evaluated period relative price changes as shown in the interest rates structure, initiate a consequent effect regarding resource utilization and income. Moreover, Keeler suggests via an Error Correlation Model that short-term interest rates have a strong adjustment process towards long-term interest rates.

4.2.3.6 Relationship of Real Consumable Output and Interest Rate Term Spread by Mulligan

Robert Mulligan (2006) used monthly data for the period from January 1959 to March 2003, reported by the U.S. Department of Commerce Bureau of Economic Analysis, to examine the relationship between real consumable output and the interest rate term spread. The used term spread was the ten-year constant maturity Treasury bond rate minus the three-month Treasury bill secondary market rate, from the Federal Reserve of St. Louis. Mulligan (2006) concluded that *“Whenever interest rates rise, higher rates of return in production are necessary to compete with financial instruments, such as relatively higher-yielding government bonds. This is manifested in a shifting of resources away from early stages of production to later stages, and can be shown as a shortening of the base of the Hayekian triangle.”* Mulligan also performed the unit-root and co-integration tests,

Considering the stationarity of money growth, Mulligan applied the Error Correction Model, a multiple regression analysis which attempts to predict the effect of X (independent var.) on Y (dependent var.) controlling for lagged X (i.e., X_{t-1}) and lagged Y (i.e., Y_{t-1}). The error correction model consists of two parts, a structural equation which defines the long-term equilibrium process, and a short-term disequilibrium adjustment process. The model may therefore look as follows: $Y_t = \alpha + \beta_0 Y_{t-1} + \beta_1 X_t + \beta_2 X_{t-1} + \epsilon_t$. The constant α expresses the contemporaneous effect of X on Y whereas the long-term effect of X on Y at $t+1$ can be obtained by X value minus lagged X value.

4.2.3.7 Stages of Process Data, Monetary Shocks & Industrial Production Expansion

In 2013, Robert B. Lester and J.S. Wolff attempted to show the empirical evidence of the so-called Austrian business cycle theory. Lester & Wolff believe that the available stage-of-process data can properly capture Hayek's notion of a structure of production. Lester & Wolff (2013) attempted to consider the empirical relevance of Hayek's (1941) and Garrison's (2001) concepts of capital-based macroeconomics, by measuring industrial production in early, middle, and late stages of production with indexes of industrial production for crude, primary, and finished goods. They used a structural vector auto regression to estimate changes in the structure of production immediately following a monetary shock (Cohen *et al.*, 2015). However, they used the Federal Funds Rate as an indicator of monetary policy which is inappropriate as it fails to distinguish between 'a low interest rate' from a market interest rate which is low relative to the 'natural rate'. It is therefore considered necessary to use an estimate of the natural rate, to improve the analysis. Further, we conclude that the over-all measures of production and prices used by Lester & Wolff are inappropriate for assessing the empirical evidence of the theory developed by Hayek and Garrison. Cohen & Luther (2015) defined an optimized and much more precise structural vector autoregression to evaluate the effects of a monetary shock on each stage of the production process. As Boettke (2013) already stated statistics are not collected 'as brute facts', statistics are often defined with the attempt to justify a previously developed thought, and consequently data is often 'informed and formed by theory'. Lester & Wolff used data published in the Federal Reserve's monthly index of Industrial Production and Capacity Utilization. Following a significant revision in 2002, the analysed industrial production was grouped into four aggregate categories, which are crude, primary, semifinished and finished. However, the stage of process data does not measure production at given temporal distance from consumption. Even if crude production logically occurs before the later stages, the measure is not able to maintain correspondance with temporal distance over time.

Thus, the terms "crude", "primary", "semifinished", and "finished" refer to categories without any reference to the time the underlying production process will actually take. Production in these industries counts towards the stage of process total, without reference to the temporal distance

of particular production processes. Without a measure of the ‘roundaboutness’ or output at a given temporal distance from consumption, it is impossible to define if the time discount effect caused by an unexpected monetary expansion successfully encourages entrepreneurs to dedicate resources to the earlier stages of long-term production processes. Cohen & Luther (2015) use stage of process data which classifies goods according to their position in an input-output table, to then measure industrial production (IP) and price level (LP). A structural vector autoregression is used to estimate the impulse response functions of crude (IP^C), primary (IP^P), semifinished (IP^S), and finished (IP^F) industrial production, as well as crude (PL^C), primary (PL^I), and finished (PL^F) producer price levels from a monetary policy (θ) shock. Two measures for θ are used, the federal funds rate and the productivity gap.

Chart N° 36: Order of the Eight Variable System

$$\begin{aligned}
 IP_t^C &= \sum_{j=1}^{\rho} \beta_1^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_1^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_1^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_1^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_1^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_1^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_1^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_1^{\theta} \theta_{t-j} + \varepsilon_t^{IP^C} \\
 IP_t^P &= \sum_{j=1}^{\rho} \beta_2^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_2^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_2^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_2^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_2^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_2^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_2^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_2^{\theta} \theta_{t-j} + \varepsilon_t^{IP^P} \\
 IP_t^S &= \sum_{j=1}^{\rho} \beta_3^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_3^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_3^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_3^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_3^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_3^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_3^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_3^{\theta} \theta_{t-j} + \varepsilon_t^{IP^S} \\
 IP_t^F &= \sum_{j=1}^{\rho} \beta_4^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_4^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_4^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_4^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_4^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_4^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_4^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_4^{\theta} \theta_{t-j} + \varepsilon_t^{IP^F} \\
 PL_t^C &= \sum_{j=1}^{\rho} \beta_5^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_5^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_5^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_5^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_5^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_5^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_5^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_5^{\theta} \theta_{t-j} + \varepsilon_t^{PL^C} \\
 PL_t^I &= \sum_{j=1}^{\rho} \beta_6^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_6^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_6^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_6^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_6^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_6^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_6^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_6^{\theta} \theta_{t-j} + \varepsilon_t^{PL^I} \\
 PL_t^F &= \sum_{j=1}^{\rho} \beta_7^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_7^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_7^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_7^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_7^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_7^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_7^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_7^{\theta} \theta_{t-j} + \varepsilon_t^{PL^F} \\
 \theta_t &= \sum_{j=1}^{\rho} \beta_8^{IP^C} IP_{t-j}^C + \sum_{j=1}^{\rho} \beta_8^{IP^P} IP_{t-j}^P + \sum_{j=1}^{\rho} \beta_8^{IP^S} IP_{t-j}^S + \sum_{j=1}^{\rho} \beta_8^{IP^F} IP_{t-j}^F + \sum_{j=1}^{\rho} \beta_8^{PL^C} PL_{t-j}^C + \sum_{j=1}^{\rho} \beta_8^{PL^I} PL_{t-j}^I + \sum_{j=1}^{\rho} \beta_8^{PL^F} PL_{t-j}^F + \sum_{j=1}^{\rho} \beta_8^{\theta} \theta_{t-j} + \varepsilon_t^{\theta}
 \end{aligned}$$

(Redesigned by the author, based on Keeler, 2001)

$\rho = 12$ lags, β_i^k describes the partial effect of the variable k on each i , where $i = 1, \dots, 8$

and $K = IP^C, IP^P, IP^S, IP^F, PL^C, PL^I, PL^F, \theta$; $X_t = (IP^C, IP^P, IP^S, IP^F, PL^C, PL^I, PL^F, \theta)$

and

$$\varepsilon_t = \left[\varepsilon_t^{\text{IPC}}, \varepsilon_t^{\text{IPP}}, \varepsilon_t^{\text{IPS}}, \varepsilon_t^{\text{IPF}}, \varepsilon_t^{\text{PLC}}, \varepsilon_t^{\text{PLI}}, \varepsilon_t^{\text{PLF}}, \varepsilon_t^{\theta} \right]$$

$$\text{Which can be defined as: } A_0 X_t = \sum_{k=1}^p A_k X_{t-k} + \varepsilon_t \rightarrow X_t = \sum_{k=1}^p A_0^{-1} A_k X_{t-k} + A_0^{-1} \varepsilon_t$$

The result, evaluating data from January 1972 to January 2012, is a structural interpretation of discussed monetary shocks on industrial production and price levels. In the shown calculation, A_0^{-1} is the impact matrix.

$$A_0^{-1} = \begin{matrix} & \mathbf{a}_{1,1} & \mathbf{a}_{1,2} & \mathbf{a}_{1,3} & \mathbf{a}_{1,4} & \mathbf{a}_{1,5} & \mathbf{a}_{1,6} & \mathbf{a}_{1,7} & \mathbf{a}_{1,8} \\ & \mathbf{a}_{2,1} & \mathbf{a}_{2,2} & \mathbf{a}_{2,3} & \mathbf{a}_{2,4} & \mathbf{a}_{2,5} & \mathbf{a}_{2,6} & \mathbf{a}_{2,7} & \mathbf{a}_{2,8} \\ & \mathbf{a}_{3,1} & \mathbf{a}_{3,2} & \mathbf{a}_{3,3} & \mathbf{a}_{3,4} & \mathbf{a}_{3,5} & \mathbf{a}_{3,6} & \mathbf{a}_{3,7} & \mathbf{a}_{3,8} \\ \mathbf{a}_{4,1} & \mathbf{a}_{4,2} & \mathbf{a}_{4,3} & \mathbf{a}_{4,4} & \mathbf{a}_{4,5} & \mathbf{a}_{4,6} & \mathbf{a}_{4,7} & \mathbf{a}_{4,8} \\ & \mathbf{a}_{5,1} & \mathbf{a}_{5,2} & \mathbf{a}_{5,3} & \mathbf{a}_{5,4} & \mathbf{a}_{5,5} & \mathbf{a}_{5,6} & \mathbf{a}_{5,7} & \mathbf{a}_{5,8} \\ & \mathbf{a}_{6,1} & \mathbf{a}_{6,2} & \mathbf{a}_{6,3} & \mathbf{a}_{6,4} & \mathbf{a}_{6,5} & \mathbf{a}_{6,6} & \mathbf{a}_{6,7} & \mathbf{a}_{6,8} \\ & \mathbf{a}_{7,1} & \mathbf{a}_{7,2} & \mathbf{a}_{7,3} & \mathbf{a}_{7,4} & \mathbf{a}_{7,5} & \mathbf{a}_{7,6} & \mathbf{a}_{7,7} & \mathbf{a}_{7,8} \\ & \mathbf{a}_{8,1} & \mathbf{a}_{8,2} & \mathbf{a}_{8,3} & \mathbf{a}_{8,4} & \mathbf{a}_{8,5} & \mathbf{a}_{8,6} & \mathbf{a}_{8,7} & \mathbf{a}_{8,8} \end{matrix}$$

Coefficients $a_{g,8} = 0$ for $g = 1, \dots, 7$

Based on the econometric model by Luther & Cohen, cumulative impulse response functions for crude, primary, semi-finished, and finished industrial production as well as crude, intermediate and finished price levels in response to innovations in the federal funds rate and productivity gap are presented. The results clearly illustrate that positive monetary shocks have been followed by industrial production expansion. However, the available stage of process data does not measure production and prices at given temporal distance from consumption, for which the available data fails in measuring production at the corresponding temporal distance, making it difficult to thoroughly 'prove' the general appropriateness of Hayek's concept for the entire period from January 1972 to January 2012.

Our approach is not an attempt to prove the general inerrability of one business cycle theory. As stated before, we argue that even if an individual business cycle theory properly explains historic

events, future crisis might evolve differently as markets are dynamic and no economic crisis has ever been fully identical to its predecessors. As societies and markets are dynamic and individual economies differ, also business cycle theory may apply in some crises but not in others. Moreover, the individual phases of a crisis can potentially be best-explained by critically considering different business cycle theories, as they focus on different mechanisms, and while the Austrian business cycle theory for example strongly looks at what caused a crisis, several monetarists rather emphasize on what happens after the visible start of a crisis. However, we strongly disagree with the neoclassical school (Keynes, 1936) which sees capital as a homogenous fund. Instead, based on the findings of Mises (1912, 1940), Hayek (1941, 1944), Huerta de Soto (1998), Keeler (2001), Garrison (2001), Skousen (2010), Bagus *et. al.* (2012) and Cachanosky (2014), we consider the ABCT as much more detailed and realistic than the corresponding concepts of Keynes (1923, 1936, 2012) and Friedman (1962, 1969), agreeing that capital goods must be seen as highly heterogeneous. Capital is by its nature heterogeneous, which is already reflected in the completely different physical units to measure it: while steel is measured in metric tons, electricity is measured in kilowatt-hours and gasoline in liters.

4.2.4 The Reasons of the 2007-2009 Financial Crisis & the Role of the Government

At the beginning of our research, we mentioned two key hypotheses which should be evaluated. On the one hand, we argued that monetary policies, such as an increase in money supply and unsustainable credit expansions, lead to a distortion of the natural market process. Moreover, we stated the hypothesis that expansionary monetary policies in combination with an increase of credit supply (which is not backed by previous savings), led to the unnatural growth of the automotive market in the period from 2001 to 2007. Thus, we want to further elaborate on these hypotheses. Within the period from 1998 to 1999, and after the bankruptcy of the hedge fund management firm 'Long-Term Capital Management L.P.' (LTCM), the Federal Reserve System

started to aggressively expand the monetary supply. Moreover, in the recession of 2001, after the information technology bubble (the 'dot-com bubble') and after the '9/11' attacks in the USA, the Federal Reserve strongly expanded its M2 money supply while simultaneously cutting the federal-funds rate, which started in 2001 at 6.25% and ended in the same year at only 1.75% (BBC, 2011). After 12 successive cuts within less than 2 years, the rate stood at only 1.25% by December 2002. This significant decrease was not caused by an increase in the saving rate, as mentioned personal savings rate was at 6.3% in January 2001 and actually decreased to 4.4% by August 2002. Consequently, this shift implies that businessmen had been misled by the monetary policies of that time, which set the stage for *malinvestment*. From 2003 to 2005, the rate was at a historic low of 1%, resulting in a negative real interest rate, as the nominal interest rate was lower than the inflation.

The lower rates in the interbank market were translated by maturity arbitrage into lower long-term rates for all sorts of credits. Between the years 2000 and 2006, the commercial bank Citibank increased its total assets from \$0.9 trillion to \$1.9 trillion, mainly financed by short-term liabilities, whereas long-term debts increased by only \$0.2 trillion. The Bank of America increased total assets by \$0.8 trillion (out of which \$0.3 trillion in loans) whereas long-term debts increased by only \$0.07 trillion. Looking at the main investment banks like Goldman Sachs and Merrill Lynch, they significantly increased their total assets showing high increases of investments into long-term financial assets, but only little increases of long-term debts. Consequently, there was a significant process of maturity mismatching (Forbes, 2015). Two business areas which were most significantly impacted by this unsustainable growth were the housing and the automotive industry. The housing boom began with an increasingly aggressive housing policy which raised the supply of mortgage loans. The Federal Reserve further increased the supply of loanable funds to avoid reduced lending in other markets as well as to stimulate a recovery from the previous 'dot-com bust'.

As illustrated by the capital-based macroeconomics theory, it is precisely these capital goods industries that suffer the most from the long-term effects of ultra-loose monetary policies and

artificially low rates of interest (Huerta de Soto, 1998; Garrison, 2001). Consequently, apart from the banks, it was the housing sector, followed by most of the automotive sector that suffered most throughout the crisis, in some cases filing for bankruptcy and/or requesting public bailout programs from governments to avoid a financial collapse.

In 2006, real estate prices began to level off and as a result, the boom period started to come to an end, as within one year the economic growth rate fell from 2.7% to 1.8%. Consequently, in 2007 the *malinvestment* became obvious, leading to falling real estate prices (and the financial products which derived their value from housing also lost value), combined with a fall in asset prices (Huerta de Soto, 2009b; Bagus *et al.*, 2012; Alonso Neira *et al.*, 2013).

Therefore, the national default rates increased while the construction industry reduced employment which marked the end of artificial booms and *malinvestment* in the housing sector.

Accordingly, we need to elaborate more on the role of national governments before and during the discussed financial crash. The German-born American physician Max Gerson (1881-1959) once stated that a “*successful (medical) treatment requires harmony of the physical and psychological functions to achieve a restoration of the body in its entirety*” (Gerson, 1950, p.2). From this perspective, we argue that any form of public interventionism into the free market must also be seen as an act which does not restore harmony, but which leads to distortions and deformations of economies and consequently of societies.

The crucial role which both government and central banks can play in the creation of an artificial economic boom and the consequently following bust can be perfectly observed in the subprime and mortgage crisis in the USA (Huerta de Soto, 2009b). Real estate construction, being an ‘early stage’ in Hayek’s concept of the stages of production, was particularly affected - also due to the fact that the Federal National Mortgage Association (commonly known as Fannie Mae) and the Federal Home Loan Mortgage Corporation (known as Freddie Mac), while being publicly traded companies, had been tasked to increase home ownership in the USA – in particular with the political goal to increase ownership rates for the poorer part of society. In his 2008 article ‘Housing

Finance and the 2008 Financial Crisis', Lawrence White stated that "the hyper-expansion of Fannie Mae & Freddie Mac was made possible by their implicit backing from the U.S. treasury.... Institutional investors were willing to lend to the government-sponsored mortgage companies cheaply—at rates only slightly above those on the Treasury's risk-free securities and well below those paid by other financial intermediaries - despite the risk of default that would normally attach to private firms holding such highly leveraged and poorly diversified portfolios." Thus, to finance this boom, Fannie Mae & Freddie Mac had to borrow huge amounts from the financial markets – which occurred at extremely low interest rates as both government-sponsored companies were 'covered' by implicit government guarantees. In 2008, the US Congress even pressured Fannie Mae & Freddie Mac to increase the purchase of mortgages (Bagus *et al.*, 2012; Alonso Neira *et al.*, 2013).

Banks were basically incentivized to give loans to people with poor credit history, precisely because one could already expect that ultimately Fannie and Freddie could buy up the mortgages. Consequently, there was an incentive for banks to provide an artificially high amount of loans.

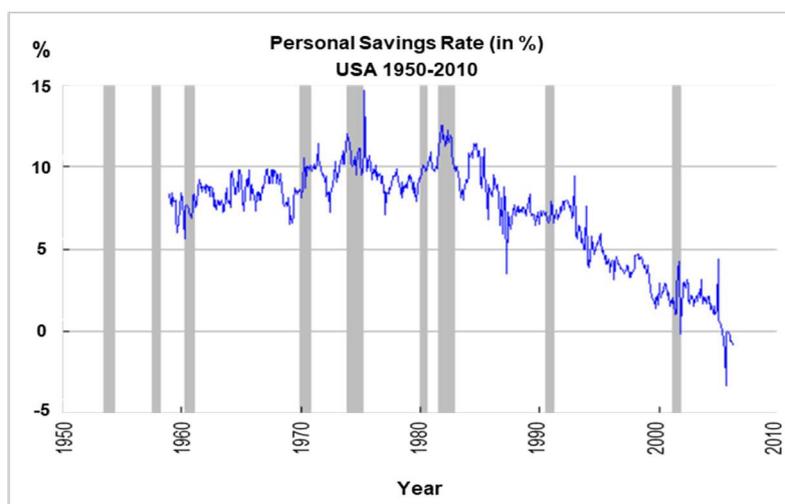
Alonso Neira *et al.* (2013) studied the US business cycles between 1988 and 2010. All used data series came from the FRED of Bank of St Louis, except the data set related to construction which was retrieved from the Board of Governors of the Federal Reserve System. The variables, except the interest rates, were measured in deviations from their trend (using the Hodrick-Prescott filter) to ensure stationarity. The interest rate gap is the difference between short- (3-months) and long-term (10-years) maturities and the difference was calculated as $DIF_t = \ln[(1+i_{10a})^t / (1+i_{3m})^t]$. It was expected that the variations in the slope of the yield curve (represented by DIF_t) would show an effect on the production structure. The analyses by Alonso Neira *et al.* (2011; 2013) confirm the positive correlations that "monetary expansion generates a liquidity effect until the 4th or 5th quarter. Starting from quarters 8-9, the coefficient becomes negative, and remains so until quarter 20". This result illustrates the concept that the slope of the yield curve tends to reverse (elevating at the beginning and then flattening at the end), as resource constraints (related to the boom) begin to emerge. However, it is also possible that the intervention of the Fed through monetary

contraction accentuated this reversal. Seven ratios were used: $\Delta K1t$ (capital goods to consumer goods), $\Delta K2t$ (durable consumption goods to consumption goods), $\Delta K3t$ (construction to consumption goods), $\Delta K4t$ (durable materials to consumption goods), $\Delta K5t$ (durable materials to non-durable materials), $\Delta K6t$ (durable manufacturing to non-durable manufacturing), and $\Delta K7t$ (durable consumer goods to non-durable consumer goods). His results depict the effect of lagged interest rate gap on the structure of the sectors of production, as the ratios show an increasing trend during the boom when resources are (mis)allocated toward more capital-intensive industries.

There are several other empiric studies which can be used to illustrate our theoretical approach. As previously stated, in the neoclassical theoretical approach, the lowering of the rate of interest by central banks is done to ‘stimulate’ investments in order to ‘boost’ the economy. However, from an Austrian School perspective, these policies must ultimately lead to a misallocation of resources, while these *malinvestments* are likely to lead to an unsustainable economic boom which must end with a corresponding ‘bust’.

As previously stated, the Federal Reserve reduced the market rate from 6.5% in November of 2000 to only 1% in July of 2003, where it remained stable until June of 2004, coinciding with the final phase of the US-American housing bubble. Thus, within this period, economic agents were discouraged from saving money while being encouraged to borrow more, either for consumption or investments/ speculation (Shostak, 2003). As stated above, the ABC theory is not based on inductive research, and does not pretend to prove its general validity based on empiric quantitative evidence (Mises, 1957). However, the following charts, based on empirical data, shall help us to better illustrate our approach and to prove that the essential findings of the ABC theory can also be found in the economic boom and bust cycle within the first decade of the twenty first century.

Chart N° 37: Personal Savings Rate (in %):

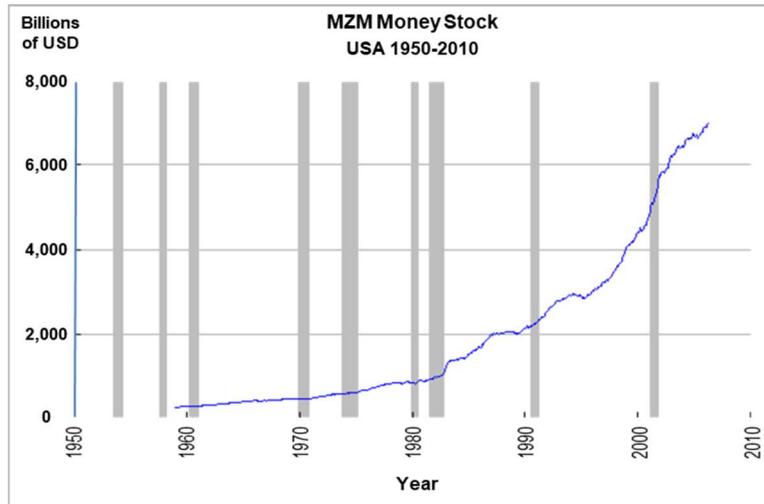


(Author's design. Source: U.S. Department of Commerce - Bureau of Economic Analysis, 2006)

Thus, when looking at our concrete example, whereas borrowing increased, the average savings rate continuously decreased since the 1980's. This was possible by borrowing money from overseas in the form of the trade deficit, but primarily due to the expansive monetary policies by the Federal Reserve (Mayer, 2003). Thus, expansive monetary policies and a market rate of interest below the natural rate of interest created a significant gap between borrowing and saving.

As shown in the graph below, the U.S. money supply has significantly grown between 1959 and 2006. The chart shows a measurement of the money supply based on the 'money of zero maturity' (MSM), which includes currency, demand deposits, traveler checks, deposits in money market mutual funds as well as saving deposits. During the period from January 1959 to August 1971 money supply grew by an average annual rate of 5.26%, while between August of 1971 and 1984 money supply already increased by 8.25% annually, and from 1984 to 2000 money supply even grew by an average annual rate of 10%.

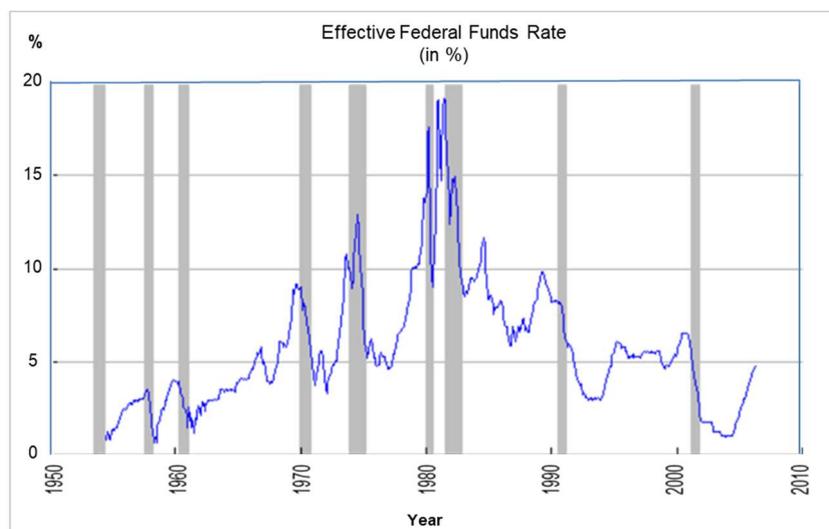
Chart N° 38: MZM Money Stock (in billions of US-Dollars):



(Author's design. Source: Federal Reserve Bank of St. Louis, 2006)

The graph below shows the historic evolution of the Federal Funds rate, based on which banks were able to borrow from other banks with the aim to meet the reserve requirements imposed by the Fed. The Fed injected reserves into the market by purchasing government bonds from banks, freeing up reserves in the banking system (Mayer, 2003). Consequently, by having access to bank reserves from the central banks at low rates, also the banking sector itself was able to offer its customers lower rates on loans (Shostak, 2003). Thus, when interest rates fall, asset prices and real estate prices tend to rise (Huerta de Soto, 2009b; Alonso Neira *et al.*, 2013). The areas shaded within the graph represent periods of economic recessions in the USA.

Chart N° 39: Effective Federal Funds Rate (in %)



(Author's design. Source: Federal Reserve Bank of St. Louis, 2006)

When looking at the financial crisis at the beginning of the 21st century, the number of new homes built, the increased prices of new and existing homes, as well as the total amount of real estate investment are all strong indicators that the Federal Reserve's expansive monetary policy, combined with public interventionism by the government and favorable tax policies for real estate owners, created the seen real estate bubble in the USA (Shostak, 2004). As of 2008 and onwards, the misdirected resources were partially redirected, leading to often painful adjustments, such as a rise in unemployment, foreclosure, and the bankruptcy of private households and enterprises. Thus, what might have appeared to be a useful attempt by the US government to 'help' improve home ownership for US-Americans turned out to be a tremendous government failure causing significant economic harm to many home owners, particularly to those who bought their property at the peak of the real estate bubble (Salerno, 2015). Meanwhile, similar trends also occurred in several other countries around the world, where local central banks engaged as well in expansionary monetary policies, directly or indirectly incentivizing investments into the housing sector.

Michael Biggs (2016) analysed the correlation between credit impulses and GDP growth. He analysed the European market and the USA from 1970 to 2015. The data was issued by GAM London Ltd and then authorised and regulated by the Financial Conduct Authority. Based on the following concept, credit and spending growths were evaluated.

If $I = \Delta D$, then $\Delta I = \Delta \Delta D$

Credit impulse_t = $(C_t - C_{t-1})/GDP_t - (C_{t-1} - C_{t-2})/GDP_{t-1}$; where C_t is stock of credit at the end of year t

Biggs analysed the economic evolution in the USA at the beginning of the 21st century, up to the year 2015. Biggs historic illustration indicates a strong correlation between the credit impulse and the GDP evolution in the USA. Strong credit impulses (reducing the interest rate versus the corresponding previous year, were generally followed by a growth in the private demand. On the other hand, when credit impulses decreased, for example between the years 2006 to 2008, the real private demand was also significantly reduced (Biggs, 2016). This historic illustration is fully in line with the Austrian business cycle theory.

In our elaboration of our theoretical approach, we already referred to the economic harm caused by interventions of governments and central banks. As Huerta de Soto (2009b) stated regarding the inefficient and ultimately harmful monetary and fiscal policies implemented after the recent subprime crisis, *“instead of a crisis that looks like a ‘V’, deep but fast (which is what a truly free market would have produced), monetary and government interventions unnecessarily produced a recession much longer and ultimately more painful”*. Thus, a crucial aspect after analysing the reasons for the recent crash must also be to evaluate how a sustainable readjustment phase would need to look like.

The decrease of the money supply (deflationary credit contraction) is a key form of recovery, as the consequently falling prices encourage greater savings in the economy and businesses may recover quickly during a recession, as “the” natural rate of interest is lower.

In order to better adapt the rate in financial markets to the natural rate of interest, the Federal Reserve would simply need to cease all open market operations, freezing reserve requirements at current levels, refraining from any further interference. This could lead to a short and sharp recession with a liquidation of unsound firms and investments, but the process of re-adjustment will soon return the economy to a sustainable structure.

4.2.5 The Austrian Business Cycle Theory and Limitations of Empiricism

Are there discrepancies between the concepts of Praxeology and the ABCT?

In line with both, praxeology (Mises, 1940, 1957), as well as with Hayek’s definition of the spontaneous order, the concept of dynamic efficiency (Huerta de Soto, 2009a) rejects the idea that historic data can assure a proper forecasting of future market changes. As indicated by Mises (1940, 1957), individual humans evaluate things differently and constantly learn, changing priorities while making experiences and gaining new knowledge. Consequently, all human actions are unique, which ultimately explains why also entire markets constantly change. This concept of dynamic efficiency (Huerta de Soto, 2009a) and the criticism of the neo-classical concept of ‘perfect competition’ (Kirzner, 1973) must be seen as key elements of the Austrian School of economics.

However, in regard to the explanation of the Austrian Business Cycle Theory, even several economists of the Austrian School of economics often refer to ‘specific ‘stages within the boom-and-bust cycle’ which can already be foreseen in advance. Thus, as we have explained in previous sections of this thesis, by already anticipating the exact sequence of events during the

next “boom-and-bust cycle”, generalizations are often used on how ‘the investor’ or ‘the consumer’ are supposed to react at the individual points in time during the cycle. In these explanations of the cycle, it is often argued that the market participants would not realize certain market distortions, for which they are led to take unsustainable irrational decisions. It is also argued that investors would often not understand the corresponding ‘warning signals’ quickly enough for which public interventionism would lead them to *malinvestments* (Garrison, 2001). Some descriptions of the general ABCT are giving such precise forecasts on what different market participants are expected to do in which sequence, that it seems hard to combine the idea of foreseeing market processes throughout the business cycles simultaneously with the concepts of praxeology and dynamic efficiency. Therefore, we want to analyse whether there is a contradiction between mentioned individual concepts related to Austrian school of economics, such as the concepts of praxeology (Mises, 1949; Rothbard, 2011) and dynamic efficiency (Huerta de Soto, 2009a) on the one hand and the defined staged of the boom-and-bust cycle (caused by artificial money supply expansion) on the other hand.

In line with Mises (1957), we argue that certain ‘*a priori*’ truths can clearly be defined without the need to evaluate empiric data. These ‘*a priori*’ laws of human action² include findings such ‘*every human action is aimed at an improvement over what would have otherwise occurred*’, or ‘*people prefer a larger quantity of a good over a smaller quantity*’, or ‘*if the price of a good is lowered, then either the same quantity or a higher quantity of the good will be bought*’, or ‘*market prices fixed below market clearing prices lead to shortages*’, and ‘*if the amount of money is increased, without increasing the quantity of real goods, social wealth will not increase while prices will rise*’: Consequently, the simple fact that artificial credit expansion is unsustainable, for which it will ultimately lead towards a financial crisis (Huerta de Soto, 1998), can also be seen as an *a priori* truth. The individual steps demonstrated in the boom-and-bust cycle explained by the Austrian Business Cycle Theory have proven to be true, not only during the US-American financial crisis between 2007-2009, but also during the simultaneous so-called ‘real estate bubble’ in Spain

(Huerta de Soto, 2009b, Alonso Neira *et al.*, 2012). However, people constantly learn, gaining new knowledge by making experiences (Mises, 1940; Huerta de Soto, 2009a). Thus, it is unlikely that a potential future crisis will happen in the exact same way it did throughout the past decade. Hayek (1967) criticized constructivist rationalism, as social sciences can only predict the very general patterns of social events, due to the high complexity of individual human behavior. According to Hayek, in regard to future social events and social structures as a whole, only pattern predictions are possible. However, Hayek, while debunking the utility of statistics and econometrics in the forecast of macroeconomic outcomes, argued that such general pattern predictions are certainly useful and scientific. The relevance and impacts of dynamic efficiency, as well as the importance of knowledge for all market participants and the consequences of entrepreneurial creativity must not be ignored nor underestimated. The findings made by investors, consumers and depositors during the mentioned financial crisis will shape their future actions and consequently their behavior during upcoming business cycles. It can therefore be concluded that every historic event, including financial crisis caused by monetary policies, are unique and will never be repeated in an exactly identical way. This however does not change the fact that the general findings of the Austrian Business Cycle theory are in line with the '*a priori*' laws of human action (Mises, 1940) as described before. We argue that economic busts, such as the financial crisis of 2008-2009, can be seen as an example of the validity of praxeology and Hayek's prediction pattern. Despite the inability to predict the concrete time and quantitative effects of such economic collapses both praxeology (Mises, 1957) and Hayek's (1967) prediction patterns allow us to explain general macroeconomic patterns which include general patterns of boom-and-bust cycles.

4.2.6 Evolution of the Market's Rate of Interest and Automotive Sales in the USA

According to the findings of Mises (1912, 1934), Hayek (1932, 1939, 1941), Huerta de Soto (1998) and Garrison (2001), artificial economic booms such as the US-American real estate bubble

between 2001 and 2007, would not be feasible without expansive monetary policies within a fiat currency, fractional reserve banking system. Monetary inflation tends to cause bubbles and booms in those areas of the economy in which it was first introduced. Throughout the seen real estate bubble, the prices of existing homes kept rising, while the bubble also led to a significant increase in the construction of new homes. Thus, wages of construction workers rose and correspondingly labor reallocated into the construction sector and related industries. Accordingly, also the price of construction materials and land increased throughout the boom. The resources which had been allocated to housing were not available in other sectors of the economy. Frank Shostak (2003) defined economic bubbles as any activity that “springs up” from loose monetary policies and the corresponding misallocation of resources leads to an increase of non-productive activities relative to the increase of productive activities. One year later, Shostak warned even more clearly that there was *“a strong likelihood that the U.S. housing market bubble has already reached dangerous dimensions”* (Shostak, 2004, p.2). In 2004, also Christopher Meyer had already argued that *“the strong housing market has all the makings of being the next bubble... Low interest rates have propelled refinancing, freeing up \$100 billion last year alone, according to the Wall Street Journal. Not surprisingly, the low interest rates have increased buying power and supported housing prices.”* (Meyer, 2003, p.1)

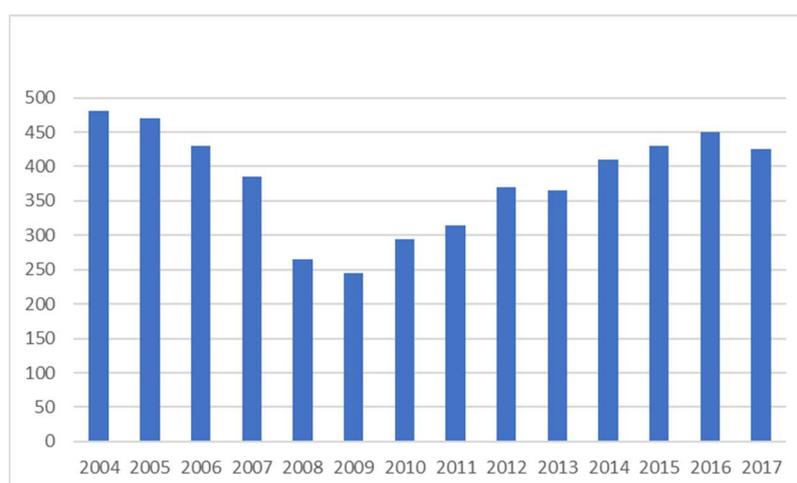
Ultimately, it is this mismatching of resources across industries and sectors which will distort the economy, accelerating the corresponding economic bust – as we have seen in the year 2008. When the crisis set in, construction and construction-related industries were those sectors which most suffered.

Until 2004, requested loans for the purchase of vehicles significantly increased due to the significant reduction of the market's rate of interest. Minimized borrowing costs allowed auto dealers to increase auto sales, as buyers were willing to purchase vehicles via financing schemes (McMaken, 2018). Also after the crisis' peak in 2008, the Federal Reserve's quantitative easing program helped to prolong the era of cheap debt, for which automotive sales recovered rather quickly. These monetary policies created a perceived stability for the automotive sector which

would have been highly unlikely in a truly free market economy without quantitative easing and with a market rate of interest based on the natural rate of interest. However, despite the seen interventions, when looking at the evolution of inflation-adjusted, per capita totals for auto loans in the USA, we can see that the average loans have not recovered to the level seen in 2004.

Chart N° 40: Evolution of Average Automotive Loans (in US-Dollars per Capita)

Auto Loans: in US\$ per capita (4th quarter of each year)



Own elaboration, based on data from: McMaken (2018)

Reverse to the increase in the rate of interest, the per capita amounts (in USD) for auto loans significantly decreased from 2004 to 2009. However, the quantitative easing programs implemented throughout the financial crisis helped to 'push' automotive sales and auto loans, however without reaching the former peak of 2004.

One must also consider the number of consumers which were not able to pay their loans throughout the crisis of 2008-2009. In particular those consumers which purchased their vehicles between 2005 to 2007, using financing schemes with running periods of 2-4 years (or more) often

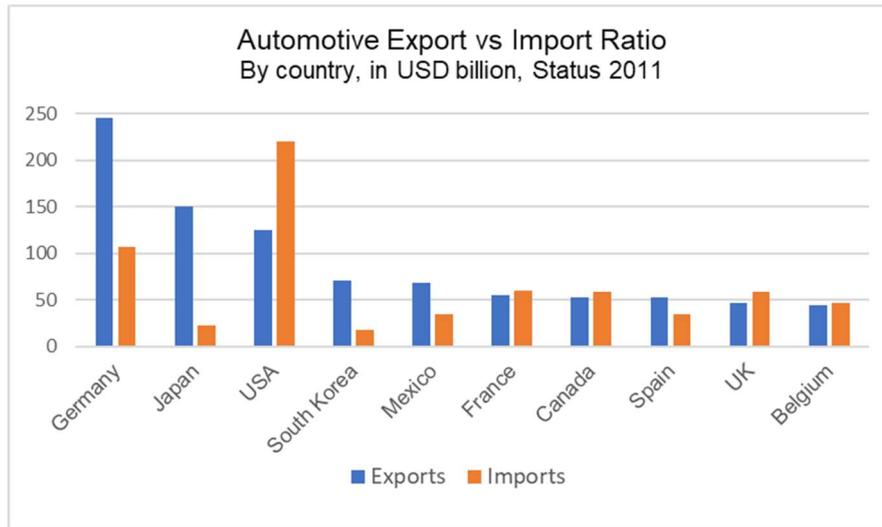
had difficulties in paying their loans when being professionally affected by the economic crisis. Within the period from 2003-2006, the delinquency rate of consumers in the USA who missed their loan payments was rather low, averaging at only 2.3% of all loans provided. However, the delinquency rate reached its peak in 2010 with a level of 5.25 percent. Accordingly, specifically from 2009 to 2011, a significant number of consumers were not able to pay-back their loans, having been affected by the simultaneous economic crisis (McMaken, 2018).

4.2.6.1 Effects of Expansive Monetary Policy on Local Production

In order to better understand the impact of monetary policies on the automotive industry, we evaluated data by the World Economic Forum (2011) on the vehicle sales evolution within three main Automotive markets, namely the USA, Japan and the Euro currency zone countries. In 2011, the global top-10 countries of vehicle exports accounted for 70 percent of the world's total automobile export value. In 2011, Germany was the world's main vehicle exporter, exporting automobiles worth USD 245.4 billion, while only reporting USD 104.1 billion of vehicle imports. Whereas a large portion of vehicles produced in Japanese automotive factories (e.g. from Toyota and Mazda) have been sold abroad, most vehicles produced in the USA remained within the US market. In 2011, the United States imported automobiles for a total value of USD 211.6 billion, whereas exports only reached USD 119.7 billion. Consequently, US automotive factories have been to a large extent depending on their own local US-market, while Japanese factories have been focusing stronger on production for export markets. In 2011, Japanese automobile exports amounted to USD 150 billion, while imports reached USD 17 billion in comparison.

Chart N° 41: Export vs Import Ratio: Automotive Trade by Country

(in USD billion, Status 2011)



Own elaboration, based on data from: World Economic Forum (2011)

In Japan, the central bank's expansive monetary policy optimized the global competitiveness of local automotive OEMs. Most Japanese OEMs, such as Toyota, heavily depend on exportation, producing a significant volume of vehicles in their Japanese factories for export markets. Thus, the corresponding monetary inflation led to an increased competitiveness of Japanese vehicles abroad, as the corresponding exchange rates facilitated the export business. The economist Gunther Schnabl (2016) argues that if the Japanese monetary policy had been significantly more restrictive throughout the past decades, Japanese automotive OEMs, and exporting industries in general, would have become less competitive, as the Yen would have revalued, strengthening the currency's exchange rate. Thus, a "more restrictive" monetary policy could have further transformed Japan from being a relatively export-oriented industrial economy into a country depending even more on its service sector (Schnabl, 2016).

Also in the case of the USA, the expansive monetary policy artificially devaluated the local currency (the US-Dollar), but in this case, monetary inflation rather 'helped' to protect automotive

producers within the US market, since imports of non-US vehicles in general became more expensive. These policies, like any other form of protectionism, gave an artificial competitive advantage to brands producing within the US. However, over the long term, such protectionism is a major threat to any corporate's competitiveness as it will tend to become more reluctant to optimizing its structures which would be necessary to adapt to market changes and new customer demands (Ikenson, 2011; McMaken, 2018; Schnabl *et al.*, 2016). Simultaneously, manufacturers producing abroad were forced to be even more competitive in order to compete on the US market with domestic producers. Moreover, the above-indicated chart clearly illustrates that, despite the expansive monetary policies by the US Fed, imported vehicles have become significantly more popular among US consumers throughout the past decades. By 2011, the volume of vehicles imported into the USA was significantly higher than the volume of vehicles produced in US factories which were then exported to foreign markets.

4.2.6.2 Europe: Impact of Exchange Rates & Monetary Inflation on Competitiveness

The European market must be seen as a quite different case, split between the Euro currency zone and other markets with national currencies. For a proper Structural-Conduct Performance (SCP) analysis, we need to show the impact of the market environment on the market, as well as the impact of the market structure on the individual company performance. The 'Euro-zone' itself is divided between export-oriented markets like Germany, and other countries which are heavily depending on imports, often without relevant local automotive production. German ambassadors of the Euro currency zone argue that vehicles '*made in Germany*' have seen a significant increase in competitiveness since the introduction of the Euro currency which in combination with a generally expansive monetary policy of the ECB have helped to significantly optimize their competitive position. It is argued that the new currency alone already increased the competitiveness of German products within the Euro currency zone. Simultaneously, Schnabl *et*

al. (2016) argue that the ultra-loose monetary policy of the ECB has generally helped to export vehicles produced in the Euro currency zone to markets outside the monetary union due to the caused depreciation of currency. Thus, combining these two factors, in particular industrialized high wage countries like Germany which had had a strong and stable national currency before the introduction of the Euro, would have become more competitive when selling outside the Euro currency zone. However, as similar expansive monetary policies have been shaping the strategies of all major central banks across the globe, a general monetary inflation was seen in all major markets throughout the past decades. Moreover, it must be stated that the economic consequences of the Euro introduction have been extremely different between the individual markets of the Euro currency zone. According to Bagus (2010b), several industrial sectors and export-oriented companies located in countries like Portugal, Greece or Italy suffered from the currency union. Whereas previously, the individual local currencies could be easily devaluated to increase the competitiveness of locally produced goods and services, this former monetary privilege was then given to the ECB (Bagus, 2010b).

4.2.7 Details on the Automotive Industry's Crisis of 2008-2009

In regard to the need for entrepreneurial creativity and the potential harm of public interventionism, we raised two hypotheses in Chapter 1 of this thesis. The first hypothesis was that already before the visible start of the subprime crisis, automotive OEMs like General Motors and Chrysler had been protected by interventionism, such as expansive monetary policies, as well as government protectionism including public incentives. Consequently, we raised the hypothesis that long-term public support via public incentives increased over-production, reducing the OEMs' willingness to become more efficient, lean and competitive. Rothbard (1962, 1970) thoroughly explained that public interventions are not only unethical and immoral but also harmful from an economic perspective. Based on the findings of von Mises (1936, 1940), Rothbard (1970), Huerta de Soto

(2005) and Benegas Lynch (2011), we emphasized on the effects of government intervention analysing the economic consequences of any form of public interference in markets. We shall detect the actual causes of the automotive industry's crisis of 2008-2009 to see whether the survival of companies like General Motors and Chrysler was mostly challenged by endogenous or exogenous factors.

4.2.7.1 Entrepreneurial Creativity & Effects of Public Interventionism

The subprime crisis of 2008 led to a visible crisis in the automotive industry. However, whereas certain OEMs were able to tackle the challenges successfully, others such as General Motors and Chrysler needed financial support by public institutions in order to survive (Berta, 2011; Ikenson, 2011; McMaken, 2018; Salerno, 2015). Therefore, we will analyse the evolution of the automotive market in selected markets, particularly the USA and Spain in order to evaluate the true origins of corresponding struggle of certain automotive OEMs'. When focusing on the US automotive industry, we must pay special attention to the manufacturers General Motors, Chrysler and Ford, which have been known as "the big three" for having been the three leading competitors throughout decades. The USA's recession caused by the financial crisis made auto sales plummet to levels not seen since 1994. Simultaneously, the lack of credit available to potential car buyers hampered car sales even more (McMaken, 2018; Reimers, 2018). Particularly in the case of General Motors and Chrysler, we will demonstrate that the financial difficulties of these OEMs were not only caused by public interventionism and unsustainable expansive monetary policies, but also by internal entrepreneurial errors within the companies.

4.2.7.2 In-house Management Failures or Victims of Monetary Policies?

In Chapter 1, we raised the following hypothesis: Before the visible start of the subprime crisis, automotive OEMs like General Motors and Chrysler would have already been forced to become more competitive, if there had been a truly free automotive market, without expansive monetary policies, protectionism and public incentives.

To get to the correct conclusions, we certainly need to look at the big picture, not only blaming the recent crisis of certain Western automotive OEMs on purely monetary or fiscal aspects. As explained by I. Kirzner (1963, 1973) and Huerta de Soto (2009a), understanding the concept of dynamic efficiency and the importance of entrepreneurial creativity must be crucial for every corporate management to properly steer and position their company. Thus, we need to clarify if the significant financial challenges certain automotive OEMs, particularly General Motors and Chrysler, were facing in 2008-2009 were mainly caused by the coercive and unsustainable interventionism of governments and central banks, or by entrepreneurial mistakes.

The economist and philosopher Rahim Taghizadegan (2016) created the term '*contrepeneur*', explaining that a modern, successful entrepreneur must be more than a manager who constantly "floats with the current", only thinking about how to maximize profits within a short period of time. True entrepreneurship is about constantly gaining knowledge, having a feeling for new trends, new demands and corresponding market niches. At the same time, the modern entrepreneur must take responsibility for himself and others, and invest his own capital in such a way that it can lead to a sustainable success (Peterson, 2017). The '*contrepeneur*', is characterized by the fact that he is willing to float against the current if he believes that other market players, potentially driven by public propaganda or artificial hypes, are not properly serving (future) consumer needs.

4.2.7.3 GM, Chrysler and the Lack of Innovation

Tigre (2006, p.72) states that “*an innovation occurs with the effective practical application of an invention*”. Rogers (2003, p.11), on the other hand defines it as “*an idea, practice or object that is perceived as new by an individual or another adoption unit*”. Thus, Rogers' concept does not properly address the actual implementation of the novelty (Rogers, 2003). In line with Tigre, also Tidd, Bessant and Pavitt's (2005) considered this crucial aspect, for whom innovation is the process of transforming opportunities into new ideas, by putting them into practice.

When planning for the future, automotive OEMs can learn valuable lessons from the mistakes made in the past by several of their major players, in particular before the so-called ‘credit crunch’ in 2008. Already before the start of the economic crisis, most U.S. automakers had suffered from structural and financial problems (Berta, 2011; Ikenson, 2011; McMaken, 2018; Salerno, 2015). In particular the ‘Detroit Three’ had experienced harmful internal management decisions as several market trends were not taken sufficiently seriously, such as the customer's request for fuel efficient vehicles, more safety features and configuration/ personalisation options. Exogenous factors (such as macroeconomic and social shocks) as well as endogenous ones (including a firm's ability/ inability to innovate) can consequently affect a company's emphasis on and success in optimizing and readjusting its corporate strategy and product line-up. Thus, the mentioned automakers' problems had built up over years, clearly before the first effects of the economy's financial crisis were visible. Kirzner (1973), Krause (2012), and Taghizadegan (2016) argue that true entrepreneurship is about obtaining new knowledge, while trying to spot new demands and corresponding market niches.

Kirzner's (1963, 1973) theory of the market and the price system strongly differed from the neo-classical price theory approach, providing a more realistic definition of the term ‘competition’ in a free market process. Kirzner aimed to understand how the decisions of individual economic agents in the market interact in order to generate the market forces which then lead to changes in market prices as well as in the qualitative and quantitative output, but also to changing methods of production and in allocating resources. In line with Kirzner, Krause (2004, 2012) argued that by seeing the market as a process of constant adjustments, the economic agents are forced to

adjust their activities to the demands and patterns imposed by other market participants. Hayek stated that “*our freedom of choice in a competitive society rests on the fact that, if one person refuses to satisfy our wishes we can turn to another*” (Hayek, 1944, p. 96). Thus, competition is a constant process in which alert and creative entrepreneurs intend to detect market niches and other business opportunities to optimize customer satisfaction, market share and profit (Infantino, 1998; Krause, 2012). Within the automotive industry, the former CEO of Fiat Chrysler Automobiles, Sergio Marchionne, can possibly be seen as one of the most creative and successful managers of the recent decades. The history of the former Italian firm ‘Fiat S.p.A.’ (Fabbrica Italiana Automobili Torino), which was then succeeded by Fiat Chrysler Automobiles (FCA) in 2014, is an excellent example of how constant public protectionism can delay and minimize a company’s striving for competitiveness, while the entrepreneurial creativity of a company’s management, namely Sergio Marchionne, can then re-establish its profitability by detecting market niches and customer needs. Marchionne led the ‘turn-around’ of ‘Fiat Group’ to become one of the fastest growing companies in the auto industry. Marchionne was appointed as CEO of former ‘Fiat S.p.A.’ in 2004 at a time when Fiat was highly indebted and uncompetitive (Berta, 2011). In June 2009, when Chrysler emerged from Chapter 11 bankruptcy protection, Fiat Group received a 20% stake in Chrysler Group and Marchionne was also appointed its CEO, replacing (the unsuccessful) former CEO Robert Nardelli (Berta, 2011). Less than two years later, Chrysler returned to profitability repaying its government loans, and in 2014, Fiat and Chrysler merged into ‘Fiat Chrysler Automobiles’, becoming the seventh-largest automobile manufacturer in the world (G.Navaretti, 2014). We also take a look at this example to show the relevance of entrepreneurial creativity, of how certain individuals can realize and discover (in Latin: *inprehendo-endi-ensum*) new opportunities, taking new paths (Kirzner, 1963; Huerta de Soto, 2009a).

Sala i Martin (2003) argued that if a company is not able to produce products which are neither cheaper nor better than those of the competitors, they must at least be different, for being innovative is crucial to be competitive.

Another relevant factor to analyse a company's sustainability is its working capital ratio. The ratio is the relative proportion of an entity's current assets to its current liabilities. The working capital ratio shows the ability of a business to pay for its current liabilities with its current assets. Thus, it measures liquidity, illustrating whether a company is able to pay its obligations. When looking at different automotive OEMs in the period from 2006 to 2008, we can see that the financial situation of 'The Big Three' had already been worrying before the bankruptcy of Lehman Brothers Holdings Inc (Cole *et al.*, 2008; Ramseyer *et al.*, 2011). Working capital management is an essential aspect of short-term finance of a firm. By assuring an efficient working capital management, companies are able to release capital for more strategic objectives, while reducing financial costs and improving profitability. Pure supply chain management usually focuses on the physical flow of goods and services, whereas working capital management is considered to refer to the management of financial flows (Ulbrich, 2008). The recent financial crisis had major effects on the automotive industry but in fact, as stated by Lind *et al.* (2012), the industry had already faced profitability problems before 2008. Due to the cost pressure, most OEMs have launched working capital management task force or sub-departments, since, as the BMW group stated in their 2009 annual report: "...stringent working capital management is a further key parameter for managing the business". Lind *et al.* (2012) analysed the working capital management in the value chain of the automotive industry in the years 2006-2008, based on a research design similar to the one previously applied by Pirttilä *et al.* (2010). Thus, the Cash Conversion Cycle (CCC) and its components were calculated for each year. According to Lind & Pirttilä (2012), the average CCC of the automotive industry was 67 days for the period 2006-2008, while the position of the value chain did not change. On the other hand, the 'days accounts receivable outstanding' (DSO) and 'days accounts payable outstanding' (DPO) changed remarkably, while the change in the days inventory outstanding (DIO) was low. Interestingly, in each stage of the automotive industry, the turnover time of accounts receivable shortened. It is assumed that companies focused more on accounts receivable management, collecting remittance from their customers in time. The amount of working capital tied into the value chain has an impact on the return on investment (ROI) by increasing the invested capital and decreasing the ROI (Lind & Pirttilä, 2012).

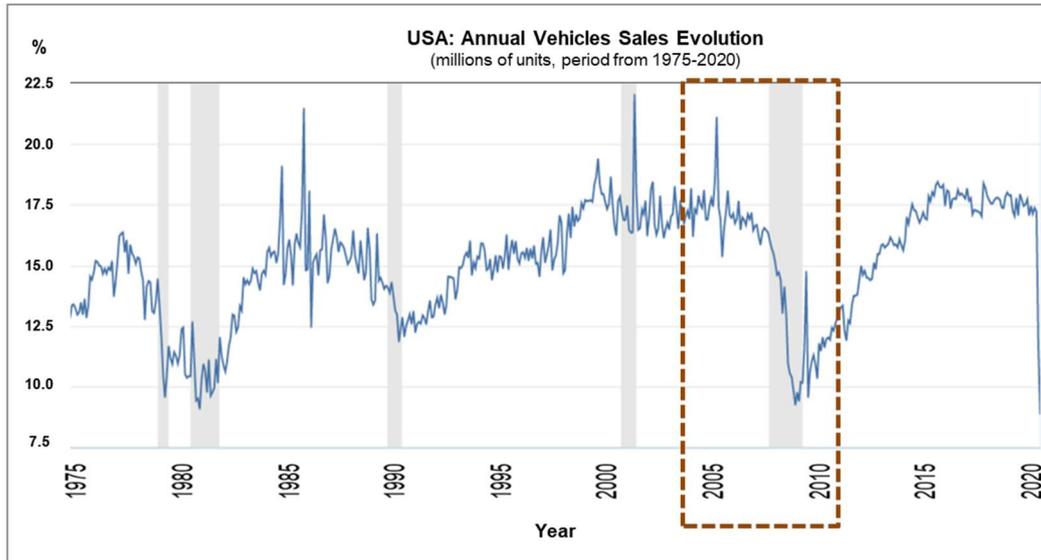
In the current times of crucial technological and structural changes, the auto industry is experiencing increasing, and often completely new, financial risks (Dudenhöffer, 2016). Moreover, regulations, compliance standards and general legislations have been tightened in several aspects. Compliance requirements and advanced risk-management systems, including customer risk assessments and financial planning, are becoming more relevant in OEMs financial departments (Lind & Pirttilä, 2012). First movers have already detected the need to improve strategic management and to monitor their markets on their local political and fiscal changes, economic downturns and changes in customer demand. Also public authorities have been implementing increasingly stringent compliance and risk requirements for the automotive industry. As an example, the new International Financial Reporting Standard, called IFRS9, was implemented in 2018 requiring significant credit-risk modelling capabilities, requiring robust stress-testing and loss-forecasting methodologies.

Moreover, we also need to consider the high labour costs which several OEMs, particularly General Motors, were facing at the beginning of the 21st century. In a research done by Leonhardt (2008) it is estimated that the average labour costs of the Big Three were approximately 30% higher than those of all transplant car factories (domestic US production of foreign owned companies like e.g. Honda). Moreover, the total cost of retiree health care borne by U.S. automakers was dramatic, putting these OEMs in an even less competitive position. In 2007 and 2008, General Motors and Chrysler had made significant losses, with General Motors alone losing almost \$40 billion in 2007 and another \$31 billion in 2008 (Cole *et al.*, 2008; Ramseyer *et al.*, 2011). Thus, it can be stated that the mentioned automakers' problems had built up over years, clearly before the first effects of the economy's financial crisis were visible.

As indicated, already before the start of the economic crisis, the '*Detroit Three*' had suffered from internal structural and financial problems, including harmful internal management decisions as several market trends had not been taken seriously (Ikenson, 2011; Salerno, 2015; Dudenhöffer, 2016).

Chart N° 42: Evolution of Annual Vehicles Sales in the USA

(millions of units)

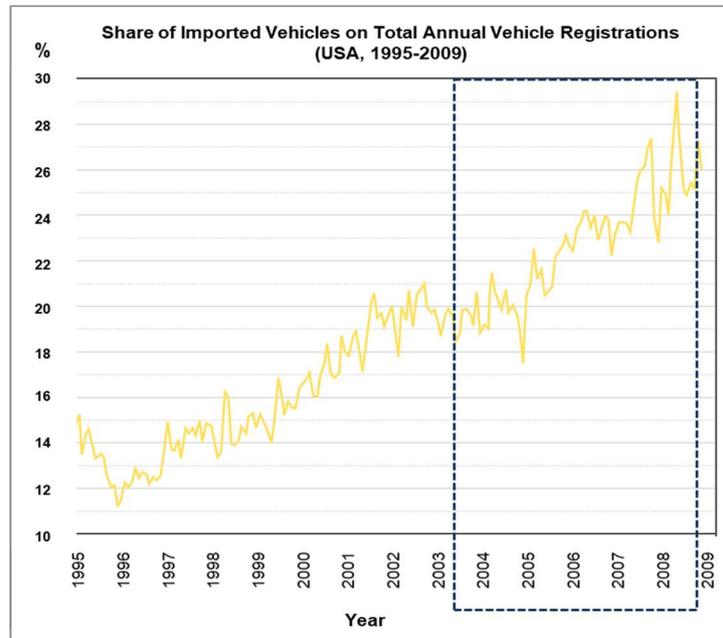


Own elaboration, based on data from: U.S. Bureau of Economic Analyses (2021)

In 1950, the ‘Big Three’ (GM, Ford, Chrysler) produced 8,005,859 automobiles, nearly three quarters of all automobiles in the world by 1950 (total: 10,577,426 units), at a time in which cars grew in overall size and engine size (Statista, 2011). In 1966, the Big Three still had a market share in the USA of 89.6%, but from 1966 to 1969, net imports increased at an average annual rate of 84% with the VW Beetle as the most successful imported model (Federal Reserve Bank, 1970). Whereas the annual production of US manufacturers reached 13-15 million units in the 1970s, it dropped to 5.7 million automobiles in 2009. Already in the 1980s, the United States was overtaken by Japan as the largest automobile producer, and subsequently by China in 2008. In the 1990s, foreign automakers continued to establish production facilities in the USA, with BMW and Daimler-Benz opening SUV factories in South Carolina and Alabama, respectively. In the 2000s, US assembly plants were also opened by Honda, Nissan, Hyundai, Kia and Toyota.

Chart N° 43: Sales Share of Imported Vehicles in the USA

The following chart illustrates percentage share of imported automobiles among the total annual vehicle registrations in the USA in the period from 1995 to 2009.



Own elaboration, based on data from: Bloomberg (2011)

Consequently, the share of imported new passenger cars among all units sold in the US market had significantly grown from approximately 12% in 1996 to more than 25% in 2008. This market shift not only led to a corresponding decrease in the market share of the 'Big Three', but also to an increased price competition and reduced margins (Bloomberg, 2011). In 1950, the Detroit "Big Three" had a combined annual market share of 85% in the US-American passenger car market. Accordingly, General Motors covered 46% of all annual new passenger car registrations, while Ford achieved an annual market share of 29%, and Chrysler of 10% in the USA. In 2001, their total annual market share in the USA had already decreased to 63%, as General Motors covered 28%, Ford 22%, and Chrysler 13% of all annual new passenger car registrations. By 2008, their combined market share had further decreased, to only 48%. Consequently, we must indicate, that

all of the Detroit 'Big Three' had constantly lost market share since the second half of the 20th century (Bloomberg, 2011).

The 2000s decade initiated with a recession in early 2001 and the effects of the often called 'September 11 attacks' in the US, ultimately also having an impact on the decrease in demand for automobiles (McMaken, 2018). The correlated stock-market decline also affected the pension fund levels of automotive OEMs, urging OEMs to significantly contribute to these funds, which led GM to finance these contributions by raising debt (Ikenson, 2011). In the year 2005 (and in line with the theoretical approach of the Austrian Business Cycle Theory), oil prices began to rise and peaked in 2008. Huerta de Soto (1998, 2006) thoroughly explained the negative effects of an economic expansion caused by the allocation of bank loans which had not been backed by a previous increase in voluntary saving. According to Huerta de Soto, the *"first temporary effect of credit expansion is an increase in the relative price of the original means of production"*, such as labor and natural resources (Huerta de Soto, 2006, p. 362). Consequently, the increased demand for original means of production in the stages furthest from consumption and the lack of a corresponding supply increase *"inevitably result in a gradual increase in the market price of the factors of production"* (Huerta de Soto, 2006, p. 363).

This price increase placed another tremendous challenge to US-American automotive OEMs, which heavily depended upon light truck sales for their profits, vehicles with relatively high fuel consumptions. Moreover, the finance subsidiaries of the Big Three became of increasing importance to their overall profitability (and their eventual downfall). Former General Motor's financial division 'GMAC' (now Ally Financial), started to focus on home mortgage loans, particularly subprime loans. With the subsequent collapse of the sub-prime mortgage industry, also General Motors suffered significant losses.

4.2.8 Quantitative Research Results: Economists on Recent Monetary Policies

As indicated, we intend to illustrate the validity of our defined theory with corresponding empiric data. We aim to properly explain in this thesis, that our following propositions can be seen as a *priori* truths:

1. Fiat money, being typically created through bank circulation credit, causes economically detrimental effects on the economy, causing capital consumption and *malinvestment*.
2. A decrease in the market interest rate (below the natural interest rate) caused by expansive monetary policies of central banks stimulates entrepreneurs to misallocate resources, leading to market distortions and an unsustainable boom.

Consequently, we also applied quantitative research tools, such as questionnaires, as an efficient alternative to interviews, to contact a wider sample of people. In regard to the mentioned propositions, we used a questionnaire to evaluate the opinion of different economists in regard to the impact of expansive monetary policies on the economy, and the automotive industry in particular. Thus, based on the concept of purposive sampling, we wanted to gain detailed knowledge from a sample which has proven experience in the analysed research topic. Accordingly, as the raised questions require a thorough knowledge of monetary policies by the interviewee, the sample size was limited to 25 economists, of which all graduated from well-known universities, holding a Master's degree in Economics (M.Sc., MEcon. or MA). Out of the total sample of 25 individuals, 10 participants graduated from Universidad Francisco Marroquin (UFM) in Guatemala, another 10 participants graduated from the private Business School 'Maastricht School of Management' in the Netherlands, while the remaining 5 participants successfully graduated from Universidad Rey Juan Carlos in Madrid. To avoid sampling bias, the sample was selected by including economists which represent a variety of economic schools of thought, including neoclassical economics, Keynesian economics, the Chicago school of economics, new

institutional economics, and the Austrian school of economics. All participants had confirmed a strong interest in monetary and fiscal policy theories.

An interval measurement structure with an itemized rating scale is used, rating the level of agreement or disagreement. Consequently, an interval 5-point Likert scale was applied as a bipolar scaling method. The questionnaire's outcome should also indicate if the participants assume that interventionism by central banks and public governments, applying expansive monetary policies and/ or public incentives, leads to a sustainable market growth or an unsustainable market distortion. We are certainly aware that these are only the subjective assumptions of individuals, for which no general conclusions can be purely drawn from the sample's feedback. However, the result should give us an additional input for our own research, as the sample's conclusions can be seen as further primary source input from economists.

As indicated in the following chart, a vast majority of our sample group agrees with our initial hypothesis on monetary policies, stating that an increase in money supply and unsustainable credit expansions lead to a distortion of the natural market process. Eighteen out of 25 participants agree that quantitative easing leads to an unhealthy distortion of the natural market process. While all 25 participants mainly or strongly agree that expansionary monetary policies are likely to have a positive short-term impact on customer demand, only 7 out of 25 participants expect to see positive long-term effects of such policies. Moreover, 15 participants mainly or strongly agree that expansionary monetary policies were a main cause of the financial crisis in 2008. Fifteen out of 25 participants expect that negative interest rates could significantly increase the demand for vehicles, whereas 20 participants expect negative interest rates to further minimize the savings rate. Particularly, the sample's response in regard to the harmful long-term effects of expansionary monetary policies is in line with our findings. However, only 12 participants of our sample agree that end consumers suffer more from price increases caused by monetary inflation ('Cantillon effect') than public institutions. Based on the findings of Cantillon (Hülsman, 2008), we are surprised that only a relatively small group within our sample realized this direct correlation. Moreover, 14 participants agree that price increases hamper the vehicle purchasing behavior of

private customers more than of major corporates. Overall, we can conclude that the majority of the sample participants confirmed our corresponding hypotheses and our initially raised propositions for praxeologic *a priori* truths.

Table N° 10: Quantitative Research: Questionnaires on Monetary Policies

Definition		TTL Participants					
Introduction Questions		25					
Dimension	Definition	Item Text	Strongly agree	Mainly agree	Neutral	Mainly disagree	Strongly disagree
Quantitative Easing	Central Bank buying short-term government bonds	Quantitative easing leads to an unhealthy distortion of the natural market process?	8	10	2	3	2
	Lowering short-term market interest rates	Quantitative easing leads to a forced short-term economic boom and unnatural growth of the automotive market, but will ultimately result in another economic bust and downturn of automobile sales?	7	6	7	2	3
		An expansionary monetary policy has likely a positive <u>short-term</u> impact on customer demand in the automobile industry?'	22	3			
		An expansionary monetary policy has a positive <u>long-term</u> impact on customer demand in the automobile industry?'	4	3	6	7	5
	Expansionary monetary policy/ supply	An expansionary monetary policy was one of the main causes of the economic crisis in 2008?	8	7	4	3	3
Interest Rates	Stimulating consumption & investments	Negative interest rates would initially significantly increase the market demand for vehicles?	9	6	3	4	3
	Negative impact for savings	Negative interest rates will further decrease saving intentions of the population?	17	3	5	1	
Inflation (caused by QE)	Price Increase	End consumers suffer more from price increases caused by monetary inflation than public institutions?	6	6	5	4	4
		Price increases hamper vehicle purchasing behavior of private/ retail customers more than of major corporates?	7	7	4	5	2

Source: Author's own design (shown results from questionnaires)

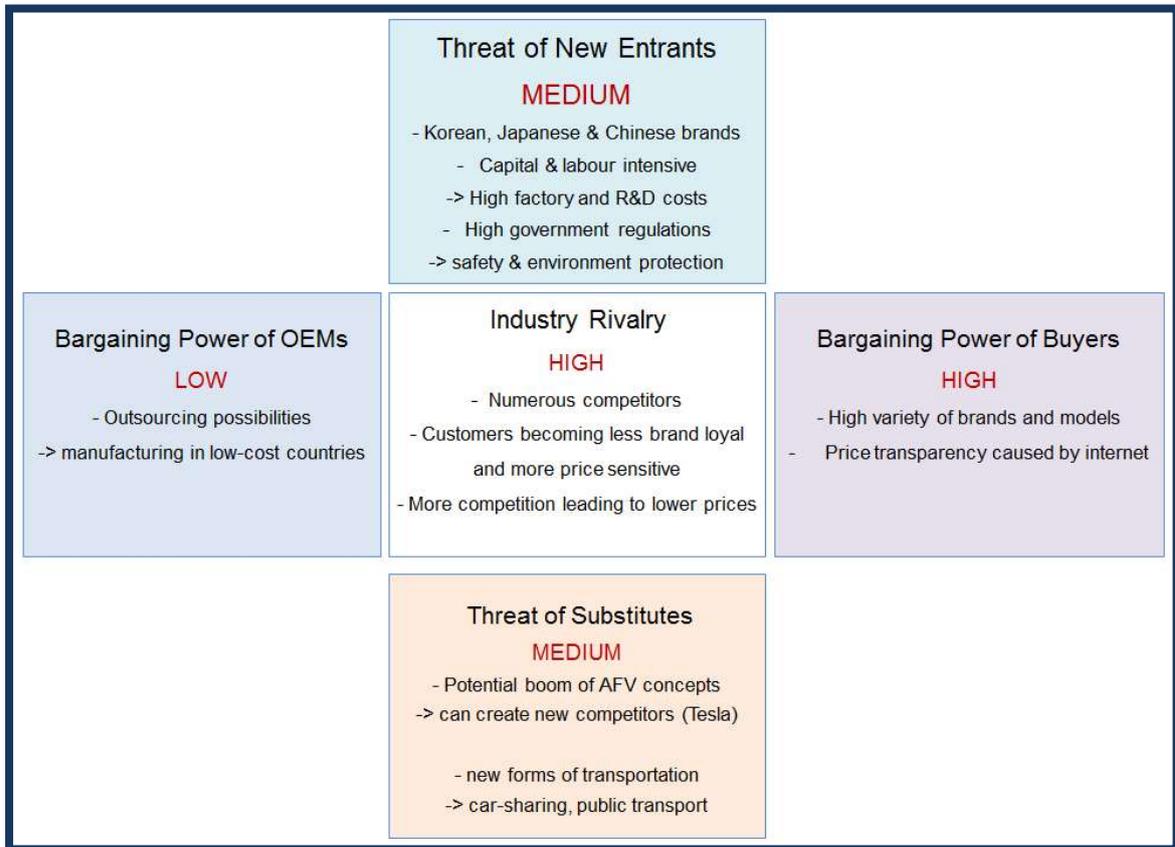
4.2.9 Theoretical Models to Historically Illustrate the State of the Automotive Market before the Subprime Crisis

Several analytical models have been developed to better understand market environments and market evolutions, as well as to define the competitiveness of individual industry sectors and companies. In the following subchapters we will use theoretical concepts such as 'Porter's 5 Forces', the 'PEST-Analysis' and a 'SWOT-Analysis' (Porter, 1998), to illustrate the situation of the automotive industry within the analysed historic context. Thus, these models are used to elaborate on and illustrate further details related to the automotive industry in the time period shortly before the outbreak of the subprime crisis in 2008.

4.2.9.1 Porter's 5 Forces: The US-American Automotive Market in July 2008

As indicated, we do not agree that the financial challenges which several automotive OEMs had to face in the years 2008-2009 were only caused by monetary and fiscal policies. Instead, we argue that the challenges which companies such as Chrysler and General Motors were facing had also been caused by their lack of competitiveness due to their low entrepreneurial creativity and a general mismanagement (Ikenson, 2011; Salerno, 2015). Therefore, we want to use the so-called 'Porter's 5 Forces' concept developed by Michael E. Porter to better understand the competitiveness of the business environment at that time (Porter, 1998). Porter's concept includes three forces from 'horizontal' competition, namely the threat of substitute products or services, the threat of established industry rivals, and the threat of new entrants, as well as two others forces from 'vertical' competition which are the bargaining power of suppliers (OEMs) and the bargaining power of customers (Michaux, 2015). Therefore, we want to show the corresponding perspective on the automotive industry in the USA, right before the outbreak of the financial crisis in 2008.

Chart N° 44: Porter’s 5 Forces Model on the US Automotive Market (Status: 2007)



Source: Author’s own design

We argue that in 2007, the automotive industry in the USA was shaped by high bargaining power of the buyers, due to a wide variety of brands and models and increasing price transparency caused by the internet. The threat of new entrants was medium, as the automotive industry is rather capital intensive, and high government regulations, including its safety and environmental protection policies limit the possibilities for quick market entries of new automotive OEMs (Dudenhöffer, 2016; Ikenson, 2011). However, the industry rivalry was already high due to several aspects such as the wide number of competitors (as, for example, Japanese and Korean brands gained further market share), and a lowering customer loyalty towards brands. Moreover, new forms of transportation, including car-sharing schemes and optimized public transport models

developed (Dudenhöffer, 2016) which could be seen as a 'threat of substitute' to the automotive OEM's vehicles (Michaux, 2015).

4.2.9.2 PEST Analysis

As indicated, it is crucial to better understand the status of the automotive market in the year 2008. Thus, we must also take a look at the global picture, but from the perspective of the US-based OEM General Motors which, while also producing and selling on a global level, has heavily depended on the US-American automotive market. Accordingly, without minimizing the importance of internal factors, within the individual companies (Kirzner, 1973; Ikenson, 2011; Salerno, 2015)., we also need to consider external factors which influenced the situation of the herein mentioned corporates (Dudenhöffer, 2016; Porter, 1998). Thus, on the following page, we briefly take a look at political, economic, social and technological factors which were relevant for western automotive OEMs like GM throughout the illustrated period of time. Accordingly, the shown PESTLE analysis (Porter, 1998) will provide a framework to illustrate those external factors in its historic context.

Table N°11: PEST Analysis of the Automotive Market in 2008

Factors	Aspects
Political	<ul style="list-style-type: none"> - Increasing international trade agreements. - Globalisation and access to developing, politically unstable markets -> led to opportunities and challenges. - High-growth developing countries are improving their infrastructure, including transportation infrastructure - Stricter laws and regulations regarding environmental measures and safety regulations -> New EU vehicle emission standards and regulations, known as Euro Standards - Governmental promotions of public transport and other alternatives in major markets (USA, EU..etc.)
Economic	<ul style="list-style-type: none"> - Constant changes of foreign currency exchange rates -> e.g. Euro vs Dollar, Yen vs Dollar - General global economic growth, e.g. in Brazil and China - Previous strong economic growth of Spain & USA was decreasing - External price elasticity coming from oil dependency-> Increased petrol prices hampered high-segment vehicle sales -> increasing demand for fuel efficient vehicles - Automobile industry with very strong impact on overall economy -> employment, parts/ commodity supplier sector -> currency alternations with significant impact on the competitiveness of goods (e.g. China) - Rising competition: New Asian brands entering the global market (e.g. Hyundai, Cherry)
Social	<ul style="list-style-type: none"> - Changes in cultures and demographics - Changes in the buying pattern: e.g. request for smaller, fuel efficient vehicles - Impact of brand image / model image - Collaborative consumption, e.g. growing demand for car-sharing
Technological	<ul style="list-style-type: none"> - Development of Hybrid and Electric Vehicles (AFVs), e.g. Opel Ampera & Chevrolet Volt. - New eco-friendly and fuel-efficient petrol and diesel engines (lower CO2 and/or NOx emissions) - New safety features (wider range of airbags... etc.) - Technical features: mobile technology, GPS systems, online sales ('online dealers') - More transparency and competition due to the internet

Based on the findings of Cole *et al.* (2008), Ikenson (2011), McMaken (2018), Ramseyer *et al.* (2011), we argue that the crisis of the automotive industry in the period from 2008 to 2010 happened at a time in which the Big Three (particularly General Motors and Chrysler) had already been in weak financial conditions and limited competitiveness versus their foreign challenger brands. Out of the Big Three, Ford was in the less severe situation, as under their CEO Alan Mulally the company had fortuitously raised \$23 billion in cash in 2006 by mortgaging most of their assets. Chrysler's situation was more critical, with weak financial backing, a very limited portfolio of new products in the pipeline, and for being heavily dependent on light truck sales. General Motors was highly leveraged, also heavily dependent on light truck sales, and burdened by high health care insurance and pensions costs for their workers.

However, the economic crisis of 2008, mainly caused by monetary and fiscal policies then led to 'the final bust' within the automotive market. Let us briefly recapture the main findings of the ABCT to ultimately conclude whether our empiric findings can be used to illustrate our theoretical approach. It is important to note that the findings of Mises (1912, 1934, 1940) and Hayek (1931, 1932, 1944) in regard to the ABCT are not only perfectly compatible but a prerequisite for the appropriateness of Kirzner's (1963, 1973) findings on competition and entrepreneurship as well as Huerta de Soto's (2009a) conclusions on dynamic efficiency.

As explained in previous chapters on our general 'theory', we agree with Mises (1940), Hayek (1941), Rothbard (1962) and Huerta de Soto (1998, 2009b), that the lowering of the interest rate initially makes several investment projects appear to be profitable, which previously had not been profitable. The interest rate is temporarily manipulated and artificially lowered by banks through a process of credit expansion. This gives rise to new stages further from consumption, i.e., stages which are more capital-intensive (Garrison, 2001). Entrepreneurs are tempted to launch new investment projects, consequently widening and lengthening the capital goods stages in the productive structure, but also leading to a process of maladjustment and inefficient discoordination between the different economic agents (Huerta de Soto, 1998; Mayer, 2018). The following crisis is driven by excessive investment ('overinvestment') in those stages furthest from

consumption, such as capital good industries and other stages with a widened capital goods structure. The economic downturn will naturally set-in, due to different economic effects which themselves are caused by the artificial bank credit expansion. We briefly want to restate those effects which set-in after the economic boom has reached its peak, consequently paving the way for the ultimate 'bust' (Garrison, 2001; Huerta de Soto, 1998). One relevant temporary effect caused by credit expansion (not backed by a prior rise in voluntary saving, but created *ex nihilo*) is an increase in the relative price of the original means of production (for both, labour and natural resources). Another, even more crucial temporary effect consists of an escalation in interest rates in the credit market. Sooner or later companies operating in the stages relatively more distant from consumption will start to face financial difficulties. The entrepreneurial errors committed become obvious, while entrepreneurs start to realize the urgent need for a massive readjustment in the productive structure (Huerta de Soto, 1998). Meanwhile, the shortage of real savings leads to factory closures, the paralyzing of several investment projects and an increase of unemployment. Furthermore, pessimism is likely to spread throughout society, stopping consumers from consuming and entrepreneurs from investing (Garrison, 2001). Moreover, the interest rate, or rate of accounting profit approached at each stage, will rise, potentially even to a level which even exceeds that of the rate of interest in the credit market prior to the credit expansion. This higher rate can be seen as a premium to compensate different factors such as the drop in the purchasing power of money, the increasing competition among entrepreneurs to obtain new loans, as well as the increase in the components of risk and entrepreneurial uncertainty. Increasing economic instability, a reduction of investments, combined with the rise of company bankruptcies (also by companies operating in the financial sector) will likely lead to a 'credit crunch'.

On 5 November 2008, the US-American (and Detroit-based) consulting company Center for Automotive Research (CAR) released a study, warning that as many as three million jobs were in danger in the US-American automotive sector, unless the US government would not implement fiscal policies to significantly support the so-called 'Big Three' automakers (Chrysler, General

Motors and Ford) throughout the economic crises (McAlinden *et al.*, 2008). Mentioned CAR report stated that, if only one of the three OEMs would have been liquidated, numerous companies in the automotive supply chain would also have gone bankrupt within months. Initially all U.S. automotive operations would be affected, also hampering automotive suppliers and foreign OEMs producing in the USA. However, CAR also considered a scenario in which all three US automakers would have ceased operations in the USA by the end of 2009. In this case, nearly 3.0 million employments would have been at stake in the USA, of which 239,341 jobs directly at the 'Detroit Three' (McAlinden *et al.*, 2008). The report described a scenario in which the entire US American automotive production could have been in danger, but giving no consideration to the likely scenario that mentioned OEMs would have been able to seek 'Chapter 11 protection' to reorganize.

4.2.9.3 General Motors in July 2008: SWOT Analysis

In the previously shown PESTLE analysis, we referred to the environment in which General Motors was operating during the analysed period of time. To evaluate the strategic and competitive positioning of General Motors, we will also refer to the so-called SWOT analysis, which in specific cases can be seen as a useful strategic planning technique, facilitating the identification of strengths, weaknesses, opportunities, and threats of individual business entities, such as GM (Porter, 1998). Thus, the following brief SWOT analysis of General Motors, shall give us an overview of GM's competitiveness shortly before the bankruptcy of 'Lehman Brothers Holdings Inc' in 2008.

Table N°12: SWOT Analysis of General Motors in 2008

Strengths	Weaknesses
<ul style="list-style-type: none"> - Wide brand portfolio - Growing business in the regions 'Asia Pacific' as well as 'Latin America' - Large scale operation: large scale facilities for the manufacture or assembly in all continents - Strong position in North America- investing in multiple technologies of vehicle electrification - GM's business is diversified across products and geographic markets 	<ul style="list-style-type: none"> - Decreasing market share in Europe & USA - Decline in revenues on the US market - Declining financial performance/ financial position - Product quality issues/ product recalls - Underfunded pension obligations with negative impact on liquidity
Opportunities	Threats
<ul style="list-style-type: none"> - Launch of Opel Ampera & Chevrolet Volt: -> to benefit from the growing demand for Hybrid Electric / Alternate Fuel Vehicles - Increasing demand for cars in BRIC countries - Emerging insurance markets 	<ul style="list-style-type: none"> - Declining demand for light vehicles in USA (demand for light vehicles in the US had slowed down by 3.4% in 2007) - Weak outlook for the US auto industry - Residual value risk - Rising raw material prices - Changes of foreign currency exchange rates- Intense competition hampering market share & margins - Stringent government laws and regulations -> stringent emission standards by the EU (EURO4)

Own elaboration, based on data from: Datamonitor (2008), Dataforce (2008)

4.3 Theoretical Approach to Public Interventionism

“Timid men... prefer the calm of despotism to the tempestuous sea of liberty.”

Thomas Jefferson (1797, letter to P. Mazzei)

So far, our analysis has focused on the impact of monetary policies on economic processes, and the automotive industry in particular. In this context, our attention was mainly drawn on the harmful market distortions caused by central banks, such as the ECB and U.S. Federal Reserve. However, apart from monetary policies, we now also want to elaborate on the relevance of fiscal policies and other forms of public interventions. Thus, in the Chapters ‘4.3.’ through ‘4.6.’ we will analyse the effectiveness of public interventionism, elaborating more specifically on the impact of fiscal policies (including scrappage campaigns and other public incentives) on the automotive industry.

In this Chapter (‘4.3.’), we will indicate our theoretical approach towards the influence of public interventionism, showing the economic benefits of a free market system versus an interventionist politico-economic system (Boettke, 2001; Ghate, 2015; Hayek, 1944; Weede, 1990). Elinor Ostrom (1990, p. 24) said: *“the power of a theory is exactly proportional to the diversity of situations it can explain.”* Our theoretical approach mainly considers the concepts of dynamic efficiency (Huerta de Soto, 2009a), and entrepreneurial creativity (Kirzner, 1973) as well as the importance of free prices within a free market (Hayek, 1939; Mises, 1940; Huerta de Soto, 2005; Rothbard, 1970).

In Chapter ‘4.4’ and ‘4.6’ we will illustrate our theoretical approach with empiric figures, which show the impact of different fiscal measures on passenger car sales in two specific phases of the 21st century. In both cases, our theoretical approach will be mainly based on concepts developed by the Austrian School of economics. In Chapter ‘4.4’ we will analyse fiscal policies related to the automotive industry in the period from 2008 to 2010, mainly referring to implemented vehicle

scrappage campaigns and government bailouts. Afterwards, in Chapter '4.6', we will then illustrate our theoretical concept on the negative impact of any form of market distortion by public entities with empiric data on the sales evolution of 'alternative fuel vehicles' (AFVs) in the period from 2010 to 2018.

Thus, most of the literature and data used to evaluate and illustrate the impact of public interventionism is gained through the following four categories with the corresponding mentioned sub-categories:

1.) Public Interventionism

- a.) The impact of Public interventionism, particularly regarding the distortion of market prices

2.) Fiscal Policies

- a.) We will particularly refer to Economic theory on fiscal policies of Keynesian and Austrian School economists on the one hand, and academic articles related to fiscal policies used to 'stabilize' the automotive sector on the other hand.

3.) Customer Behaviour:

- a.) General customer behaviour, customer demand and behavioural economics
- b.) Recent academic papers on customer behaviour & adaptation related to AFVs

4.) Alternative Fuel Vehicle Sales in Europe's Automotive Market:

- a.) Market data on sales volumes by automotive business intelligence providers
- b.) Recent academic papers on public incentives related to alternative fuel vehicles

Accordingly, in Chapter '4.4.', we will illustrate our theoretical approach on public interventionism and fiscal policies with empiric data on the automotive industry for the period from 2008 to 2010, whereas in Chapter '4.6.' we will specifically refer to empiric data on the sales evolution of AFVs in Europe from 2010 to 2018.

4.3.1 Theoretical Concept on the Impact of Public Interventionism

In the following sections of this chapter, we will indicate our theoretical approach, showing the economic benefits of a free market system versus an interventionist politico-economic system. Ayn Rand stated that *“every government interference in the economy consists of giving an unearned benefit, extorted by force, to some men at the expense of others”* (Rand, 1966, p. 205). Our general ethical theory is based on the benefits of human cooperation in a free society, in which individuals define, negotiate and achieve desired ends through interaction in the market process (Mises, 1940). We embrace objectivity through radical subjectivism, as each individual's evaluation of his own ends is the only relevant valuation (Hayek, 1944). Accordingly, we support the concept of praxeology (Mises, 1957), while defending the benefits of a spontaneous order (Hayek, 1939, 1944), including the division of labor and an unrestricted price system in a free market. Our ethical concept is also based on the non-aggression principle as elaborated by Rand (1964), while also considering the related contributions of Rothbard (1973, 1982) in regard to the importance of private property and freedom of contract as a part of self-ownership. This theorem is based on the idea that no one may threaten or commit violence against a nonaggressor or his property, as violence can only be used purely defensively. Accordingly, the only purpose for which power can be rightfully exercised over a member of a community (or the citizen of a state) against his will, is to prevent harm to others. Ayn Rand stated that: *“The precondition of a civilized society is the barring of physical force from social relationships—thus establishing the principle that if men wish to deal with one another, they may do so only by means of reason: by discussion, persuasion and voluntary, uncoerced agreement.”* (Rand, 1964, p. 108). Thus, our ethical stance is based on Rand's minarchist interpretation of the non-aggression theorem, while also incorporating findings of Mises (1912, 1940, 1957) and Hayek (1939, 1944) in regard to the moral and economic superiority of free markets and the spontaneous order versus any form of public interventionism and central planning. There are already several profound academic elaborations on the impossibility of socialism as well as on the inefficiency of central planning and public interventionism. Huerta de Soto (2005, 2009a) indicated that the information people work with in

the market place is not objective, but subjective and tacit. Moreover, Huerta de Soto stated that central authorities cannot acquire the information needed to give their commands a proper coordinating quality, while in fact, human beings are endowed with an innate creative capacity, constantly discover 'new' things, ends, and means. In regard to public interventions after the subprime crisis, Sala i Martin argued in the TV program 'Èl Convidat' as follows: "*El capitalisme funciona bé només si l'empresari... es queda el fruit de la seva feina quan tot surt bé, i paga quan surt malament. I aquí distorsionem el sistema quan rescatem els bancs*" (Sala i Martin, 2013). Sala i Martin indicated that in a functioning free market, entrepreneurs should keep their profits when operating successfully, but must also be held responsible for their entrepreneurial failures, for which bailouts (for the banking sector) must be rejected.

As indicated, we also consider the concepts of dynamic efficiency (Huerta de Soto, 2009a), entrepreneurial creativity (Kirzner, 1973) and the importance of free prices within a free market (Mises, 1940; Huerta de Soto, 2005; Rothbard, 1970). Then, empiric data, related to the automotive industry within the period from 2010 to 2018 will be evaluated, particularly in regard to the sales evolution of so-called alternative fuel vehicles (AFVs). By doing so, we want to illustrate the validity of our theoretical concept in regard to the analyzed topic within the specific period of time. Moreover, we will also pay attention to the concept of negative externalities (Rallo, 2014) regarding environmental challenges caused by air pollution, considering that even Chicago School economists like Friedman justified public interventions to control and minimize certain negative externalities (Rothbard, 1982). Rothbard argued that Friedman justified theories of value-free property rights, stating that Friedman would ultimately define and protect human rights not on the basis of ethical norms (such as justice), but based on the concept of 'social efficiency'.

However, the main purpose of this thesis is to define the impact of monetary and fiscal policies on the automotive industry, not to evaluate politico-economic theories on how to best protect the environment and individual property rights simultaneously. Thus, we do not pretend to find legal solutions on how to best deal with negative externalities. Instead, in final sections of chapter 4, we intend to show how public interventions can distort the automotive market, causing misallocations and artificial bubbles.

4.3.1.1 The Importance of Free Prices & Entrepreneurial Profits

Up until the late 19th century, classical economists generally used to be under the delusion that the price of a final product was determined by its 'costs of production'. Karl Marx (1867) had defined a labour theory of value, which argued that the value of a certain commodity shall be equal to the socially necessary labour time invested in it. Marx theorized that the gap between the value a worker produces and his corresponding wage would be a form of unpaid labour, known as surplus value. Consequently, due to industrialization, and technological progress, the value of a given item would tend to decrease, not because of a changing market demand, but simply because the labour time necessary to produce the good can be reduced. Marx (1867) argued that even the value of commodity money, such as gold, would be defined by the labour time necessary to produce it. We entirely reject this approach, as it completely ignores that actual market demand for the final product, as well as the fact that basic raw material, may have a high consumer demand (and market value), even if no labour time for its supply is needed. It was then up to the Austrian School economist Carl Menger to precisely define the Austrian marginal utility theory, detecting the proper approach towards price definition: that price determines cost and not vice versa (Hayek, 1941). Hoppe (1993) added that the price setting of entrepreneurs is constrained by the actual given demand, since any price set by the entrepreneur is based on the expectation that an even higher price would ultimately yield a lower total revenue, as the volume sold would then clearly decrease. Or to explain it differently, as long as an entrepreneur expects the consumer demand for his goods or services to be inelastic within the region of any price-range under consideration, he will take advantage of this and ask for a higher price (Rothbard, 1962).

With almost identical wording, Mises (1940), Rand (1966), and Rothbard (1962) stated that in a truly free market, all prices, wages, and profits must be determined exclusively by the law of supply and demand. In such a market, men shall trade goods or services by mutual consent to their mutual advantage, and based to their own independent, un-coerced judgment.

According to Rothbard (1962) and Huerta de Soto (2005), the price of any good on the market place is determined by supply and demand schedules, which themselves are determined by the

value scales of the individual consumers in the market. As individual value scales, technological progress and the variety of available means constantly change, also consumer demand may quickly shift from one good to another. Moreover, time preferences can change which will have an impact on interest and capital formation. As stated by Huerta de Soto (2005), Hoppe (1998) and Rothbard (1962), when, due to subsidies or other public interventions, the official price of a product is below its actual free-market price, an enormous and excessive demand is generally stimulated for that good. This interventionism directly leads to the misallocation of resources. Also Sala i Martin (2005), similar to Rothbard (1962), argues that no entity, neither public institutions nor private entities, can provide a concrete foresight into future economic evolutions. However, in comparison, private entrepreneurs on a free market are better equipped (by financial incentive and by economic calculation) than any central public planning office to detect and satisfy future needs of consumers (Ostrom, 1990; Hayek, 1944; Huerta de Soto, 2005; Boettke, 2012). Rand said that capitalism *“demands the best of every man.... When men are free to trade, with reason and reality as their only arbiter, when no man may use physical force to extort the consent of another, it is the best product and the best judgment that win in every field of human endeavor, and raise the standard of living”* (Rand, 1961, p. 25).

The market economy must be distinguished from both, the autarkic and the centrally controlled economy. In the autarkic economy, individuals carry-on their economic activities isolated from one another, as they are either unaware or unwilling to take advantage of opportunities for exchange (Kirzner, 1963). In the centrally controlled economy, on the other hand, economic activities of individuals are steered by a central authority, for which individuals are not free to benefit from exchange opportunities (Huerta de Soto, 2005). Hülsmann (2000) stated that in a developed market economy, production processes and conditions adjust naturally to the market requirements. Consequently, market activity ultimately refers to individual activity, and the actions of each market participant is impacted by the actions of other participating individuals. Each market decision is influenced by market forces which themselves are linked to (past or expected future) decisions of the market participants. Thus, decisions made by the individual market participants create an interlocking system, and this network of decisions leads to what we call the

free market system (Kirzner, 1963). In the market as a whole the elasticities of demand curves can be related to the expected changes in total sales revenue due to the corresponding decrease or increase in price. Thus, when looking at market demand as a whole, we analyze the quantities a market will request at different market prices (Kirzner, 1963). The corresponding indicated quantities reflect the quantities that the individual market participants separately request at these prices. However, to fully understand the market, we must not only look at the market system from a consumer's but also from an entrepreneur's perspective. This will allow us to understand how mentioned interlocking chains of decisions by buyers and producers ultimately define the market price as well as the quantitative and qualitative output. Benegas Lynch (2014), Boettke (2012), Garrison (2001), and Huerta de Soto (2005) point out that in a competitive market, the entrepreneur knows that consumers are likely to be responsive to noticeable price changes on his part. Rothbard (1982) properly highlighted that 'value' is purely the subjective reflection of what the market participants are willing to pay for a good or service.

If from the consumer's point of view, the goods offered by one producer are highly similar to those of other providers, a relatively small increase in his pricing is expected to significantly reduce his sales revenue - and vice versa. However, if the consumers consider the similarity between the products of different producers to be less obvious, then the elasticity of demand is expected to be inferior. Thus, the demand for a commodity in the market at any given price also depends on the prices and availability of similar goods and services (Kirzner, 1963). The concept of cross elasticity of demand refers to the extent in which the demand for one good changes due to the price change of another good. This cross elasticity can be both positive (for goods which consumers consider as substitutes for one another) or negative (if the goods are considered as complementary to one another). The market process is kept in motion by entrepreneurial activity, based on the entrepreneurs' aim to gain profits (Rothbard, 1963). Huerta de Soto (1998, 2005) showed that the subjectivist view of the Austrian School, based on the concept of creative human action (entrepreneurial activity) and a dynamic analysis of the general processes of social interaction, is more appropriate than the neo-classical approach. Entrepreneurs invest in a process because they expect to make a profit, for example because the market has underpriced and undercapitalized certain factors in relation to their future rents (Kirzner, 1963, 1973). Kirzner

heavily emphasizes on the entrepreneur's role in reallocating resources which had been misallocated, for which the market process itself tends to correct misallocations of resources. It is a key role of the corporate capitalist to cover his entrepreneurial function by guiding the processes of production towards the desires of consumers (Krause, 2004 & Garrison, 2001). In line with the knowledge and foresight of entrepreneurs, a free market will assure that factors are best allocated to satisfy the wishes of consumers (Huerta de Soto, 2009a; Benegas Lynch, 2011). Huerta de Soto (2005) defined socialism as "*toda restricción o agresión institucional contra el libre ejercicio de la acción humana o función empresarial*" - meaning: any institutional restriction or aggression against the free exercise of human action and man's business function (Huerta de Soto, 2005, p. 87). Also Hayek strongly criticized all forms of socialism, stating that any socialist system has been and will be a mistake, as only a free market economy, which Hayek preferred to call an 'extended order', can assure long-term prosperity and freedom (Hayek, 1944, 1990).

Hayek argued that "*...our civilization depends, not only for its origin but also for its preservation, on what can be precisely described only as the extended order of human cooperation, an order more commonly, if somewhat misleadingly, known as capitalism*" (Hayek, 1990, p. 6). The extended order of human cooperation plays a central role in Hayek's beliefs, which needs to be understood and respected, to maximize prosperity and freedom of mankind. Hayek defines the "extended order" as a society based on a voluntary exchange within a free market, with limited government, property rights, and the Rule of Law.

Hayek (1979) points out that the moral institutions of free market capitalism, such as private property and contracts, represent the natural result of a proper evolutionary process. Hayek states that humanity, without central planning and without any conscious central designing, naturally and gradually moved towards capitalism since it represents the most efficient order (1990). Consequently, Hayek's spontaneous order is a concept of unplanned social order, generated unconsciously by goal-oriented individual action, stating that these self-organizing social phenomena are transmitting more relevant information than any centrally steered, conscious design (Boettke, 2001; Benegas Lynch, 2011).

Each market participant benefits as the market process leads to a proper coordination of the activities of all participants (Hayek, 1944; Sala i Martin, 2005). One participant may specialize in repairing other people's automobile engines as long as he can rely on the market system to ensure that other participants will provide him with essential goods such as food and clothing. The more effective this coordination works, the more each market participant will be able to achieve his own goals (Huerta de Soto, 2005). This coordination must combine a priority system according to which the wishes of consumers are successively satisfied, as well as the means by which all contributions of the different individuals involved in the specific productive process can be detected and measured to assign incomes to the corresponding individual productive contribution (Kirzner, 1963). In line with Mises (1949), Kirzner (1963), Boettke (2001) and Huerta de Soto (2005) we agree that through the assignment of market prices to resources and products only the free market system can assure that these coordinating functions are properly fulfilled. Prices and opportunities for profit play a crucial role in the market process in which resource misallocations are being corrected. A price discrepancy exposes an existing misallocation of resources and consequently promotes corrective actions, providing an opportunity to make profits. This entrepreneurial foresight will be caused naturally by the market process, when consumers reward good forecasters while penalizing those forecasting market changes poorly (Huerta de Soto, 2009a).

4.3.1.2 Market Niches & Entrepreneurial Creativity

Rand stated that *"life is motion, a process of self-sustaining action...Biologically, inactivity is death"* (Rand, 1964, p.141). Humans must think, produce and meet the challenges of existence, trying to transform their environment through productive work, constant effort and inventiveness. Capitalism naturally entails a constant process of motion, growth and progress. The free market creates the optimum social conditions for all market participants in order to properly respond to

the challenges of nature, operating to the benefits of all economic agents (Mises, 1940; Nozick, 1974; Rand, 1964). Several economists, such as Schumpeter (1934) considered innovation to be the essence of entrepreneurship, referring to innovation when envisioning bold innovators that develop new methods and products, which then cause the disturbance of the previous business routine. For Schumpeter (1934), entrepreneurs reform or revolutionize the pattern of production, by developing new goods and new production methods, as well as by exploiting previously unused/ unknown resources, and by developing new processes and structures to organize firms. Boettke (2001) agrees that for successful entrepreneurs it is crucial to be alert in order to detect new opportunities. Moreover, the mutual learning by all economic agents involved in this discovery will then move the market to an even more efficient allocation of resources. One good example of such constant innovation is the ride-sharing platform Uber. Uber launched a new business concept by offering ride-sharing as an alternative to traditional taxi services. To increase transparency and customer peace of mind, new processes to track customer satisfaction were implemented. Customers are able to monitor drivers' routes in real time and after using Uber's ride-sharing service, customers can rate their driver. Uber then evaluates these ratings rewarding high performers while potentially cancelling the cooperation with low-performing drivers. However, Rothbard (1962) urged not to overrate the importance of solely developing new concepts. He argued that most successful entrepreneurs are rather assuring their professional success by properly investing capital within the framework of existing technological opportunities. Thus, entrepreneurial success is not only about inventing new technologies, but rather about properly investing into business areas with growth potential. Apart from Rothbard, also Kirzner (1973) Boettke (2001) and Huerta de Soto (2005, 2009a) point out that entrepreneurial activity must constantly deal with changes and uncertainty, for which the true entrepreneur must satisfy the demands of consumers, using market niches and eventual temporary market discrepancies to increase profit. A key aspect in regard to the entrepreneurial function in a free market is the fact that the misallocation of a unit of a resource also implies the existence of an unexploited profit opportunity (Hayek, 1944). We state that Uber is a good example that both mentioned aspects are often crucial: creativity to come up with innovative ideas, but also the willingness and ability to invest capital into the structures needed to actually operate.

M. Polanyi (1948), Kirzner (1963) and Ostrom (1990) stated that society consists of many individual human beings, of which each one acts in order to improve his position. Whenever an exchange between individuals occurs freely, these individuals acted in order to achieve their respective separate goals. According to Kirzner (1963), Hoppe (1995), Huerta de Soto (2006), and Hülsmann (2008) any exchange on the free market occurs because each party concerned expects to benefit from it. Rothbard (1962) argued that, as everyone is able to gain in utility from his free actions, the free market would ultimately maximize social utility. When defining new products and services, the free market never loses sight of the question: 'Of value to whom?' Rothbard (1962), Rand (1964), Ravier (2018), and Azevedo Alves (2014) properly highlighted that capitalism has been the only system in history in which wealth was not acquired by force, but by production and trade.

Thus, in such a free market, individuals are free to act - either in isolation or to engage in exchanges with others whenever these individuals detect an opportunity of mutual benefit through trade. On the free market, consumer wants force entrepreneurs to assure the best allocation of productive resources (Kirzner, 1973). In line with Kirzner, also Hoppe (1995), Huerta de Soto (2006, 2009a), and Hülsmann (2008) agree that free exchange is created by voluntary actions between the participants, leading to the mutual benefit of the parties involved. Moreover, these free exchanges in society lead to an efficient mechanism, properly allocating productive resources and naturally leading to the definition of prices, while assuring the greatest possible satisfaction of consumer demands (Kirzner, 1973). Hayek (1948), Mises (1949), Rothbard (1962) and Kirzner (1973) agree that the free market benefits all parties, while it also creates an efficient instrument of social order. Boettke (2012) states that the private property market economy is a self-regulating system which is steered by relative price adjustment and a profit and loss calculus. Thus, free pricing in free markets can accomplish what politics often cannot: realizing mutual gains from social cooperation. Moreover, and even more importantly, Boettke states that "*the market society forms the basis for a political order of free people*" (Boettke, 2012, p. 13). Apart from Boettke (2001), also Public Choice economists such as Buchanan (1990) highlight that prices summarize the terms of exchange on the market as the price system provides information which enables market participants to plan. Free pricing in a free market economy guides the economic agents

to discover mutual gains and to develop new and more efficient ways to use scarce resources (Weede, 1990). Thus, due to the superiority of economic freedom compared to government control, efforts to intervene in the market order must be minimized (Rallo, 2014). The entrepreneurs' aim to achieve profit within a free market naturally guides and channels the factors of production. This process, based on the entrepreneur's own interest, assures an output of thousands of different commodities in accordance with the actual demand, which no central public institution could do as efficiently (Mises, 1951; Rand, 1966; Rothbard, 1962).

In line with Azevedo Alves (2004, 2020), Bagus (2014), Benegas Lynch (2014), Boettke (2012), Garrison (2001), Huerta de Soto (2009a, 2009b), and Ravier (2018) we argue that in today's real-world economies, we can detect several public – and therefore artificial - obstacles to correct resource allocations. Arbitrary controls have been implemented in most present-day economies, hampering the allocative functions of the market system and consequently creating obstacles which interfere with the natural evolution of the market process (Garrison, 2001). A common example of such interventionism is the imposition of restrictions upon the price movements. Minimum or maximum prices may be imposed for particular products (or at least for selling these products to certain target groups) and for resources (Kirzner, 1973). If the imposed price limits conflict with the natural market prices, the restrictions may prevent the market from allocating resources in the optimum manner (Huerta de Soto, 2005). Exchanges which would have taken place at lower/ higher prices are prohibited by public intervention while certain quantities of output, which would have been produced with freely floating prices, remain unproduced (Kirzner, 1963). Thus, such interventionism ignores and distorts the actual availability of resources, as well as the actual wants and needs of consumers (Rothbard, 1970). In addition, a distortion of the market process may consist of artificial obstacles by institutional grants of monopoly power or by a pattern of different taxes and subsidies (Mises, 1949). True competition is hampered when heavy taxes or other sanctions are imposed on profits, or when uncompetitive companies are subsidized (Hayek, 1944). All these interventions can distort the allocation of resources, affecting the production process and preventing the true prices of the corresponding resources or products to emerge (Boettke, 2012).

4.3.2 Dynamic Efficiency & Competition

The concept of dynamic efficiency (Huerta de Soto, 2009a) and the criticism of the neo-classical concept of 'perfect competition' (Kirzner, 1973) must also be seen as key elements of the Austrian School of economics which we refer to in this thesis. In the neoclassical model, the market process mainly consists of recognizing what is generally already known, and then simply acting upon it, ignoring the fact that resources and technology are not "given constants" in the real world, but both can significantly change due to entrepreneurial actions (Kirzner, 1973; Huerta de Soto, 2009a). Israel Kirzner defined a detailed alternative to the unrealistic approaches of the neo-classical school, emphasising on seeing competition as a constant process in which alert and creative entrepreneurs intend to detect market niches and other business opportunities to optimize customer satisfaction, market share and profit (Kirzner, 1963, 1973).

Unfortunately, throughout the 20th century, the emergence of mechanical physics and the use of the mechanical physics rationality in economics hampered the creative dynamic dimension of economic efficiency, leading to the static approach (Huerta de Soto, 2009a). In 1909, also Leon Walras, confirmed in his 'Economics and Mechanics' that the mathematical formulas used in his book 'Elements of Pure Economics' were mainly identical to those applied in mathematical physics. In the neoclassical model, economic efficiency is mainly based on a mathematical concept. Economic efficiency is manifested by a simple mathematical extraction of "the optimal result". In the neoclassical model, the market process basically consists of recognizing what is generally already known, and then simply acting upon it. Thus, in reality, this model of 'perfect competition' represents a state of affairs where competition has actually ceased, where all relevant knowledge has been discovered and fully transmitted. Hence, this model entirely fails to explain the emergence of market efficiency (Kirzner, 1963). What the static concept of efficiency and most followers of the neo-classical idea fully ignore is the fact that resources and technology are not "given constants" in the real world, but both can significantly change due to entrepreneurial actions (Taghizadegan, 2016). The static approach focuses on minimizing waste of already

known and/or given economic resources. Obviously, mentioned static approach is completely ignoring developments in “the real world” as most resources, and in particular all technological advancements used are not simply “given”, but in fact are constantly changing in quantity and quality - also as a result of entrepreneurial activities (Huerta de Soto, 2009a). Israel Kirzner (1963, 1973) defined a detailed alternative to the unrealistic approaches of the neo-classical school, emphasizing on seeing competition as a constant process in which alert and creative entrepreneurs intend to detect market niches and other business opportunities to optimize customer satisfaction, market share, turn-over and, most importantly, profit.

Competition is a competitive process, a series of competitive acts & steps taken by competing enterprises/entrepreneurs, influencing prices as well as service and product quality (Taghizadegan, 2016; Mayer, 2018; Ghate, 2015). In Kirzner's view, an efficient economic order and sustainable, long-term growth cannot be achieved in a market with centralized public interventionism, but instead it can only be assured by the absence of any centrally planned economy (Kirzner, 1973). Etymologically, the word "entrepreneurship" has its origin in the Latin term '*inprehendo-endi-ensum*', meaning "'o discover' and 'to realize', as entrepreneurship must be seen as human's ability to realize opportunities for one's own profit, acting in order to take advantage of them. Israel Kirzner (1963, 1973) focused on the vital role of entrepreneurial alertness and creativity, arguing that it is the entrepreneurial element which is key for an understanding of human action as active, creative, and human - rather than as being passive, automatic and mechanical. As indicated, also Huerta de Soto (2009a) emphasized on the concept of dynamic efficiency, the need to detect market niches and new opportunities in a constantly changing market environment. Huerta de Soto properly showed that the concept of static-efficiency is unrealistic, as its operative functioning would require a given and known framework of ends and means which is simply not possible in a constantly changing social environment.

Kirzner (1963, 1973) stated that the entrepreneurial opportunities to create profit are mainly due to previous entrepreneurial errors that had occurred at an earlier stage, which had then resulted in a shortage or surplus of certain services or goods, or other ways of misallocated resources. It is then up to the entrepreneur to discover these opportunities.

4.3.3 Public Interventionism – The Cause of Market Distortions

As thoroughly explained in Chapter 1 of this thesis, our aim is to evaluate economic developments in European and North American countries within the 21st century. As stated in our research objectives, we intend to evaluate whether public interventionism, such as scrappage campaigns and bailouts, as well as public incentives for 'alternative fuel vehicles' have been sustainable. One of our hypotheses is, that public interventions have been inefficient and unsustainable, distorting the market by intensifying the misallocation of resources.

We will not spend too much time on analyzing political and economic processes in truly totalitarian socialist countries such as the former Soviet Union, or today's Cuba and North Korea. As we know, in such entirely collectivist order, the state controls all means of production. However, as this thesis focuses on countries within the EU as well as on the USA, purely socialist totalitarian regimes are not in the focus of our research. Therefore, when using the term 'interventionism' in regard to the analyzed monetary and fiscal policies, we refer to interventions into certain economic processes by democratically elected governments and public authorities. These interventions are often justified by the belief that within a democratic state, public institutions can and should steer a 'middle way' between laissez-faire capitalism and collectivist central planning. The negative effects of such interventionism, often leading to price control, market barriers and other market distortions have already been studied by several economists (Rothbard, 1970; Kirzner, 1973, Huerta de Soto, 2005). While the organizing principle of the free market is pure entrepreneurial competition and free pricing, interventionist orders have strong intervening public entities (Hayek, 1979; Boettke, 2001). Whereas in the free market, investments can be efficiently steered by profit-seeking entrepreneurs based on free prices, centrally planned interventionist orders rely on costly, inefficient bureaucratic processes (Mises, 1936; Rand, 1966; Ghate, 2015). Macroeconomic interventions include fiscal policies aimed at either stimulating or reducing the market potential of certain goods, services or specific business sectors (Mises, 1949; Rothbard, 1970). The effectiveness of such interventions can only be given if the intervening public entities have both the needed knowledge as well as the proper incentives to effectively steer and solve the problem they had identified. As we learned from M. Polanyi (1948) and Hayek (1944, 1979, 1990), no

public institution can effectively bundle all the relevant information available on the market place to 'steer' the market more efficiently than what the market itself could do within a spontaneous order (Reimers, 2020b).

Mises (1922, 1940), Hayek (1944, 1979) and M. Polanyi (1948) proved the inefficiency and the lack of moral or economic justification of all forms of Socialism, as socialist ideas are not only incorrect from a logical perspective. Moreover, there is no effective way to combine and detect the astronomical quantity of information needed to direct economic resources of specific applications properly. There is not one person, not one computer or government, that can contain all of the relevant knowledge necessary to detect all scarcity ratios of all goods and services within a certain economy, and will therefore never be able to define new business models, niches and necessities as quickly and properly as the free market does. Both were convinced that central planning cannot be more efficient than a spontaneous order, since knowledge is dispersed (Hayek) and tacit (Polanyi). Hayek (1990) defended that only calculation and distribution in terms of market prices enable us to utilize discoverable resources intensively. One of Hayek's main arguments can be found on page 108 of *The Fatal Conceit*: "*imagining that all order is the result of design, socialists conclude that order must be improvable by better design of some superior mind.*" Hayek stated that "*in the marketplace, unintended consequences are common, as the distribution of resources is affected by impersonal processes in which individuals, acting for their own ends, do not know what will be the net result of their actions*". In line with Mises (1940), also Hayek (1944) and Polanyi (1948) agreed that in a socialist system, the allocation and use of means of production will always be less effective than the free market, and it must ultimately fail as there is no rational, valid means of economic calculation to allocate scarce resources efficiently. Hayek argued that people are not as good at creating and designing as they often think they were, or, using Hayek's words: "*The curious task of economics is to demonstrate to men how little they really know about what they imagine they can design*" (Hayek, 1990, p. 76). Ostrom (1990) said that there is no reason to believe that governments and other public entities would be better at solving problems than those citizens which are directly affected by the corresponding problems. Ostrom argued that bureaucrats often do not know the concrete local conditions, not having as much relevant precise information as the locally affected citizens and users.

Hayek (1979, 1990) concluded that a planned socialist economy would never be able to cope with the speed and precision of an unplanned/ free market economy. The planned economy must always be less efficient than the free market. Consequently, central administration makes a reasonably efficient allocation of resources and timely rate of production impossible. Thus, Hayek (1944, 1979) and Polanyi (1948) agreed that knowledge must never be artificially concentrated into a single entity at the hierarchical top, but it should be naturally distributed within society and used effectively by free market participants. Consequently, central government never has rational means of figuring out which goods and services are the most crucial and desired ones for the population, nor about what amount of time and money to invest in developing them. In Polanyi's (1941) concept, the liberal state exercises supervisory authority over society, which can be seen as an inclusive dynamic order, forming "*the intellectual and moral order of society*" (1941, p. 429). The state should support the growth of dynamic order simply via its supervisory authority.

We need to further investigate on the effects and effectiveness of fiscal stimulus and other fiscal policies. Thus, at this stage we need to properly explain our theoretical approach in regard to public interventionism in general as well as to public incentives in the automotive industry in particular.

Already in 1944 Mises concluded that bureaucracy must automatically emerge in all social spheres in which a free entrepreneurial pursuit of profit is not permitted. Political bureaucracies are always affected by inner conflicts, while reflecting the diverse pressures of various social groups which pursue their own interests. As the Hungarian economist János Kornai said, "*a bureaucrat must be interventionist because that is his role in society; it is dictated by his situation*" (Kornai, 1986, p. 1727). He objected that the leaders of any organization are likely to try to influence those central planners/ regulators who imposed certain rules – or e.g. incentive schemes. Thus, the result will certainly be a conflict between the regulators and the firms regulated by such bureaucracy. Also Hayek had stated these problems showing that Lange's model would have to lead to horrible bureaucracy, as the central planning agency would even be asked to monitor managers' compliance with those rules for which 'compliance' could not be objectively evaluated. Even the Polish economist Oskar Lange (1937, p. 127) himself stated that

“the real danger of socialism is that of a bureaucratization of economic life” even though he did not understand the full extent of the socialist danger.

Based on the findings of Franz Oppenheimer (1929), Rothbard (1962) stated that there are only two ways of acquiring wealth, either by economic means (voluntary production and exchange) or by political means (confiscation by coercion). Oppenheimer (1929) argued that, wealth can be obtained by “political means”, which ultimately refers to the results of public coercion, or alternatively by “economic means” giving people the ability to peacefully trade goods and services. On the free market, only the mentioned economic means can be used, for which everyone will only earn what other individuals in society are willing to pay for his/ her services. Rothbard referred to the free market as *“an orderly pattern, structured to meet the desires of all individuals, and yet eminently suited to adapt to changing conditions. (T)he free, voluntary actions of individuals combine in an orderly determination of such seemingly mysterious processes as the formation of prices, income, money, economic calculation, profits and losses, and production”* (Rothbard, 1962, p. 876). Hayek (1948, 1973) stated that man’s behavior can be both rule-following as well as purpose-seeking. Constant public interventions in peoples’ lives are not needed, as basic general rules are sufficient to allow a spontaneous order to naturally emerge.

In a speech at Carleton Place Arena in June 2017, Jordan Peterson stated that *“citizens have the inalienable right to benefit from the result of their own honest labor.... the government, local and distant, should leave people to their own devices as much as possible.”*

According to Rand a government *“is an institution which holds the exclusive power to enforce certain rulers of social conduct in a given geographical area”* (Rand, 1964, p. 125). Within democratic political systems, economists such as Piketty (2014) and Krugman (2008) justify overwhelming government authorities with the ‘consent of the governed’, meaning that the governed citizens had previously democratically elected their political leaders. Consequently, also all public incentives and other public interventions by elected governments would be morally justified. We disagree with this approach, arguing in line with Mises (1949), Rand (1961, 1964), Benegas Lynch (2014) and Nozick (1974) that government must only be the servant of its citizens,

and its power must be limited to a few, specific areas, mainly the citizens' protection from violence and robbery.

We agree with Henry Hazlitt (1946), Mises (1940), Boettke (2012) and other mentioned economists of the Austrian School, that free prices and profits within a free-market system will optimize production and relieve shortages. Hazlitt is correct that from a long-term perspective, *“arbitrarily fixed prices and arbitrarily limited profits can only prolong shortages and reduce production and employment”* (Hazlitt, 1946, p. 171). In line with Mises (1940), Rand (1964) and Nozick (1974), Hazlitt (1946) concluded that it is only the government's role to create and enforce a framework of laws to prohibit violence and fraud. However, government must fully refrain from economic interventions, as its main economic role is to encourage and preserve the free market. Hayek (1944) indicated that one way to minimize wasteful misallocations occurring from distorted price signals, is to oblige policymakers to define transparent policy rules which send clear signals about the true intentions of each policy. This must be achieved with a consistent adherence to the rule of law, as *“government in all its actions is bound by rules fixed and announced beforehand—rules which make it possible to foresee with fair certainty how the authority will use its coercive powers in given circumstances and to plan one's individual affairs on the basis of this Knowledge”* (Hayek, 1994, p. 112)

Apart from Hayek (1944), M. Polanyi (1948), Boettke (2012) and Buchanan (1990) also the Bloomington school economist Elinor Ostrom (1990) doubted that public governments would primarily aim to make decisions in the public interest. All the economists agreed that private structures are generally much more efficient than public institutions, for which more power should be given to individuals and privately organized entities (Azevedo Alves, 2004). Particularly Boettke (2012) has been emphasizing the term 'mainline economics', aiming to highlight relevant similarities between different schools of thought, such as the Austrian school of economics, public choice economics and new institutionalist economics as well as the economics of governance, including the Bloomington school. To Boettke (2012), the concepts of important thinkers such as Mises (1949), Hayek (1944), Buchanan (1990), Vernon Smith (1962), Ronald Coase (1960, 2006), Douglass North (1990, 1992), Gordon Tullock (1986), Robert Nozick (1974), Israel Kirzner (1963) and Elinor Ostrom (1990) all share two fundamental observations of commercial society which

strongly distinguish their concepts from mainstream Keynesianism: the “*individual pursuit of self-interest, and a complex social order that aligns interests with the general interest*” (Boettke, 2012, p. xvii).

Robert Nozick (1974) argued no state larger than the minimal state can be justified. The minimal state must treat its citizens as individuals, allowing each individual “*to choose our life and to realize our ends and our conception of ourselves, insofar as we can, aided by the voluntary cooperation of other individuals possessing the same dignity. How dare any state or group of individuals do more?*” (Nozick, 1974, p. 334). Consequently, he argued that “*a minimal state, limited, to the narrow functions of protection against force, theft, fraud, enforcement of contracts, and so on, is justified, but any more extensive state will violate persons' rights ... and is unjustified*”. (Nozick, 1974, p. ix).

After von Mises and Hayek, not only Austrian School economists such as Israel Kirzner, Murray Rothbard, Roger Garrison and Huerta de Soto, but also other liberal minds such as the mentioned Buchanan (1990), Coase (1960), North (1990), Nozick (1974), Smith (1962) and Ostrom (1990) all aimed at developing concepts for a free society, elaborating on new insights in political economy and entrepreneurial market processes (Azevedo Alves, 2004; Boettke, 2012). However, we consider the Austrian school approach - particularly in regard to the findings of Hayek (1932, 1939, 1944) and Mises (1912, 1934, 1940) on monetary policies, as well as of Hayek (1939, 1941), Garrison (2001) and Huerta de Soto (1998) on business cycles theory, but also Kirzner's (1963, 1973) and Huerta de Soto's (2009a) concepts of entrepreneurial creativity and dynamic efficiency - as clearly superior to any other economic school of thought. Thus, in this thesis, we have mainly focused on ‘the Austrian perspective’, while showing its main similarities and discrepancies with other economic schools of thought when considered as relevant for our research.

As we have learned (and in contrast to Austrian School economists such as Mises, Hayek, Huerta de Soto and Garrison), John M. Keynes (1936) considered depressions to be extremely harmful for market economies once total spending (‘the aggregate demand’) was insufficient to support full employment. Keynes (1936) believed that markets would not possess a self-correcting mechanism for which public interventions are needed to prevent economies from long-term

depressions. From Keynes' perspective, only with powerful central banks and governments, able to interfere in the economic processes, could a stable and steady economic growth be achieved.

We had already referred to various well-known economists, such as Krugman (2008) and Piketty (2014), who blamed laissez-faire capitalism for the subprime crisis of 2008, while Marxists such as Hardt and Negri generally consider 'capitalism' as a dangerous concept which is inherently controlled by the dominant class and its political elites (Hardt & Negri, 2017). Paradoxically and as properly stated by Benegas Lynch (2016), several mainstream economists and socialist theorists have criticized 'capitalism' for all politico-economic crisis since WWII, although true capitalism has not existed in any industrialized country throughout this period of time. In line with Benegas Lynch, we may say that the state apparatus has become an "*infernal machine, causing astronomical internal and external public debts, creating suffocating regulations... and an enormous level of public expenses... to feed an insatiable Leviathan.*" (Benegas Lynch, 2016, p. 1). In an article in Portugal's journal 'Observador', Rui Albuquerque (2021) criticized the current politico-economic system for being a system based on partisanship and favouritism, in which large corporates and politics have created an intransparent and corrupt system which actually prevents true competition. Precisely speaking, Albuquerque defined this 'crony capitalism' as a "*capitalismo de compadres, dos amigalhões que passam... do mundo da política para o das grandes empresas e destas para o mundo da política... O jogo do mercado é outra coisa. O capitalismo é outra coisa. O liberalismo nada tem que ver com isto.*" (Albuquerque, 2021). Also Huerta de Soto (2006, 2009b) stresses the irony that many features of the current banking systems in the USA and the European Union, such as the significant power exerted by central banks, the fractional reserve banking system, as well as the existence of currency monopolies, are all concepts which are actually more compatible with centrally planned socialist economies than with true laissez-faire capitalism. Laissez-faire capitalism is a politico-economic system based on the essential right to private ownership of the means of production, in which the power of the state is minimized, not interfering with deliberate exchanges between individual economic agents on the free market (Rand, 1964; Mises, 1940; Ghate, 2015). From this perspective, governments should focus on defending individual's rights, protecting its citizens against the

initiation of physical force by other individuals as well as by private entities – and the state itself (Rand, 1964). Hayek (1979) argued that this could be achieved by a written constitution, a system of division of powers and checks and balances, as well as by assuring a well-functioning legal framework and jurisdiction. In this context, we shall mention that other Austrian School economists, such as Block (2009), Huerta de Soto (2005, 2010), Hoppe (1993, 2006) and Rothbard (1970, 1973), criticized Hayek's approach who had considered the existence of certain public sectors (such as a public legislative system) as necessary. Hayek clearly differed from Rothbard's ideal of an anarcho-capitalist society which operates under a mutually agreed-upon legal code in which private insurance companies could fulfill the roles of courts (Rothbard, 1970, 1982).

Rand (1964), Nozick (1974) and Ghate (2015) argued that under true laissez-faire capitalism within a minarchist state, there would be a strict separation between the economy and the state, as the state would essentially consist of a police force, law courts, and a national defense establishment. The complete absurdity of defining the present political-economic environment in the United States or the European Union as 'laissez-faire capitalism' becomes obvious when considering all politico-economic areas in which public entities nowadays interfere (Bagus, 2014).

Public intervention is always distorting the free market development, as it coercively changes the behavior of those individuals involved (Huerta de Soto, 2006). Roland Baader once said that *"there are four major gateways through which the state penetrates people's lives. These door signs are: 1) public goods, 2) social security, 3) 'social justice' & redistribution, as well as 4) subsidies and protectionism"* (Baader, 1997, p. 161). Public coercion, in the best case, will benefit one party at the expense of others, as coerced exchange is a system of exploitation of man by man (Hülsmann, 2008). For Rothbard, *"the government's productive contribution to the economy is precisely zero"* (Rothbard, 1970, p. 940). For Huerta de Soto, *"...real socialism and interventionism are simply two manifestations, of different degrees of intensity, of the same coercive, institutional reality, and they fully share the same essential intellectual error and pernicious social consequences"* (Huerta de Soto, 2001, p. 109). Any coercive imposition of an allocation of resources and productive factors which contradicts with the actual consumer

demands must distort the market, leading to *malinvestments* and reducing the overall living standards within a society.

Intervention can be defined as the intrusion of aggressive physical force into society, meaning the substitution of voluntary actions by coercion (Rothbard, 1962). Ostrom (1990, p. 222) stated that “*as long as a single center has a monopoly on the use of coercion, one has a state rather than a self-governed society.*” Hoppe (1993) argued that empirically, the majority of interventions against private property and individual freedom has been performed by states. Rothbard (1970) divided interventions into three broad categories: autistic intervention, binary intervention, and triangular intervention. By doing so, Rothbard provides a logic to argue that all forms of government aggression would make society worse off. In the case of autistic intervention, the specific order or command only involves the subject himself, as the intervener may directly restrict the subject’s use of his property. In the case of binary intervention, a hegemonic relation is established between the intervener and the subject, where the intervener can force an exchange between the individual subject and himself. Triangular intervention refers to the state in which the invader can either compel or prohibit an exchange between two subjects, for which a hegemonic relation between the invader and a pair of actual or potential exchangers is established. All these interventions represent hegemonic relations, being the opposite of contractual, free-market relations of voluntary mutual benefit (Huerta de Soto, 2006). In this context, Rand made a pointed remark in stating that: “*the businessman’s tool is values; the bureaucrat’s tool is fear*” (Rand, 1966, p. 48).

For this thesis, we will mainly focus on examples of binary and triangular intervention: for binary interventions (where the intervener forces the subject to make an “exchange” or gift to the former) on taxation, and for triangular intervention (where the intervener enforces or prohibits exchanges between sets of two other individuals) on price control and licensing.

Back in 1940, Mises had already referred to the *‘Abarten der steuerpolitischen Eingriffe’*: “Abarten” can be translated with “subcategories (of fiscal intervention)” as well as with “abominations” or “deformations” (of fiscal intervention)”. He stated:

*„Man kann durch Besteuerung die Erzeugung bestimmter Güter im allgemeinen
oder ihre Erzeugung in bestimmten Erzeugungsweisen ganz unterdrücken
oder beschränken. Damit wird auch der Verbrauch abgelenkt.“ (Mises, 1940, p. 662)*

Which means Mises already highlighted that government can tax the production of certain goods in general, or even fully restrict the production of certain goods, at least the goods’ creation in specific modes of production. And all these actions will certainly distract consumption (Rothbard, 1962; Benegas Lynch, 2014; Ravier, 2018). Public interventions only occur because the individual or individuals coerced would not have voluntarily done what they are now being forced to do (Hazlitt, 1946; Mises, 1940). Consequently, those being coerced to certain actions always lose in utility. Thus, interventions supply one set of men with gains at the expense of another (Hoppe, 1989; Huerta de Soto, 2005, 2009a). These findings of Rothbard, Huerta de Soto and Hoppe clearly contradict with the findings of the essayist Michel Eyquem de Montaigne (1533-92) who believed that the profit of one man causes the damage (or loss) of another, for which human intercourse leads to the exploitation of the weaker by the stronger. Before Hayek (1948), Hoppe (1995) and Rothbard (1962), von Mises (1940) had already strongly criticized this approach, naming the doctrine (after its proponent) ‘the Montaigne fallacy’. Mises (1929, 1940) was convinced that citizens would have more knowledge and would make fewer mistakes if they could act freely, interacting voluntarily, not being hampered by public interventionism. Mises’ based his economic theory on the idea that men shall be free to seek their respective goals by peaceful means, to compete, cooperate, trade and exchange with one another. People would learn by reason and experience, being able to correct any possible mistakes and miscalculations at an early stage by themselves, for which ultimately everyone concerned would benefit (Mises, 1929). In line with Mises (1940), Hazlitt (1946), and Weede (1990), we argue that the market economy in which the entrepreneurs are unconditionally subject to the supremacy of the consumers, is

clearly more efficient and morally superior to a centrally steered interventionist system. In a free market system, entrepreneurs are forced to offer products and services requested by consumers in order to be profitable, for if entrepreneurs fail to serve these demands, they will suffer losses and will ultimately run the risk to go out of business (Kirzner, 1963; Albuquerque, 2021). On the other hand, in an interventionist system, the government prevents entrepreneurs from focusing on those processes, goods and services that the consumers actually ask for, and both producers and consumers are forced to adjust their behavior to public regulations (Rothbard, 1970). If mentioned public regulations do not lead to the desired results, the public entity is likely to add to its first intervention other, even more severe, regulations. This leads to further market distortions and lower general living standards (Mises, 1949; Sowell, 2015). When focusing on the impact of taxation, we can see that coercive taxation always ensures that some will be gaining a net benefit, while others will be losing (Huerta de Soto, 2005). Thus, binary intervention such as taxation, cannot increase the social utility for all affected individuals. The larger the level of taxing and public spending, the greater the market distortion tends to be (Hayek, 1944; Mises, 1940; Huerta de Soto, 1998; Boettke, 2001; Azevedo Alves *et al.*, 2014). We must also consider the disincentive effects of taxation: the greater the amount of taxes imposed on entrepreneurs, the lower the marginal utility of work will be (Huerta de Soto, 2006). Hoppe agreed that “any form of taxation implies a reduction of income a person can expect to receive from original appropriation, from production, or from contracting” (Hoppe, 1993, p. 36). Hoppe’s approach is similar to Mises’ (1940), who stated: “*Der preispolitische Eingriff legt das Getriebe des Marktes still, er zerstört den Markt. Er nimmt damit der Marktwirtschaft die Steuerung und macht sie sinnlos.*” (Mises, 1940, p. 672). Mises argues that any intervention in the free price definition of the market distorts the natural process of the market. The intervention destroys the market, by taking over control of the economy’s processes.

Also the effects of triangular intervention must generally be seen as negative. As stated, triangular intervention occurs when an intervener either compels or prohibits a pair of people to make an exchange. This coercion may be imposed on the terms of the exchange through a price control, i.e. the price at which an exchange takes place. While the establishment of a mandatory maximum price will lead to an artificial shortage, a minimum price is likely to lead to an artificial unsold

surplus. Thus, also a publically steered price control will always decrease the utility for at least one of the parties involved (Hoppe, 1995). Price controls distort the production and allocation of resources and factors within the economy, while also hampering the free selection of goods by the consumers (Huerta de Soto, 2006).

Also in regard to subsidies, we agree with Hazlitt (1946), Brunner (1999) Ravier (2018), and Rothbard (1970) that these interventions lead to harmful market distortion. As stated by Rothbard *“transfer spending or subsidies distort the market by coercively penalizing the efficient for the benefit of the inefficient.”* (Rothbard, 1970, p. 942).

In line with Hoppe (1995), Brunner (1999), Huerta de Soto (2005, 2009a), Hülsmann (1998) and Rothbard (1962), we argue that subsidies artificially extend the life of inefficient and uncompetitive companies and distort the market, not allowing the market to naturally satisfy the actual consumer wants. The more governments intervene by providing subsidies, the more the market will be hampered from properly working. Resources will be spent in inefficient ways, and average living standards in society will decrease (Taghizadegan, 2016; Ghate, 2015). Apart from the pure financial aspects, we also need to consider the moral and psychological harm which subsidies cause to society (Rothbard, 1970). The more governments intervene and subsidize, the more conflicts will be created in society, as individuals and different interest groups/ lobbies will request public support with the aim to financially benefit (at the expenses of others). The more governments increase transfer payments within society, charging taxes to those working efficiently while providing subsidies to those not operating competitively, the less benefits there are for entrepreneurs to invest into the production of goods and services requested by consumers (Hoppe, 1995). On the free market, wealth is a direct consequence of the voluntary choices of all individuals, whereas government subsidies create a separate distribution process (Ghate, 2015; Krause, 2004). If the government subsidizes constantly loss-making, uncompetitive companies via public interventionism such as subsidies, *“the life of inefficient firms is prolonged... and factors are encouraged not to enter their most value-productive uses”* (Rothbard, 1962, p. 1255). As for all forms of transfer payments steered by governments (including subsidies to privileged groups), one may argue these payments will partially be saved or invested - and even if they are directly spent on consumption, such spending would ‘positively stimulate the economy’. However, these

transfer payments will not represent the voluntary desires of consumers, and will lead to investments in areas of production not desired by these consumers (Benegas Lynch, 2014). Such transfer payments represent the desires of exploiting consumers fed by the unilateral coercion of the state, and the corresponding investments by privileged groups will lead to be *malinvestments*. These transfer payments distort the expenditure pattern of the market by shifting productive resources away from those activities desired by free competitive entrepreneurs, steering them toward the pattern desired by the corresponding privileged group. Using an example of Rothbard (1970), if a government taxes funds which would have been spent on automobiles in order to then spend these funds on the purchase of weapons, the arms industry will become a net tax consumer, while a loss will be imposed on the automotive industry.

Lobbyism becomes more relevant while entrepreneurs spend more time on optimizing their connection to public institutions, rather than looking for market niches and new ways to please consumers (Bagus, *et al.*, 2014; Rothbard, 1970). Moreover, in such an environment of strong public interventionism with significant transfer payments, the average production and general living standards will also decrease as governments inevitably shift the financial burdens of the inefficient, privileged groups to the customer-oriented, competitive entrepreneurs (Huerta de Soto, 2006). Also Rallo (2014), Albuquerque (2021), and Sowell (2015) agree that governmental subsidies promote lobbying, nepotism and favoritism, while distorting the market, leading to misallocations of resources. In previous chapters, while analyzing the subprime crisis in 2008-2009, we had already referred to General Motors and Chrysler and their (mostly successful) attempts to compensate a lack of competitiveness by requesting protectionist support by US governments. Moreover, also in the upcoming chapters, which focus on public incentives for alternative fuel vehicles, we will refer to market distractions in the automotive industry caused by lobbying and public interventions.

Those who flourish on a free market are those showing high flexibility, creativity and the will to satisfy customer wants, while those succeeding in the political struggle for subsidies are those most adept at winning favors from wielders of coercion (Friedman, 1962; Infantino, 1998; Hazlitt,

1946). Thus, the greater the extent of government subsidies in the economy, the more the market will be hampered, not working efficiently and not properly serving the wants of consumers (Benegas Lynch, 2011; Rallo, 2014). In line with Huerta de Soto (2005), Krause (2004), Rand (1964), and Ravier (2018), we argue that the free market is the basis for the capitalist calculation, necessary for the efficient and productive allocation of the factors of production. Every government interference in the market distorts the allocation of resources. Thus, also government taxation and subsidies hamper market adjustments and lead to lower general living standards (Rothbard, 1970).

Rothbard (1970), Hoppe (1993) and Block (2009) even generally question the need for any public institutions whatsoever, correspondingly rejecting any form of public interventionism, such as public incentives or taxation. The starting point of Rothbard's considerations is, that if the state is harmful as a territorial monopolist, then all state actions are worse than market actions would be. As a solution, Rothbard envisaged a "private law order" - without any public institutions, and consequently no public law. Rothbard (1970) provided a logic to argue that all forms of government aggression make society worse off. Rothbard also highlighted that inefficiencies of government operations are "inherent in all government enterprise, and the excessive demand fomented by free and other underpriced services is just one of the many reasons for this condition" (Rothbard, 1970, p. 946). Government expenditures can be divided into two groups. On the one hand, there are consumption expenditures by government officials, as well as "*beneficiaries of government subsidies, and other nonproductive recipients*" (Rothbard, 1962, p. 941). On the other hand, there are what Rothbard considered to be waste expenditures, which government officials might consider as true investments into capital, but which then result in waste assets. For Rothbard (1962, 2003), government investment diverts the structure of production from the course that it would have taken in an unregulated market. Rothbard's emphasis is on consumer satisfaction as the ultimate and only meaningful end of economic activity. Thus, he considered all government spending, even spending that appears to be investment, to actually be consumption spending. Subsidies enable the users of a subsidized good to benefit from them without having to pay the actual free market price. This, however, is only possible at the expense of non-using taxpayers, leading to a misallocation of resources.

Unfortunately, the disastrous effects of such interventions are often only visible after a longer period of time, for which citizens have regularly failed to detect the actual origins of economic crises (Baader, 2012). Accordingly, Rand (1961) stated that man is free to make wrong choices and free to temporarily evade reality, but humans cannot escape the penalties of unconsciousness, or in other words, man cannot evade the consequences of evading reality. In line with Rand (1961), also Ayaan Hirsi Ali argued that “*reality is not easy, but all this make-believe doesn't make it easier.*” (Hirsi Ali, 2008, p. 225). Thus, we argue that just like on a private level too much protectionism by friends and relatives will hamper an individual in becoming an independent adult, also public interventionism keeps society from developing in a free, sustainable and effective way. We agree that the more private goods turn into public goods, the less the individual economic agents (e.g. the consumers) can influence the price, quality and production volume of such goods. In line with Mises (1936) and Huerta de Soto (2005), we argue that state-driven market distortions makes the distribution process increasingly unjust, as the production costs are not only covered by those who actually benefit from the product, but instead by all economic agents. In an economic system led by subsidies and other interventions, goods tend to become a political instrument, as their price, quality and production quantity are manipulated by public authorities (Boettke, 2012). Thus, the creation and distribution of these goods will be shaped by political distribution struggles, for which their overall process will ultimately be more expensive and less effective than in a free market. In line with Rothbard (1970), also Baader (1991) agreed that whenever something is initiated, organized, and financed by the state, the result will be rather inefficient. Such publically-financed endeavors ignore to a large extent the entrepreneurial risk of loss and liability and will not have to face the ‘trial-and-error’ corrective of competition which shapes innovations and market changes in a free market (Kirzner, 1973).

In his book ‘Privatization of Roads and Highways’ the economist Walter Block (2009) defends a truly free market system, also arguing for the full privatization of all roads, streets, highways and other vehicular thoroughfares. Block attempts to demonstrate the viability and efficiency of the private-enterprise system, arguing that if the concept of private property even works for the road

system, the economic and moral superiority of the free enterprise system can be proven in all sectors. Block's book mainly argues in favor of a privatization of the entire road network in order to improve road safety. Although road safety is certainly not to the topic of this thesis, we still consider Block's approach towards an entire privatization of infrastructure as interesting, as it could provide valid ideas to minimize negative externalities caused by air pollution. Block argues that the administration of roads and highways by public entities is not only costly but also deadly, referring to the more than 35,000 annual deaths on public streets in the USA (Block, 2009). However, Block points out how inefficient the current public infrastructure is and how a privatization could help to improve the road network while significantly reducing bureaucracy and the misallocation of resources. Block argues that the benefits of a free market and the economic principles of private property and free pricing also apply to all sectors related to transportation and logistics. The main benefit of the free market is its direct reward and penalty system, imposed by profits and losses.

In line with Rothbard (1970), Baader (1991) and Huerta de Soto (2005), Block (2009) states that businesses which are successful in satisfying consumers will earn a profit, while entrepreneurs who fail to satisfy customer needs will face decreasing sales, shrinking profits and potentially bankruptcy. Thus, a road enterprise would face very similar challenges as those of other business sectors, such as detecting profitable opportunities, finding a qualified labor force, increasing customer loyalty and satisfaction, as well as offering competitive prices. In line with Block (2009), and based on the ideas of Rothbard (1970) we also argue that such privatization could create a competitive market process, with innovate entrepreneurs seeking new ways to provide satisfying services to their customers.

4.4 Historic Illustration of Market Distortions Caused by Public Interventionism: Fiscal Policies and the Automotive Industry from 2008-2010

One of our research objectives is to define the impact of fiscal policies on the automotive sales evolution, particularly referring to so-called 'scrappage campaigns' in countries like Germany, Spain and the USA within the period from 2008 to 2010. Moreover, attempts by US-governments to 'protect' US-American automotive OEMs from bankruptcy by providing government bailouts, must also be critically considered. Thus, in the following section, we will illustrate our theoretical approach to these research topics with empiric data

4.4.1 General Motors, Chrysler and Public Bail-Outs

In 2009, annual US auto sales actually decreased to 9.5 million, coming from a peak of 16.5 million in 2006. The US-Time magazine reported that former Chrysler CEO Robert Nardelli purely blamed "*macroeconomic forces outside of the OEM's control*" for the company's difficulties, referring to "*a devastating automotive industry recession caused by the nation's financial meltdown*" which led to the problem of "*the buyers' and dealers' lack of access to credit*" (Time, 2008). In 2009, severely hurt by the global financial crisis, General Motors and Chrysler both had to file for Chapter 11 bankruptcy, only surviving due to government bailouts. In June 2009, General Motors Corporation filed for bankruptcy with \$173 billion in liabilities and \$82 billion in assets, but quickly emerging from bankruptcy in July 2009 as two separate companies: 'General Motors Company' and 'Motors Liquidation Company'. In this structure, 'Motors Liquidation Company' (the 'old GM') retained the liabilities, and 'General Motors Company' (the 'New GM') held the assets – already "becoming profitable" in 2010 (Ramseyer *et al.*, 2011).

By 2011, a total of 225,000 jobs were lost in the US-American automotive sector compared to June 2008 (Ikenson, 2011). However, these numbers could still be interpreted as a success story, compared to the 2-3 million jobs which (based on the discussed CAR report) the US automotive sector 'could have lost' without any sort of government intervention. Thus, Keynesian economists and members of the former Obama administration justified the taken interventions as necessary and accurate. With net profits of \$3.2 billion, the first quarter of 2011 was GM's best quarterly performance since 2001 (Cole *et al.*, 2008). This appealing financial result has often been mentioned to argue that those who opposed GM's bailout were – morally and economically - wrong. We do not disagree that the combination of expansive monetary policies with different fiscal policies has (meanwhile) saved GM. However, we argue that the unsustainable combination of quantitative easing, scrappage campaigns, bailouts and other public interventions does not give any indication on whether GM has actually become a more competitive and efficient company. According to Ikenson (2011), from 2008 to 2011, the US government directly committed more than \$50 billion to the rescue of GM, using public money to nourish a company which still needs to prove that it can survive an economic crisis without protectionism. One must also mention that \$1.8 billion of the \$3.2 billion reported profits in the first quarter of 2011 were attributable to the one-time sales of shares in Ally Financial and Delphi (Cole *et al.*, 2008). Moreover, the mentioned \$50 billion outlay between 2008 and 2011 excluded several indirect subsidies, such as \$12-\$14 billion in tax breaks granted to GM while in bankruptcy, and another \$17 billion in funds committed from the 'Troubled Assets Relief Program' (TARP) to GM's former automotive financing entity GMAC (an acronym for General Motors Acceptance Corporation).

Also excluded from this calculation was GM's portion of the \$25 billion Energy Department slush fund for research and development activities related to 'green automotive technologies', as well as a temporary \$7,500 tax credit granted for every unit sold of Chevrolet's alternative fuel vehicle, the 'Volt' (Cole *et al.*, 2008). When evaluating these bailouts, one must not ignore the questionable diversion of TARP funds and the coercive transfer of assets from shareholders and debt-holders to pensioners and their union. One must also consider the long-term impact of the signals the US government sent by hampering GM's competitors, and by not holding the United Automobile Workers union responsible for their impact on GM's bankruptcy (Ikenson, 2011). These public

interventions distorted the market, hampering true competition. Relevant market share, sales revenues, profits, and productive assets were artificially taken away from other OEMs such as Volkswagen, Kia, Hyundai, or BMW which had taken better operational decisions, while operating more efficiently and responding better to consumer demand than GM. Moreover, all these foreign corporates had already established their own US factories, creating thousands of new jobs in the USA, such as Honda with its operations in Ohio, Toyota in Kentucky, Nissan in Tennessee, BMW in South Carolina, and Hyundai in Alabama. (Ikenson, 2011). The bailout hurt the overall US economy by misallocating resources, as market forces were replaced by special-interest deal-making. Moreover, in case of potential future crisis, the seen bailout is likely to encourage other automotive OEMs, as well as other industries to seek public support whenever they face similar situations. We conclude that such corporate bailouts are not only unfair to taxpayers, but also to the successfully operating (often foreign) corporates which are getting taxed, while less competitive (often local) producers are being subsidized.

Consequently, one may ironically argue that politically-motivated bailouts and other fiscal policies after the credit crunch tried to save those automotive OEMs whose internal corporate challenges had previously been significantly intensified by the financial crisis. And the financial crisis itself had precisely been caused by the unsustainable increase of money supply and artificial credit expansions caused by the Federal Reserve's ultra-loose monetary policy. In line with Ikenson (2011) we are convinced that the actions taken by the US government undermined the rule of law and distorted the market signals. The implemented economic policies were not based on economic feasibility but on political activism and opportunism (Salerno, 2015). Limited resources are most productively used in a free economy where the more innovative, efficient, and customer-focused companies are allowed to gain market share and to increase profits, while the less competitive corporates may ultimately disappear (McMaken, 2018). The economist Xavier Sala i Martín (2003), already stated that a solution which is 'theoretically' correct but practically not feasible is irrelevant, as in economics, good intentions are irrelevant, what matters are only the results.

Thus, we can summarize that the monetary and fiscal policies throughout the first decade of the 21st century clearly influenced the sales strategies of automotive OEMs. Mentioned scrappage campaigns helped to cover-up the actual structural weakness of the automotive industry, in regard to general production overcapacities and a lack of innovation by several OEMs. The illusion of economic stability and microeconomic competitiveness were kept alive with these incentives, and consequently, an artificially stable market structure reduced the need of individual companies like General Motors, Chrysler to optimize their internal structure and performance (Ikenson, 2011; Salerno, 2015). We want to further explain our reasoning when showing the similarities between the processes occurring within a truly free market with those internal changes occurring in agile companies. Successful entrepreneurs will always invest in those business areas which are essential for the company and/ or those which offer the highest potential for additional profits (Kirzner, 1973; Rothbard, 1962). We may take the example of a company which operates in a total of ten business areas, of which seven areas provide profits whereas the other three areas are constantly leading to losses. The company's management is likely to analyse those three unprofitable areas, to see if ongoing operations and investments in these areas can be justified. This could be the case, either if the company's presence in these sectors is considered as strategically crucial, or because a relevant mid- to long-term growth potential can be detected. If none of these justifications can be found, the company is likely to refrain from mentioned non-profitable business areas, to concentrate its financial and human resources on more profitable activities. Once the losing activities are shut down, the released funds can then be used to strengthen the profitable areas or even to invest into new, profitable activities. On a larger scale, this is what would happen in a free market economy. Unfortunately, this is precisely what the discussed public interventions, particularly the bailout programs, prevented from happening. The government interventionism did not rescue the economy, on the contrary, it helped to protect those goods and services which consumers did not request. In line with Mises (1940), Rothbard (1962), Huerta de Soto (2005), Bagus *et al.* (2014) and Benegas Lynch (2011, 2016), we conclude that public interventions increase misallocations, by draining scarce resources from sustainable natural growth and efficiency.

4.4.1.1 Public Bailouts as Harmful Market Distortions

As already touched on, our ethical theory is based on the non-aggression theorem, as developed by Rand (1964) and Rothbard (1973, 1982). Accordingly, it is crucial to highlight the benefits of human cooperation in a free society, protecting private property. In this order, individuals shall achieve their desired ends through interaction in the market process (Mises, 1940). Defending the free market concept with unrestricted prices (Kirzner, 1963), we support the spontaneous order concept as defined by Hayek (1944, 1948, 1973) which must be seen as clearly superior to public interventionism. Therefore, and in line with Ikenson (2011), we argue that a regular Chapter 11 bankruptcy without a bailout or any other public incentives would have been a more sustainable approach than the seen public interventions. The general Chapter 11 proceedings should have been sufficient to help GM in adjusting its operations in order to then become competitive and profitable again. Mentioned bankruptcy laws were precisely designed to enable struggling companies to reduce costs and to streamline operations.

We strongly criticize any public interventions in the bankruptcy process of corporates, as any governmental supports for specific companies or industry sectors must lead to market distortions. By referring to the term 'the road to serfdom', Hayek (1944) had already warned that an increased government control of economic decision-making through central planning will lead to a reduction of wealth and individual liberty. Accordingly, public protectionism preserves uncompetitive companies and inefficient production processes, extracting resources from more profitable business opportunities.

Thus, while bailouts may have protected some jobs in the short run, such interventions intensify the misallocation of resources in the long run. Moreover, it also creates moral hazard by artificially incentivizing market participants to invest into excessively risky activities. In this context, moral hazard refers to the ability to take excessive risks without having to fear to suffer the eventual negative consequences. In the explained scenario, certain corporates can expect to be bailed-out in case their management decisions turn out to be economically disastrous for the company. Consequently, from a long-term perspective, protectionist actions such as public bailouts will

ultimately increase the general likeliness of corporate bankruptcies. White (1977) critically observed that bankruptcy law can be considered as a system of interventionary legislation which interferes with the ability of individuals to freely establish the terms of loan contracts. However, we argue that bankruptcy should be seen as a normal part of economic life, covered by laws which shall guarantee that stockholders will be compensated as much as possible. After the bankruptcy filing of unefficient, uncompetitive companies, more efficient firms will attempt to cover the new market potential. Moreover, certain competitors are expected to acquire those parts of the bankrupt firms, which can be put to productive use.

If a company filing for Chapter 11 has the potential to recover, a bankruptcy judge is expected to guide the corporate throughout this process. In such a process, many rigorous decisions need to be taken, which may certainly include a comprehensive number of layoffs. It is likely that the inflated management structures of GM would have been streamlined in a much more radical way than what actually occurred. Moreover, a regular bankruptcy process would have required GM to thoroughly adjust its labor structure, to dissolve its union contracts, causing an end to excessive pension benefits and inefficient workplace practices.

However, based on Hayek's (1944, 1948, 1973) findings on the superiority of the spontaneous order versus centralized planning, we conclude that the Chapter 11 reorganization process cannot accurately value and reorganize an insolvent firm. The limited access to information, places the bankruptcy judge during a Chapter-11 filing in a similar situation to that of a central planner in a planned economy. Thus, the bankruptcy judge is given the impossible task of economic calculation without being able to obtain all relevant market. However, we certainly agree that the seen public bailouts for General Motors and Chrysler must be criticized even more significantly than the general process of bankruptcy filing in the USA. We agree with Ikenson who stated that the U.S. auto industry would have needed a shakeout (as a natural process within a free market), instead of the seen bailout (Ikenson, 2011).

4.4.1.2 The Myth of *Too-Big-to-Fail*

In line with Salerno (2015), we refuse to believe that a public bailout could be justified by the pure size (or, more precisely, by the number of employees) of any company, warning that such major corporations would be 'systemically relevant' and simply 'too big to fail'. We agree that the term 'too big to fail' cannot be specified by any concrete quantitative or qualitative factor. Moreover, in 2008, when General Motors asked for public bail-outs, there were 8 US-American companies, namely AT&T, GE, McDonald's, IBM, Wal-Mart, Citigroup, Kroger and Sears, which had more employees than General Motors. Several other companies, such as Home Depot, United Technologies, Abercrombie & Fitch as well as Verizon, had nearly as many employees as General Motors and clearly more employees than Chrysler.

Thus, when exactly is a company 'too big to fail', who defines the minimum number of employees a company must have in order to be saved by public interventionism? We agree with Rothbard (1962) and Kirzner (1973), considering it as unethical to force taxpayers to bail out inefficient and uncompetitive companies with failing business models and a lack of innovation. When looking at the corresponding sales evolution, one may conclude that already throughout the years before the subprime crisis, GM and Chrysler had produced vehicles which consumers valued less than those of their competitors.

Meanwhile, instead of optimizing their products and business models, mentioned OEMs had invested significant amounts of resources on lobbying for public subsidies and other forms of protectionism (Roland, 2010; McMaken, 2018). In 2007, before the economic crisis, GM had even spent USD 14.3 million on lobbying activities in the USA. In 2010, after the bailout and Chapter 11 bankruptcy reorganizations of General Motors and Chrysler, the government held a 60 percent ownership stake in GM and a 10 percent stake in Chrysler. Despite these public supports and the corresponding partial ownership by the US government, GM still spent USD 4.3 million and Chrysler USD 2.3 million on lobbying activities between March 2009 and March 2010 (Roland, 2010; Whoriskey, 2011). In the total year of 2010, GM spent USD 6.6 million on its lobbying efforts according to public records. As of 2010, mentioned lobbying was primarily focused on avoiding

(or minimizing) planned legal intensification of safety and pollution regulations for the automotive industry. Thus, while GM's was able to avoid its closure mainly thanks to significant public interventionism, they simultaneously invested into lobbying activities to reduce the impact of planned safety and environmental protection regulations (Whoriskey, 2011). We need to point out that even if GM and Chrysler had been unable to survive bankruptcy without any public aid, the resources freed from its grasp could have been beneficial to other OEMs, which could have used these resources more effectively. Ultimately the target for any efficient economy must be to allow the free market processes to shift resources to marginally more productive activities. Following the concepts of Mises (1940), Hayek (1939, 1944, 1990), and Huerta de Soto (2005, 2009b), we argue that governments should have denied to 'protect' any specific company or business sector, and instead should have let the market reevaluate resource values. This approach might have led to further bankruptcies, but such company closures would have been part of a natural readjustment processes and could have been more sustainable than the experienced public interventions (McMaken, 2018).

Government bailouts preserve valueless production while preventing valuable production from ensuing. Moreover, bailouts decrease the overall production of an economy by extracting resources from the private sector which is more capable to properly allocate resources in a productive manner than the public sector. The GM bailout rewarded the irrational politics of the United Auto Workers union with its inflexible and anti-competitive concepts. It distorted the market, coercively reducing the opportunities of other automotive OEMs to increase their market share, sales volumes and profits. Consequently, these interventions were counterproductive for the long-term competitiveness of the automotive industry, in which the most competitive producers should provide their goods to attracted consumers, without depending on subsidies, bailouts and other fiscal policies paid for by the taxpayers (Ikenson, 2011).

4.4.2 Public incentives to Cover Monetary Policy Effects:

The Scrappage Programs between 2008-2010

In our research questions, we indicated our aim to evaluate if the scrappage campaigns implemented in the period from 2009 to 2010 were sustainable. In our propositions for the discussed *a priori* truths we argued that fiscal policies and other public interventions lead market distortions and unsustainable misallocations.

The subprime crisis of 2008 had provoked a significant drop in global vehicle sales, for which governments of several countries implemented different public incentives, including specific scrappage programs, to revitalize the automotive sector and new car sales (Köhler *et al.*, 2015). Also in the years before the subprime crisis, the importance of the automotive industry was often highlighted by several politicians, journalists and economists (Carrasco *et al.*, 2009). In 2007, 29% of the global automotive vehicle production occurred within the European Union, as a total of 15 million people were working directly or indirectly (including dealer ships, suppliers and the after sales business) in the automotive sector (ACEA, 2008). By 2007, the three markets within the EU with the highest volumes of annual vehicle production were Germany, France and Spain (Matas *et al.*, 2008). However, whereas from 2004 to 2006, vehicles production in Germany had increased by +4.48%, production in the entire EU had decreased by -3.96% (in France even by -10.99%).

Simultaneously, production had increased in the new EU-member states Czech Republic, Hungary, Poland, Romania, Slovenia and Slovakia by an impressive average of +86.08%. Thus, even in the booming years before the financial crisis of 2008, several western European countries had struggled to compete with the new competition caused by new EU-member states in Eastern and Central-Eastern Europe (Carrasco *et al.*, 2009). Based on the mentioned findings we conclude that the economic evolution of Spain within the first decade of the 21st century can be seen as the 'perfect' example of how a perceived economic growth can be artificially created by expansive monetary policies, even though the country's general economic competitiveness had been heavily challenged by the mentioned expansion of the EU towards Eastern Europe. When

in 2008 the financial crisis occurred, politicians and several economists alike concluded that in countries like Germany, France and Spain, a drastic downturn of the automotive sector could lead to a significant increase in the unemployment rates of these countries. We argue that, apart from the economic impact, such further aggravation of the crisis would have also been a major political challenge to the respective local (democratically elected) governments and their attempts to be re-elected. Hoppe (1993, 2006) stated that democracies are based on short-sighted thinking, populist actions and a disregard to capital values. Consequently, democratic governments are rarely trying to take the economically most rational and sustainable decisions from a long-term perspective, but prefer to please the short-term desires of the majority to remain in political power. Mises (1940) and Leoni (1961) highlighted that in democracies, majorities tend to oppress minorities, as the rights of individuals may easily be violated under sanctions approved by the majority. Hoppe criticized the 'presence-orientedness' of democracies, in which pressure groups seek to increased government expenditures. According to Hoppe (2006), democracies must be seen as 'publicly owned governments', in which governments tend to take populist decisions, leading to an expansion of public debt and redistribution of wealth. Thus, after the expansive monetary policies, which had been intensified since 2001, additionally, as a response to the subprime crisis in 2008, significant interventionist fiscal policies were seen as 'necessary' in order to avoid a further economic recession and following mass unemployment.

4.4.2.1 Spain: The Scrappage Program 'Plan 2000E' and the Monetary Origins for the Fiscal Interventions

As stated, Spain's economy was significantly hit in 2008, as the global economic crisis which followed the subprime crash, coincided with the bust of Spain's homemade real estate bubble. Thus, in 2008, and after 14 years of growth, this caused the deepest economic downturn in democratic Spain (Huerta de Soto, 2009b). However, to better understand the causes and consequences, we briefly want to review the evolution of the Spanish automotive industry since the end of the totalitarian Franco regime up to the global subprime crisis in 2008.

The end of the Franco dictatorship in the 1970's, the following opening of the Spanish economy, and finally its integration into the European Community can be seen as the framework conditions for the rise of Spain (and Portugal) as important automotive economies (Köhler *et al.*, 2015). The initially rather low wages, compared to other European countries, enabled Spain to gain competitiveness, attracting huge investments by multinational companies, including automotive OEMs which started to establish local factories.

Thus, in the 1970s and 1980s, Spain received significant direct investments, and its automotive sector was one of the most relevant growth industries. Several European and US-American automotive OEMs opened plants in Spain, while a considerable supplier industry emerged due to foreign investments of multinationals as well as new Spanish firms (Carrasco *et al.*, 2009). However, with the implementation of the Euro currency and the EU enlargement with the entrance of several Central and Eastern European countries (CEECs), Spain started to turn from low-wage into an average-wage country with a considerable impact on its economic competitiveness. Thus, since the beginning of the 21st century, production figures declined, although sales kept rising until the crisis of 2008–2009 (Köhler *et al.*, 2015).

In 2007, the annual turnover created by the automotive sector covered 4.9% of Spain's GDP, 21.2% of the country's exports, 15.9% of the country's imports and 9.6% of the country's employment (working directly in or indirectly for the automotive industry). In 2007, a total of 11 automotive OEMs had established 18 factories in Spain, producing 2,889,703 units within the same year. While the general economy was still growing, supported by expansive monetary policies, also the annual turnover of mentioned automotive OEMs had increase by +7.4% to € 51.768m versus 2006 (Carrasco *et al.*, 2009).

Table N° 13: Overview of Spanish Automotive Production (2006-2007)

Topic	2006	2007	Delta (%)
Turnover (€ in million)	48,190	51,768	+7.4
Units Produced	2,777,435	2,889,703	+4.0%
Units Exported	2,272,872	2,389,224	+5.1%
Employees (direct only)	70,601	69,929	-0.9%

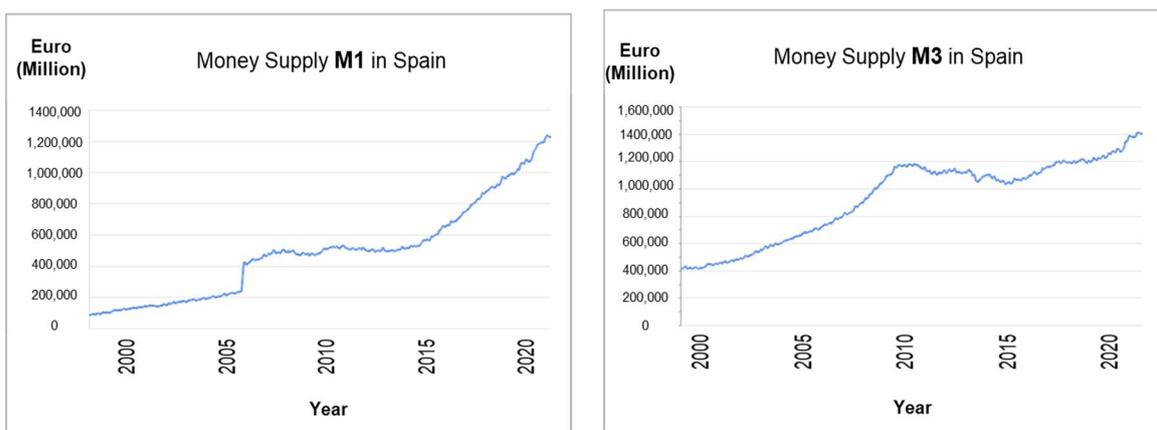
(Author's own design. Source: ACEA, 2008)

However, as stated, also before the outbreak of the economic crisis in 2008, automotive production in Spain had already been strongly challenged by new factories which were being built in new-EU member states such as Poland, Romania and Slovakia. Moreover, the Spanish economy had already slowed-down at the beginning of 2008, several months before the bankruptcy of Lehman Brothers Holdings Inc (Bagus *et al.*, 2014).

The reasons of the general financial crisis had already been explained in this research, but we briefly want to summarize the key issues specifically for the Spanish economy:

Between 2001 and 2007 the money supply (M3) in Spain was growing at an average annual rate of close to 11%, for which M3 was growing faster in Spain than in the rest of the EMU (Alonso Neira *et al.*, 2011, 2013). Simultaneously, Spain experienced important capital imports between 2003 and 2007 as European (mainly German and French) banks increased their loans to Spain and other ‘peripheral EU countries’. In the case of Spain, this capital financed the credit expansion of local banks. (Bagus *et al.*, 2014).

Charts N° 45 & N° 46: Money Supply: M1 & M3 Evolution in Spain (2000-2020)



Own elaboration, based on data from: Bank of Spain (2021)

According to the Bank of International Settlements, Spain’s current account deficit grew from 23,700 million euros in 2002 (3.2% of the GDP) to 104,700 million in 2007 (9.9% of GDP, and

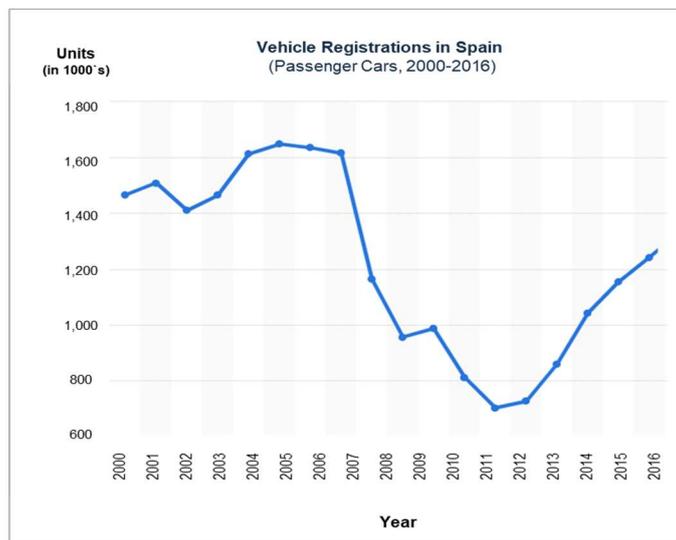
correspondingly foreign liabilities of Spain's banking sector increased from 312,000 million euros in 2002 to 872,000 million euros in 2007. Spanish banks granted long-term loans at historically low interest rates, while the average mortgage rate fell to 3.1%. Thus, particularly loans to the construction sector significantly increased (from 347 billion in 2002 to 1,075 trillion in 2007). The main borrowers beside the construction sector were households and companies. According to the '*Encuesta de Población Activa*' of the INE ('*Instituto Nacional de Estadística*'), employment in Spain's construction sector increased from approximately two million in 2002 to 2.6 million in 2007, even though simultaneously, labour costs in Spain increased by 22.5% - clearly more than in Germany (7.6%) or France (17.7%). Thus, this significant increase in construction activities was clearly caused by the availability of cheap credit due to the low rate of interest. To make things even more unsustainable, also public spending soared as politicians eagerly spent the newly gained public revenues (which increased by 151 billion euros from 2002 to 2007) from the (artificial) construction boom. Thus, we can summarize that in 2007, Spain's economy was significantly distorted, with excessive focus towards construction in terms of investment and employment, while many households, banks and other companies were already highly indebted (Huerta de Soto, 2009b; Alonso Neira *et al.*, 2011; Bagus *et al.*, 2014).

However, since the beginning of 2006 and due to the seen strong and growing demand for credit, interest rates started to rise again. By the end of 2007, these interest rates had reached 5.38% in the case of mortgages, 5.97% in the case of corporate loans below one million euros and 9.53% in the case of consumer loans. Consequently, employment began to fall and in the year 2008 alone, the Spanish economy lost 600,000 jobs, mostly in the construction sector. Thus, we fully support the findings of Huerta de Soto (2009b), Alonso Neira *et al.* (2011, 2013) and Bagus *et al.* (2013, 2014) which indicate that the downturn of the Spanish economy in 2008 was a consequence of the expansive monetary policies and the following extensive housing bubble from 2002 to 2007. This economic bust did not only lead to banks suffering severe losses, but economic activities generally decreased, also causing a crisis of the automotive sector. We argue that particularly those automotive brands which had already shown a lack of competitiveness before the crisis, such as SEAT and Opel, were then significantly hit. Thus, we conclude that the

unsustainable fiscal policies implemented in several markets after the subprime crisis of 2008 have their original cause in the similarly unsustainable expansive monetary policies in the years before 2008. In other words, without mentioned expansive monetary policies and artificially low rates of interest defined by central banks (such as the Federal Reserve and the European Central bank), all the populist short-sighted fiscal policies which followed, including scrappage campaigns and mass bailout actions, would not have been necessary.

The following charts clearly show the correlation between interest rates and (artificial) growth in the 'early stages of production'. From 2001 to 2007, new car sales significantly increased in Spain to a large extent thanks to extremely low interest rates. Simultaneously, also the housing market as well as the commodity price indices significantly increased within the mentioned period.

Chart N° 47: Annual New Car Registrations in Spain (Evolution 2000-2016)



Own elaboration, based on data from: Statista (2020)

The mentioned chart (above) illustrates the number of new passenger car registrations per year in Spain between 2000 and 2016. The shown numbers indicate how the Spanish vehicle market

kept growing until 2007. This growth was strongly related to the expansive monetary policies, which then led to the economic bust in the third quarter of 2008, also severely hampering the Spanish automotive market evolution. Correspondingly, in order to 'incentivize' consumer spending, the scrappage campaign was launched in 2009.

The Spanish scrappage program was introduced in the context of a general policy called 'Plan 2000E', in order to provide a short-term stimulus to the economy by increasing public expenditures. The Spanish scrappage scheme was launched in May 2009, with a special credit scheme for new passenger cars with CO₂ emissions of less than 120 g/km and trucks with up to 160 g/km. The public incentive consisted of a direct customer bonus of €500 per car from the state government plus an additional €500 per car from the corresponding regional government. Moreover, it was expected that the automotive OEMs would also grant an additional subsidy of €1,000 per car, leading to a total amount of €2,000 per car. In May, the scheme was initially launched for a planned period of one year - or until the budget of €100 million would be exhausted. After five months, this budget had already run out and a second stage of the plan with a budget of €40 million was implemented for the last two months of the year 2009. In aggregate terms, these incentives provided satisfying results by stabilizing the demand for vehicles.

Unlike its predecessor the so called 'Plan VIVE', which was a program launched to subsidize the financing of vehicle purchases (Matas *et al.*, 2008), the 'Plan 2000E' provided direct sales support for the final customer. While the 'Plan VIVE' was an obvious public subsidization program to artificially boost vehicle sales via public interventionism, the successor program 'Plan 2000E' at least pretended to focus on environment protection, by only supporting sales of vehicles with low CO₂ emissions. Encouraged by stabilized vehicle demand, the Spanish government extended the Plan 2000E to 2010 with an additional budget of another €100 million. By July 2010, also this budget was already exhausted.

Table N° 14: Vehicle Scrappage Programs in 2009 (USA & Major European Markets)

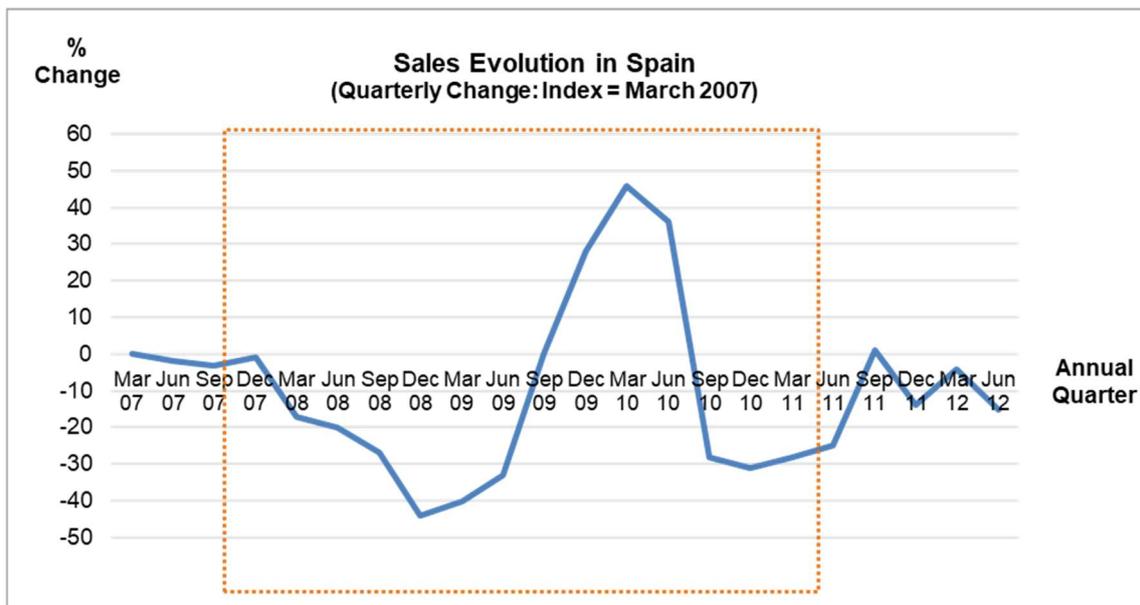
Country	Maximum incentive (per unit)	Car age requirement	Total cost to government
United States (USA)	€ 3,309 (USD 4,500)	below 25 years	USD 3 billion
Germany	€ 2,500	above 9 years	USD 7.1 billion
United Kingdom	€ 2,410	above 10 years	USD 500 million
France	€ 1,000	above 10 years	USD 554 million
Italy	€ 1,500	above 10 years	-
Spain	€ 2,000	above 10 years	USD 220 million

Own elaboration, based on data from: Cantos-Sánchez et al. (2015)

The exogenous character of this campaign came as a surprise to many consumers, providing a financial incentive to invest into the purchase of an elaborate good, despite the economic instabilities within the analysed period of time (Cantos-Sánchez *et al.*, 2015).

However, Jiménez, Perdiguero and García (2016) detected that the Spanish 'Plan 2000E' campaign led to an increase of 650€/unit of the relative vehicle transaction prices (excluding the Plan 2000E customer bonus), as the automotive OEMs and their franchise dealers were able to significantly reduce their average customer discounts (versus the average discounts given prior to the Plan 2000E campaign). Thus, many customers perceived the Plan 2000E bonus already as 'a sufficient discount', for which the automotive sector was able to use the public incentives to reduce their own average discounts to the final customer. In line with Jiménez *et al.* (2011) we argue that the fiscal stimulus, financed by tax payers, was not properly returned to the consumers. As shown in the following chart, the public incentives produced a short-term effect, as the decline in new cars sales re-appeared and remained as of July 2010, right after the scrappage campaign had been stopped.

Chart N° 48: New Car Sales Evolution in Spain: Quarterly Percentage Change (Index)



Own elaboration, based on data from: Directorate-General of Traffic (2013)

We can conclude that the incentivized anticipation of vehicle purchases by consumers led to an unsustainable market distortion. Moreover, these substitution effects were only analysed within the car industry itself, without considering any potential effects on other industries. Thus, even if scrappage programs provoked a relevant rise in the purchase of new vehicles, such rise in consumption is likely to occur with a simultaneous reduction in the consumption of other types of goods (Jiménez *et al.*, 2011).

The Spanish passenger car market significantly dropped in 2008, particularly suffering in the 2nd half of the year (ACEA, 2012). In May 2009, with the start of the Plan 2000E campaign, vehicle sales quickly (and artificially) recovered, causing a quick and abrupt demand increase which to this extent would have been highly unlikely without significant public subsidies. In particular for the local automotive brand SEAT these policies were crucial, as it had been the market leader before the economic crisis, heavily depending on its key (domestic) market.

4.4.2.2 Germany: The Scrappage Campaign “*Umweltprämie*”

Also in Germany, the impact of the local scrappage campaign “*Umweltprämie*” (publically known as “*Abwrackprämie*”), was quite significant. Owners of vehicles older than 9 years were entitled for a scrappage premium of €2,500 when buying a new car. The program was launched in January 2009 with an initial budget of €1.5b (Kreder, 2020). As the German car market started to boom with an unexpected increase of 40% (March 2009 versus March 2008), in 2009 the German government decided to continue the scrappage scheme, causing an estimated net impact on the German budget of approximately €5.0b (Kreder, 2020). Automotive OEMs like Ford, Hyundai, KIA, Toyota, VW-Group, FIAT as well as the French brands significantly benefitted from the program, boosting sales of smaller passenger cars in the A-, B- and C-vehicle segments. Ford significantly increased sales of its models Ford Ka, Fiesta, and Fusion, achieving an increase of 56% in April 2009 (vs April 2008)³. On the other hand, domestic luxury automakers like BMW, Mercedes-Benz, and Porsche had little benefit from the program as the impact of mentioned 2,500€ scrappage premium was likely not relevant enough to stimulate purchases of the corresponding higher-priced new vehicles. Thus, the scrappage campaign must be criticized for at least 4 negative consequences: First of all, the public incentives for the automotive industry simultaneously drew-away investments and consumption from business sectors which continued to offer their products and services without any public incentives (Jiménez *et al.*, 2011). Secondly, the achieved automotive market growth was only temporary, in most cases simply leading to a pre-drawing of planned/ needed investments into the purchase of automotive vehicles. Thirdly, the scrappage campaign led to a market distortion within the automotive industry, generally favoring those OEMs focusing on price-sensitive vehicles, whereas premium brands and other upscale vehicle models could barely benefit. Fourthly, particularly in the case of Germany, one cannot even argue that these interventions ‘protected millions of workers’ jobs’, as for the

³ ACEA (abbreviation for ‘Association des Constructeurs Européens d’Automobiles’) is the European Automobile Manufacturers’ Association, publishing vehicle registration data for European markets on a monthly basis on its website. Throughout this thesis, we referred to ACEA’s automotive market data for different periods in time, within the individual analysed markets.

previously indicated reasons, local German brands (with domestic factories) like Audi or BMW benefitted clearly less from these incentives than importer brands like KIA, Hyundai, Fiat or Peugeot (ACEA, 2011). However, the further stable corporate evolution of BMW, Audi and Porsche showed that OEMs which had been run in a strategic, future-oriented and customer focused way, properly combining entrepreneurial alertness and creativity with efficient cost reduction, can even survive economic busts caused by monetary policies and do not depend on politically motivated, wasteful subsidies.

4.4.2.3 USA: 'Cash for Clunkers'

The Car Allowance Rebate System (CARS), also known as '*cash for clunkers*', was a \$3 billion US federal program to stabilize the US-vehicle market, which had suffered from the financial crisis in 2008. It was promoted as providing a stimulus to the economy, boosting auto sales, while increasing the share of safer, cleaner, and more fuel-efficient vehicles, as the support scheme was meant for US-citizens which intended to purchase 'fuel efficient vehicles' when trading in a less fuel-efficient vehicle. The program ran from July to August 2009, when the appropriated resources were exhausted. The initial \$1 billion appropriated for mentioned campaign were exhausted by 30 July 2009 due to the high demand, and consequently US-Congress approved an additional \$2 billion for the program. Depending on the type of car purchased and "the difference in fuel economy between the purchased vehicle and the trade-in vehicle", the total credit given in form of vouchers to eligible customers was \$3,500- \$4,500. The corresponding new car dealers were able to reduce the purchase price by the amount of the corresponding customer voucher. Mian and Sufi (2012) as well as Li *et al.* (2013) applied a differences-in-differences approach to assess the recent US program "cash for clunkers". Their empirical studies showed that scrappage subsidies had a positive effect on car sales in the short run, but no relevant effect on the total sales volume in the long run.

The scheme resulted in 690,114 dealer transactions, causing a total cost of \$2.877 million. Main profiteer of all OEMs was Toyota, accounting for 19.4% of the total sales, followed by General

Motors with 17.6%, Ford with 14.4%, Honda with 13.0%, and Nissan with 8.7% (Blanco, 2009). Burton Abrams and George Parsons, both professors at the University of Delaware, stated that for each vehicle trade, the program caused a net cost of approximately \$2,000.

In order to justify mentioned government interventionism, the scheme was presented as ‘an environment protection campaign to decrease CO2 emissions’, and consequently the US Department of Transportation was satisfied to announce that the average fuel efficiency of the trade-in vehicles was only 15.8 mpg, compared to 24.9 mpg for the new cars purchased to replace them. However, researchers at the University of Michigan argued in a research paper that there had already been a trend towards buying vehicles with better fuel economy due to the high gasoline prices of 2007 and 2008. Thus, mentioned scrappage campaign mainly helped to pull-forward the sales of new, fuel-efficient vehicles.

4.4.2.4 Effects of the Scrappage Campaigns

We raised the research question, whether the discussed scrappage campaigns were sustainable, whether they rather ‘stabilize’ or distort the automotive market. From a Keynesian perspective, the program was required to avoid a liquidity trap in times of economic depression. However, Mian and Sufi (2012) concluded that these programs were only able to pull purchases forward – but at a high additional cost. The positive effect during the campaign was directly reversed in the following months when significantly fewer cars were sold. Moreover, the monetary inflation which was necessary to finance the scheme raised the general price level with the corresponding negative effects - in particular for lower class workers and employees, as shown by the Cantillon effect. Accordingly, the poor and lower-middle class were ultimately suffering most from the consequences of the schemes which led to a price increase of the remaining cars in the secondary market (Mian, A., Sufi, A., 2012). Excluding potential benefits such as the reduction of nitrogen oxides (NOx) and carbon dioxide (CO2) emissions, as well as of other pollutants due to the substitution of old vehicles by new one, the results show that scrappage programs mostly led to negative effects, such as a misallocation of resources and a corresponding market distortion.

Ambassadors of bailout programs during the financial crisis, such as Naudé (2009), argued that the negative impact for the US economy would have been worse if companies such as General Motors and Chrysler had not been saved by government interventionism. A complete failure of these corporates could have led to the bankruptcy of thousands of parts suppliers, dealerships, and other direct service providers. In 2009, and according to the Center for Automotive Research (“CAR”), all auto manufacturers and parts suppliers based in the USA directly employed over 1,200,000 workers of whom about 240,000 were employed by the Detroit Three. Another indirect effect of a complete failure of General Motors and/ or Chrysler would have been the loss of revenue to state and local governments, caused by the transfer of health care costs from auto manufacturers to Medicare, and the transfer of pension costs to the Pension Benefit Guarantee Corporation (“PBGC”). In 2009, the Detroit Three had \$100 billion of healthcare liabilities for retirees, spending almost \$13 billion annually on pensions – which in the case of a complete failure of these corporates would partially have to be covered by the PBGC (Burr, 2009). Another relevant aspect is the country’s foreign trade balance, as in 2009 the value of exported automobiles, parts and engines made up approximately 7% of the USA’s total exports. Therefore, the combination of lost exports and increased imports would have had a significant adverse effect on the USA’s already significant balance of trade deficit.

However, these arguments seem to miss the real fundamental aspects, crucial for a properly working, sustainable economy, which are the concepts of “dynamic efficiency”, “entrepreneurial creativity” and the “impossibility of socialism” primarily defined by von Mises (1936, 1940), Hayek (1944, 1979), Kirzner (1963, 1973), and Huerta de Soto (2005, 2009a).

Even if the US automotive industry, including its parts suppliers, dealerships and other service providers, would initially suffer from an OEM’s failure, the market would naturally recover if the natural demand for these services is given and if the mentioned market players are truly competitive on the global stage. The mentioned costs related to health care and pensions, which would potentially partially be transferred to the PBGC and (other) public institutions, would be a severe burden, but must rather be immediately stopped due to their inefficient costly structures,

rather than using costs and risks of these failed services to further justify inefficient bailout projects for uncompetitive corporates. Mises (1940) argued that over the long-run, public spending, such as public incentives, bailouts and other forms of subsidies, cannot create additional jobs. Such interventions are based on the transfer of wealth, leading to a suspension of the market forces and the corresponding consequences of malinvestments and market distortion. According to Mises (1940), if a government provides such funds to selected groups by taxing its citizens, it will ultimately destroy wealth and threaten more jobs than it pretended to create/ protect. In our concrete example, the market distortions caused by scrappage campaigns, bailouts and other interventions led to the misallocation of resources in unsustainable business concepts – resources, which in a free market would have been allocated differently. As Huerta de Soto (2009b, p. 233) stated, *“the market is very agile and quick to detect errors, spontaneously setting in motion the necessary investment processes to meet the unavoidable restructuring as soon as possible and with minimal costs”*.

We argue that even playing ‘the national card’, by arguing that it is vital for an economy to maintain its major corporates alive, does not make sense from a long-term economic perspective. The natural evolutionary process within any market must not be stopped nor distorted by public institutions (Ghate, 2015). Consequently, those companies which have made the proper decisions are much more likely to survive even within a very competitive environment, while companies which did not detect market changes and niches, while producing in an inefficient costly way, are likely to disappear over the long run (Sala i Martin, 2013).

Already back in the early twentieth century, Joseph Schumpeter pioneered studies of innovations as engines of economic development. Schumpeter argued that the dynamics of the capitalist system was driven by the process of "creative destruction". The introduction of new elements and the consequent stimulus to new consumer needs cause discontinuities in the current economic structure (Schumpeter, 1984). Thus, innovations are mostly leading to changes in the existing economic balance. Those entrepreneurs capable to exploit these opportunities on behalf of their organization will benefit from the imbalance. First of all, we need to define what innovation actually refers to. Tigre (2006, p.72) states that an innovation occurs with the effective practical application

of an invention. Rogers (2003, p.11), on the other hand defines it as "an idea, practice or object that is perceived as new by an individual or another adoption unit". Thus, Rogers' concept does not properly address the issue of implementation, which was done by Tidd, Bessant and Pavitt's (2005), for whom innovation is the process of transforming opportunities into new ideas, putting them into practice.

As indicated, our ethical concept is based on the non-aggression theorem (Rand, 1964) and values the benefits of human cooperation in a free society, in which individuals achieve their goals through interaction in the market process (Mises, 1940). We emphasize on the benefits of a spontaneous order (Hayek, 1939, 1944) and an unrestricted price system in a free market. We argue that economics and entrepreneurial activities must ultimately focus on the coordination management of society's scarce resources. As resources are scarce while the needs and wants of people are endless, these limited resources need to be allocated in the most rational manner. In line with Kirzner (1963), Rothbard (1962) and Huerta de Soto (2009), we argue that it is not only economically efficient, but also morally accurate, if the market rewards those companies which provide better products at competitive prices with the consequence that companies providing uncompetitive products or services simultaneously lose profits and market share. Companies, including automotive OEMs, which cannot compete in the market must naturally disappear. When companies fail, the resources which had been tied to them (such as human, physical and financial capital) get freed up. Thus, business failure can be considered as a cure, as resources which had been allocated to uncompetitive corporates get released and can then stream into growing industries where a more sustainable and profitable expansion seems possible. In this context, we also want to refer to the concept of 'creative destruction', as popularized by the economist Joseph Schumpeter (1942). With the term 'creative destruction' Schumpeter (1942) emphasized that, paradoxically, the 'destruction' of one company (or entire business sector) can certainly lead to a more competitive economy and correspondingly to economic growth in the long run. Thus, the economy as a whole can benefit from the lay-off of those workers which had worked for failing uncompetitive companies, as these human resources can then be used more efficiently in more value-creating business ventures.

In line with Sala i Martin (2013), Alonso Neira *et al.* (2013), and Salerno (2015), we argue that the politically motivated approach of helping major corporates to socialize their losses (during economic crises) through fiscal and monetary policies hampers the market, leading to a harmful misallocation of resources. Accordingly, if a natural, sustainable market growth should be achieved, public bailouts and other public interventions, based on the ‘too-big-to-fail reasoning’, need to be stopped.

4.4.3 Has Recovery Been too Fast, or too Slow – or both?

After the complete abolishment of the gold standard by US-President Richard Nixon, the consequent further stretching of the fractional-reserve banking system by continuously lowering the minimum required reserve ratios, as well as after the repeal of the Glass–Steagall Act in 1999, the banking practices along with monetized subprime mortgages practically sold as no risk investments (Huerta de Soto, 1998, 2009b). After its tipping point in 2008, the following phase was characterized by severely contracted liquidity in the global credit markets and insolvency threats to investment banks and other institutions (Bagus *et al.*, 2012; Alonso Neira *et al.*, 2013). In response to that, the U.S. government announced a series of steps which can be justified from a short-term political perspective but which must be criticized from a long-term and economic point of view, such as an unsustainable ultra-loose monetary policy/ quantitative easing, as well as several bailout programs for so-called ‘system relevant major corporations and banks’.

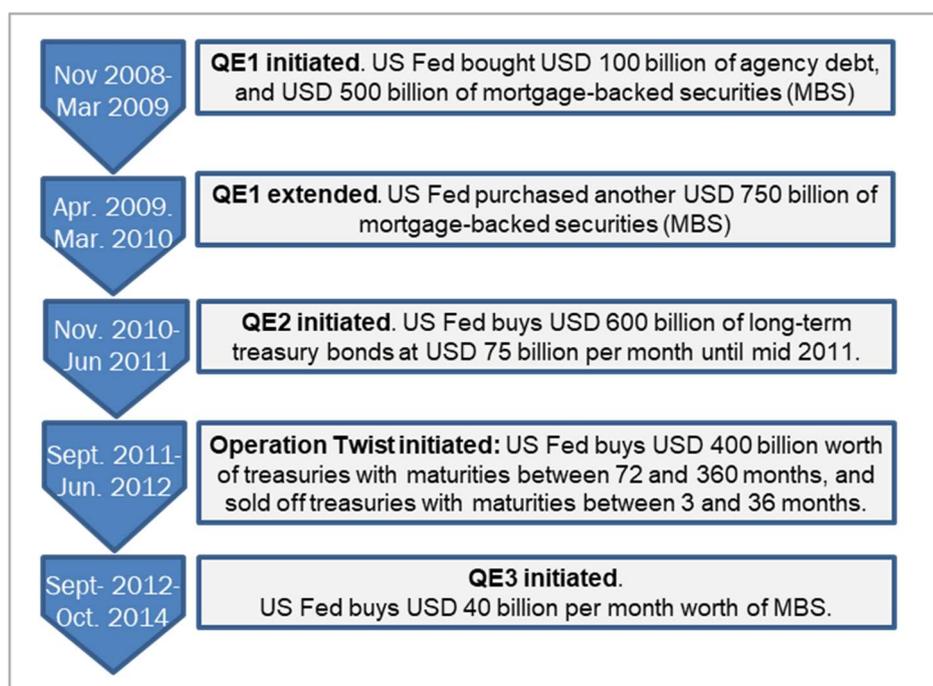
Thus, when comparing the Western economies’ status in 2019 (prior to the so-called Covid-19 crisis) with that in 2009, one may say that the economy’s recovery process has been unnatural and unsteady. In line with Bagus *et al.* (2012), Alonso Neira *et al.* (2013) and Rallo (2014), we argue that public interventionism and expansive monetary policies have distorted the market by causing the misallocation of resources, for which the affected economies could never reach their full potential. Thus, we conclude that the expansive monetary policies and coercive fiscal policies/

public incentives implemented after the bankruptcy of Lehman Brothers have led to an artificial economic growth after 2008, while simultaneously keeping the economies from growing to their actual potential level (if no resources would have been lost due to interventionism by governments and central banks). Centrally-planned public interventionism, combined with expansive monetary policies and public incentives, does not allow the economy to develop a natural, sustainable economic growth based on actual previous savings. Thus, in line with Huerta de Soto (2009b) we conclude that a short, severe recession followed by a healthy, natural and sustainable recovery without any interventionism by governments and central banks would possibly have been much more efficient from a long-term perspective. In this context, we want to briefly look at the depression of 1920–1921, which occurred in countries such as the USA and the United Kingdom, starting only 14 months after the end of World War I. It lasted 18 months, from January 1920 to July 1921, and was followed by the so-called ‘Roaring Twenties’ which brought a period of economic prosperity. The depression was characterized by extreme deflation, a significant temporary increase in unemployment rates (Grant, 2014) and a sharp decline in industrial production (including a decrease in automobile production of 60% in the USA from May 1920 to July 1921). According to Grant (2014), during the 1920–1921 depression, laissez-faire economic policies with a rather freely operating price mechanism were in place while public interventionism was minimized. These free-market policies allowed to reduce market distortions, leading to a realignment of investment and consumption in the post-war economic environment of the early 1920s. Thus, the depression can be seen as the last example of a rather unmediated business cycle downturn, not distorted by massive public interventionism. Consequently, the seen free-market policies had a direct positive impact on the recovery of the US economy, for which the mentioned depression was relatively short, compared to other economic crises.

In regard to the economic crisis of 2008 to 2010, only three of the major interventions effected by US- governments and/ or the Federal Reserve should herein be further analysed. All three of these interventions significantly interfered with the US economy’s readjustment process, impeding the natural recovery of the US economy.

1.) Quantitative Easing: Starting in late 2008, after the collapse of the global financial services firm Lehman Brothers Holdings Inc., the Federal Reserve has since then used several rounds of Quantitative Easing to ‘stimulate the US economy’, by growing its balance sheet, purchasing government bonds and mortgage-backed securities. In November 2008, the first round of QE, also later called QE1, was initiated. Since then several rounds were used for the FED to buy agency debt, mortgage-backed securities while also channelling millions of US-Dollars into longer-dated treasuries. Between the initial QE round (QE1) in November 2008 and the QE3 round in October 2014, roughly \$3 trillion were ‘deliberated’ by the Federal Reserve. We agree with Bagus *et al.* (2012), Alonso Neira *et al.* (2013) and Salerno (2015), that ultra-loose monetary policies have increased the distortion of the market, leading the way to further *malinvestment*, while creating the erroneous impression of a strong and growing economy.

Chart N° 49: Expansive Monetary Policies in USA: Evolution 2008-2014



Own elaboration, based on data from: New York Times (2014)

2.) Bail-outs: In October 2008, US-Congress launched a USD 700 billion bailout program of the U.S. financial system, called the ‘Emergency Economic Stabilization Act’ (Herszenhorn, 2008). Up until then, this had been the most expensive government intervention in US history. Instead of letting uncompetitive banks and other corporates which had incurred existence-endangering losses go into bankruptcy, the UC-Congress saved these companies with US-tax payers’ money. This law, enacted after the subprime mortgage crisis, authorized the US Secretary of Treasury to spend up to \$700 billion to purchase distressed assets, in particular mortgage-backed securities, and simultaneously supply cash directly to banks. The government’s aim was to ease the credit crisis by keeping credit flowing while protecting normal economic activity (Herszenhorn, 2008). We support the findings of Huerta de Soto (2009b), Salerno (2015) and Alonso Neira *et al.* (2013) which indicate that these bail-outs have kept uncompetitive and unsustainable companies artificially alive. Instead of allowing the market to naturally recover and restructure itself, political interventionism helped to distort the market, spending tax payers’ money on corporations, simply because from a political short-term perspective, they were considered to be “too big to fail” (Salerno, 2015).

3.) Consumption Stimulation: In 2009, the American Recovery and Reinvestment Act⁴ was passed in the US Congress, meant as a ‘stimulus package’ and based on the Keynesian economic theory. Government wanted to ‘save existing jobs and create new ones’ by counterbalancing the decrease in private spending with an increase in public spending in order to ‘stop further economic deterioration’. Consequently, this bill aimed to stimulate demand in the economy via consumption – which can be seen as the exact opposite of the ABCT concept developed by Mises (1912, 1934, 1940), Hayek (1932, 1939, 1941), Huerta de Soto (1998) and Garrison (2001). These actions were based on the Keynesian idea that it is more important to create an increase of consumption than to focus on a natural economic growth based on previous

⁴ The Economist. (18 August 2012) ‘The big promise’.

savings and sustainable investments (Keynes, 1936). Instead, these actions led to a socialisation of investments, based on government spending.

One may assume that the mentioned interventionist monetary and fiscal policies helped the automotive industry to ‘quickly recover’ from the crisis. From a short-term perspective, the scrappage campaigns incentivized consumers to purchase new vehicles despite the generally challenging economic environment. Even from a mid-term perspective, certain indicators could suggest, that the seen interventions led to a sustainable stabilization of the automotive sector. In 2016, worldwide vehicle sales reached a record 88 million units with average profit margins for OEMs at a 10-year high⁵. According to the Center for Automotive Research, automakers spent more than \$108 billion building new factories or expanding existing ones solely in North America between 2010 and 2016.

However, more critically viewed, also by the end of 2018, the industry was still far from being in perfect shape, apart from the relatively limited ‘total shareholder return’ (TSR): Between 2011-2016, the annual rates of return that the S&P 500 and the Dow Jones Industrial average achieved for investors were at 14.8 percent and 10.1 percent respectively. In that period, the average TSR of automotive OEMs alone was only 5.5 percent –making it relatively less attractive for investors to choose the automotive industry than other sectors. We conclude that the apparent stabilization of the automotive sector in the period from 2010 to 2019 would not have been possible without significant public interventions and expansive monetary policies. These actions kept several automotive OEMs (including General Motors and Chrysler) alive, which had lost competitiveness. Consequently, resources and market share kept being ‘blocked’ by these ‘protected’ OEMs, or, to say it differently, additional volume and profit potential was withheld from the more competitive OEMs. In 2020, a significant contraction of the automotive market was ultimately initiated by the

5 PwC (2017). 2017 Automotive Trends

recent Covid-19 crises and its so-called 'lockdowns' which hampered automotive dealers across the globe in selling their vehicles. However, after the long, unsustainable market growth throughout the previous years, we argue that a significant market contraction was also likely to happen without the outbreak of the SARS-CoV-2 virus.

4.4.4 A Critique to Hayek's Approach:

Arguments for Limiting the Free Market to Limit Financial Panic

That a structural problem caused the 2008 financial crisis is confirmed by most economists and across all major economic schools of thought. There are numerous examples of economists and economic experts asking for a 'reform of the international financial system' (Piketty, 2014; Krugman, 2008; Huerta de Soto, 2009b; Bagus *et al.*, 2012). However, the visible symptoms of the recent crisis are related to the detection of often entirely different causes, consequently leading to very different suggestions on how to precisely reform mentioned financial system.

The economist Wim Naudé (2009) generally follows concepts which could be associated with mainstream economics or neoclassical economics. Naudé (2009) argued that the lowering of interest rates after the 'dotcom bubble in 2000 and the terror attacks in 2001 clearly helped to assure a period of sustained expansionary economic policies to ward off recessions. Naudé argued that rises in housing/ real estate prices further fuelled credit growth, particularly through mortgage lending. Consequently, subprime market mortgage lending significantly increased in the USA, as institutions such as Fanny Mae and Freddie Mac lent money to households which did not have the means to potentially repay those loans. Naudé (2009) then states that the growing global economy and the pay incentives of asset managers aggravated the extent of the crisis significantly. Naudé argued that risk-management tools were not properly assessing risks during the economic growth phase, stating that 45% of all new securities rated by Standard &

Poor's in 2007 were rated with AAA. Naudé assumed that after the bankruptcy of Lehman Brothers and the corresponding financial panic, the central cause of the sudden reductions in availability of credit, in particular in the interbank bank, is what Taylor (2009) defined as the 'Queen of Spades problem'. This expression refers to securities containing bad subprime mortgages which had been distributed throughout the financial system, of which most banks and institutions did not know where they were. Naudé summarized his understanding of the main reasons for the crisis with "easy credit, bad loans, weak regulations debt defaulting, insolvency of key financial institutions, a loss of credibility and trust... financial panic and a mass selling-off of stocks.... and a hoarding of cash by banks and individuals".

Naudé suggests immediate, short-term and long-term policies to recover from the crisis. His main concern is to restore confidence in the financial institutions and to minimize the crisis' impact on the real economy.

Table N°15: Evaluation of Naudé's Neo-Classical Understanding of the Subprime Crisis

Timeframe	Objective	Policy Option	Our position
Immediate	Limitation of financial panic	Guarantee of bank deposits	Yes
		Guarantee of interbank loans	No
		Provide liquidity to banks	No
Short-term	Resolution measures	Recapitalize banks	No
	Monetary expansion	Raise inflation targets	No
	Trade expansion	Lowering of national/ EU protective measures	Yes
Long-term	Domestic financial development	Increase supervision & regulation	No
		Strengthen property rights and rule of law	Yes
	International financial architecture	More inclusive system of global financial governance	No

(Author's own design)

Naudé (2009) is right, when he argues that easy credit and bad loans were main reasons for the recent financial crisis. Based on Huerta de Soto (2009b) and Bagus *et al.* (2012), we had already highlighted our corresponding findings. Moreover, we certainly support his demand for lowering

protectionist measures which have been hampering international trade. In addition, we defend his ideas to strengthen property rights and the rule of law, in particular in developing countries. We also agree that a private sector-based financial system with competition is clearly the best option, instead of the nationalization of all banks. However, we criticize his position that guaranteeing bank deposits must simply be seen as a “pragmatic” solution to ‘calm the market’, as the long-term effects of such interventions are harmful. Moreover, we are afraid that most of the other actions suggested by Naudé, such as providing additional liquidity to banks through further monetary expansion, would distort the markets even more. From a short-term perspective, these interventions may temporarily cover the structural weaknesses of the economic system, but must ultimately lead to further harmful distortions.

Friedman (1957) predicted that both, private households as well as governments were likely to use cash infusions to either pay down debts or to plan consumption in the intermedium-term. Ultimately, the short and mid-term effect of fiscal stimulus depend on politics, on how exactly these incentives are implemented, but also on how the economic agents perceive these actions. First of all, we need to critically evaluate the myth that such fiscal stimulus would be implemented as timely, targeted and temporary measures. Taylor and Castillo (2014) evaluated historical data on relevant fiscal stimulus packages since the 1930s. Both concluded that the expansion of government size and scope during times of crisis have neither been timely, nor targeted, nor temporary. Instead, government spending programs tend to create a corresponding structure of concentrated interests, generally with the aim to assure its long-term continuance. Böhm-Bawerk (1914) stated that social arrangements and regulations have always had an impact on the distribution of goods, and it would be useless to ignore this fact. However, laws compelled by influential lobbies (such as labour unions) and implemented to restrict the free market, may appear to have positive effects from a short-term perspective, but are usually causing negative long-term effects to the economy. Thus, Böhm-Bawerk (1914) argued that attempts to hamper the free price mechanism in an economy cannot work effectively from a long-term perspective. Accordingly, market distortions caused by such interventionism must and will be overcome by entrepreneurial competition and free prices in a free market system. In line with Böhm-Bawerk,

Bagus *et al.* (2012) argue that from a long-term perspective, politics cannot ignore nor override economic laws, even though politicians constantly pretend they could.

Based on the ideas of Huerta de Soto (1998, 2009b, 2009c) we argue that the actions suggested by Naudé could have postponed the crisis but would have aggravated the structural problems even further, possibly leading to the bust of an even more destructive bubble. In this context, the previously described Austrian Business Cycle Theory properly illustrated that excessive credit creation combined with low ‘mis-priced’ interest rates must ultimately result in widespread malinvestment. Moreover, Naudé stated that “defaults on mortgage lending by the private sector triggered” the 2008 crisis. We insist that it is crucial not to confuse the visible symptoms with the actual causes. Naudé does not mention the negative effects of maturity mismatching, and fractional reserve banking, nor does he refer to the difference between the market interest rate and the natural interest rate. In line with Bagus *et al.* (2012) and Alonso Neira *et al.* (2013) we argue that it was not ‘a natural’ boom of the housing market which increased the demand for credits. On the contrary, in the first place artificially low-interest rates (far below the natural interest rate) distorted the market, causing a strong demand for investments in the ‘early stages of production’, e.g. the real estate market (Alonso Neira *et al.*, 2011). Moreover, the ultra-loose monetary policy had been caused by public institutions and agents of governments such as central banks, and not by the private sector (Huerta de Soto, 2009b; Bagus *et al.*, 2012).

As stated in chapter 3, Mises’ axiom of human action is an *a priori* synthetic judgment, and can be used as a general *a priori* theory. Using Mises’ praxeology and applying formal logic can allow us to deduct further truth claims from the irrefutably true axiom of human action. By doing so, propositions about reality can be defined which are irrefutably true, such as the concept of causality, as every effect has a cause (Mises, 1957). One conclusion of such *a priori* theory is that fiat money is generally created through bank circulation credit, thereby necessarily causing capital consumption and malinvestment, as explained by the mentioned Austrian Business Cycle Theory (Huerta de Soto, 1998). Moreover, following the concepts of Mises (1940, 1957), Huerta de Soto (1998) and Bagus *et al.* (2012), we argue that the following proposition can be seen as a correct *a priori* truth: ‘a fiat-money injection in connection with a lowering of the market interest

rate to below the natural interest rate, allows companies to produce goods and services which do not correspond to the market's true demand. This misallocation of resources will initially lead to an economic boom, but must ultimately end in an economic bust.' Most Austrian School economists argue that deduction, considering *a priori* truths, is able to properly explain the origins of the seen economic crisis. We argue that also by analysing the subprime crisis of 2008-2009 in an inductive way (which is contrary to the deductive Austrian School methodology), the Austrian business cycle model must be seen as the theoretical business cycle concept which best serves to illustrate the seen corresponding causes and effects. However, we argue that one must not only blame politicians and banks for this unsustainable evolution, but also the individual consumers which (as voters in democratic elections) maintained this artificial politico-economic boom. In his book '1984' Orwell stated that the really crucial choice for mankind should always be made between freedom and happiness, but that for the great majority of men, their (short-term) happiness has been more relevant (Orwell, 1949).

4.5 Theoretical Approach to Negative Externalities & Marginal Social Costs

In the final sections of Chapter 4, namely Chapter '4.5' and '4.6' we evaluate whether significant, long-term public incentives for alternative fuel vehicles (AFVs) are unsustainable from a macroeconomic perspective, leading to instable market distortions. Initially, in this Chapter '4.5', we will elaborate and demonstrate our theoretical concept in regard to public interventions with the aim to minimize negative externalities. Then, in Chapter '4.6', we will illustrate our findings with empiric data on the sales evolution of AFVs and its correlation with the corresponding public incentives. One of our indicated key research objectives is to evaluate the impact and effectiveness of public incentives for AFVs in Europe in the period from 2010 to 2018. Thus, we intend to understand which of the incentive models implemented in the different analyzed markets have been successful. We also want to critically consider the sustainability and market competitiveness of the different AFV technologies without any public incentives. However, before looking at specific empiric data on the AFV sales evolution and corresponding public incentive schemes, we must further elaborate our general theoretical approach in regard to public interventionism. Therefore, the concepts of several economists with regard to public interventions to minimize negative externalities such as the emission of nitrogen oxides (NOx) and carbon dioxide (CO₂), must be considered. Even if this question may not be fully clarified in this thesis, we consider it as crucial to consider how negative externalities caused by air pollution can be reduced, and if there are any alternatives to public taxes and fines for air polluting vehicles.

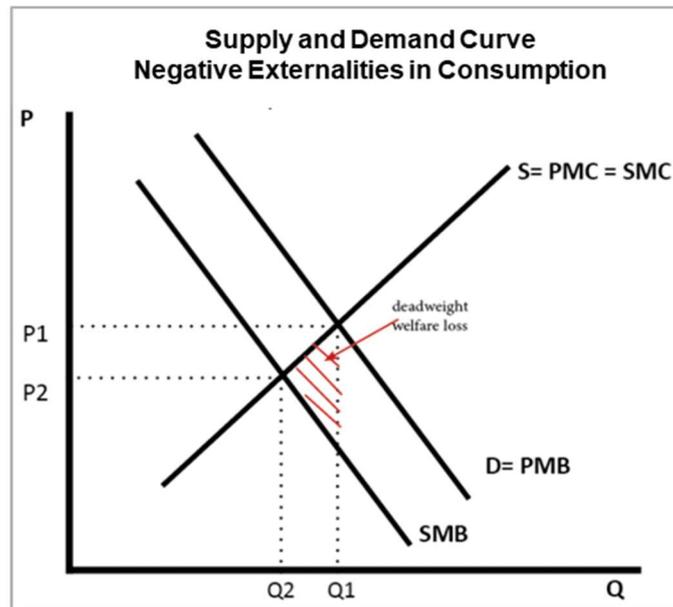
One question often raised when discussing market distortions caused by public entities with the declared aim to 'protect the environment' is: Do the ends justify the means? We consider it as necessary to also consider the arguments of those justifying centralized planning to protect the environment.

Despite the reasonable desire of individuals and groups to maximize economic profit, the protection of the environment and of the population's health must certainly be seen as a priority in any society. The neoclassical analysis of externalities is shaped by the impact of the equilibrium

models of physics as well as by the quest for precise quantification and measurement, ultimately justifying the idea that a 'neutral' public institution is best suited to define 'fair and objective rules' for all market participants. Consequently, it gives the state a reason to assume a coercive role in limiting individual freedom by penalizing 'marginal social costs' of negative externalities, such as the emission of nitrogen oxides (NO_x), carbon dioxide (CO₂) and other pollutants. The neo-classical perspective is that economic efficiency can best be achieved by implementing policies which should maximise the (so-called) aggregate welfare. Thus, by placing additional charges (such as emission taxes) on products and services which cause pollution, an efficient allocation of resources should be achieved in order to maximise 'welfare' (Benson, 2017). Accordingly, we will evaluate the concepts of several economists of different schools of thought on the idea of 'environmental taxes' for negative externalities such as CO₂ emissions. The concepts of William G. Gale on the carbon tax as a Pigouvian tax, as well as the individual (and differing) concepts of Nicholas Stern (2007), Ronald Coase (1960) and Murray Rothbard (1962, 1970, 1982) will be considered. Arthur Pigou (1877-1959), who was a crucial figure in the development of welfare economics and who published his 'The Economics of Welfare' in 1920, used microeconomic techniques to evaluate the well-being on an aggregate (economy-wide) level. To define what the term 'innovation' actually refers to, the works of Israel Kirzner (1973) and Huerta de Soto (2009a) were evaluated emphasising on the concept of dynamic efficiency and the alert entrepreneur, as well as on the importance of entrepreneurial creativity. We consider Elon Musk as a prime example of entrepreneurial creativity and innovation within the automotive industry. In 2002, the business magnate and engineer Musk founded SpaceX (an aerospace manufacturer and space transport services company), and in 2008, he became CEO of the electric vehicle manufacturer Tesla Motors, Inc. (now Tesla, Inc.). Throughout Musk's leadership as CEO, Tesla launched the Roadster (the first serial production all-electric car to use lithium-ion battery cells), and later on constructed multiple lithium-ion battery and electric vehicle subassembly factories (e.g. the 'Gigafactory 3' in China), while entering the S&P 500 stock market index and becoming the most valuable carmaker in 2020 (Boudette, 2020). Moreover, a brief consideration should also be given to the question of 'how can negative externalities, caused by air pollution, be reduced?' We will take a look at the arguments of those justifying centralized planning to optimize environmental

protection, while also looking at the arguments of those looking for alternatives to public interventions.

Chart N° 50: Supply and Demand Curve for Negative Externalities in Consumption



(Redesigned by the author, based on E. Schmidt, 2010)

4.5.1 Negative Externalities: Public Interventions vs. Private Property Rights

So-called 'environmental problems' are herein defined as those challenges which arise due to the damaging effects of human activities on the biophysical environment. This includes destructive effects on biodiversity, climate systems, ecosystems, and natural resources, but also the harmful effects on human health resulting from the effects of human activities on the environment.

The economist William G. Gale considers a carbon tax as the best way to deal with climate change. The carbon tax is a Pigouvian tax, designed to manipulate the price of a good or a service in order to capture all the negative externalities it imposes. It is argued that in the presence of negative externalities, the social cost of a market activity is not covered by the private cost of the

activity. Therefore, the market outcome is not efficient and can lead to over-consumption of the corresponding product. Thus, Gale argues that a carbon tax could make economic sense as it would correct *“a market failure and make the economy more efficient”* stating that *“there are also big societal costs that people don’t pay for when they produce and consume energy – including air and water pollution, road congestion, and climate change.”* (Gale, 2013, p. 1)

It should not be questioned that also with regard to the use of automobiles by final consumers, the impact of negative externalities must be taken seriously. The damage/costs suffered by a third party (for example by pollution and noise) as a result of an economic transaction between the (automotive) producer and the (final) consumer cannot be ignored.

The general concepts on anthropogenic global warming (AGW) mostly imply that there is a need for government intervention, for example regarding the emissions of automobiles, to prevent natural disasters - potentially caused carbon emissions. This concept is mainly based on the assumption that ‘the market’ has failed and that it must be better steered and controlled by public institutions to prevent further environmental damage. The economist Sir Nicholas Stern (2007, p.1) believes that *“... the problem of climate change involves a fundamental failure of markets: those who damage others by emitting greenhouse gases generally do not pay.”*

Taking this argumentation even further, the self-declared social engineer Jacque Fresco (2007) envisioned a global civilization in which science and technology are applied with “human and environmental concern”, with the declared aim to prevent cycles of boom and recession while minimizing poverty and pollution. Fresco suggested that the world's resources shall become the common heritage of all of the earth's people, by ‘establishing’ a global, resource-based economy. For Fresco (2007), recent conflicts between nations or regions were related to opposing values, the harm caused by focusing on the accumulation of scarce resources, and limited access to the true ‘necessities of life’.

Ultimately, Fresco's macroeconomic and political concepts are based on the same centralized and interventionist logic (the ‘fatal conceit’) which had already been criticized by Hayek (1990).

Undoubtedly, the aim must be the definition of a strategy which protects to the greatest possible degree the liberties of all market participants, not only of the users of fossil fuels but also of those people whose health and property is at risk - generally because of pollution but also if the AGW hypothesis is true. In 1940, Mises already referred to external costs, conceding that certain laws concerning the liability for and indemnification of damages caused by negative externalities were deficient. However, for Mises these deficiencies were not caused by capitalism, and the corresponding private ownership of the means of production, itself, but by governmental errors and legal loopholes within the system. These deficiencies could be minimized by strengthening the free market and preventing private ownership, while reforming the legal system towards emphasising on the market participants' liability for caused damages.

Ronald Coase (1960) developed a theoretical analysis of environmental problems, stating that environmental damage is not a case of market failure but occurs because of government failures in defining and allocating property rights. Also Rothbard (1962, 1982) argued that it is not markets that have failed but governments which have failed in properly allocating property rights. Negative externalities are therefore seen as a property rights problem, which in our example would ultimately lead to the question of 'who owns the air that vehicles pollute?' (Rothbard, 1982) As stated, the neoclassical perspective sees consumer preferences and resources as given and the equilibrating function of the market is seen as a purely technical procedure which could properly be done by a central planning agency. The objective of policies for the abatement of climate change is to minimize the economic impact of climate change, that is, the damage that it is believed to cause. Contrary to the neoclassical position, Austrian economics argue that competition is a dynamic process and that costs are subjective (Mises, 1940; Hayek, 1990; Huerta de Soto, 2009a).

Individual valuation is crucial for economic theory, as economics is used to analyse the logical characteristics and consequences of individual valuations. The driving force of human action, and accordingly of the human market economy, are individual valuations by market participants (Mises, 1940). Thus, human action is the result of choice among alternatives, and the corresponding choice reflects the market participant's individual preferences among these alternatives (Rothbard;

1970, 1997). Rothbard (1997) indicated that individual valuations are the direct subject matter of the theories of utility and of welfare. Utility theory focused on the laws of the values and choices of an individual, whereas welfare theory elaborates on the relationship between the values of many individuals, and the corresponding possibility of a scientific conclusion on the 'social' desirability of different alternatives. Rothbard (1997) indicated that for both approaches (the theory of utility and the theory of welfare), the 'demonstrated preference' concept shall be applied. Which argues that actual choice demonstrates each individual's preferences, for which preferences are deducible from what has been chosen in action. These preferences, rooted in real choices, serve as the basis of the logical structure of economic analysis, particularly in the case of utility and welfare theory.

The concepts of Pareto optimality and perfect competition represent the foundation for the neoclassical approach to efficiency. Accordingly, the Pareto optimum represents a static state of affairs within which no possible changes should be made, as achieving 'a perfectly efficient market' must not be based on economic transactions in society from which some gain at the expense of another. In addition, the final equilibrium should then represent a situation in which no further transactions can be made without violating the Paretian rule. From a neoclassical perspective, market inefficiency is an indication of 'market failure' for which government intervention appears to be necessary to 'readjust' the market. In regard to externalities, the neoclassical notion of market externalities elaborates on the concept of costs and benefits to society as a whole as well as on the expanded concept of social efficiency (Kirzner, 1963, 1973).

Contrary to this neoclassical approach, the Austrian School concept is shaped by its consistent focus on the actions and subjective valuations of individuals. As indicated before, this approach uses 'methodological individualism' and 'radical subjectivism', seeing economics as a branch of the more general science of human action (Mises, 1957). Society is made up of numerous individuals and each individual defines his own course of action to achieve certain goals (Mises, 1940). Thus, it is unrealistic to speak of society as a single unit. Accordingly, 'efficiency' for a social system can be defined as the efficiency with which the system permits its individual members to achieve their individual goals (Kirzner, 1973, 1997). As markets are never in

equilibrium and costs are subjective, Austrian School economists reject the neoclassical idea of being able to realize market equilibrium where marginal social benefit equals marginal social cost (Kirzner, 1973, 1997; Rothbard, 1997). The key aspect to increase economic efficiency is knowledge, as the extent to which individuals act efficiently is determined by the amount of relevant knowledge they possess to attain the desired goals (Hayek, 1973, 1990). The Austrian School understanding of 'perfect efficiency' and 'market equilibrium' does not set any restrictions on the market structure, nor on the relationship between marginal cost of production and the price of the corresponding output. In a free market, inefficiencies promote their own corrective actions, as the entrepreneurial aim to achieve profits provides entrepreneurs with the incentive to search for situations in which resources have been misallocated (Huerta de Soto, 2005). Thus, while markets cannot establish a permanent state of perfect efficiency, the corrective forces which arise in a free market will make the market process as efficient as possible (Huerta de Soto, 2005; Rothbard, 1997). We conclude that government interventions into the market process can never be justified on the basis of improving efficiency, as from a long-term perspective, government actions do not increase social utility.

Whereas for Austrian School economists, the right to property is a negative right of non-interference, several neoclassical economists see property rights (particularly in regard to negative externalities) as a positive right, which can be fully granted, but also reduced or even completely denied by the state (Benson, 2017). From a neo-classical perspective, environmental problems are an example of a market failure, for which official mechanisms such as emissions taxes, cap and trade schemes are needed (Friedman, 1979; Rothbard, 1982). In addition, cost-benefit analyses are used to determine optimal levels of pollution through calculations of social and private costs. By 'punishing' pollution, an efficient allocation of resources should be achieved to maximise welfare. The market-based policy instrument supported by neoclassical economists is usually the environmental tax – of which the biggest problem is to gather reliable information on the exact amount of these external costs.

The neoclassicals have attempted to establish 'the optimal level of carbon emissions' – which would allow them to 'steer and engineer' the economy accordingly. Consequently, from their

perspective, individuals need to accept the outcomes of such centrally steered policies, also with potential negative effects on their property or health, if the result is a net increase in benefit throughout society as a whole (Rothbard, 1982). We argue that this neoclassical argumentation is unprecise, arbitrary and random and therefore unscientific. It is neither possible to calculate a general 'ideal or acceptable level of carbon emissions' nor should patronizing public regulations (which could ultimately lead to expropriations) be generally justified if only based on the formal aim to 'protect society from future harm'.

Already in the 1970s, Friedman proposed a system which is very close to the current 'environmental protection policies' implemented in the USA. Instead of focusing on the defence of property rights, Friedman suggested governments to define a "cost-benefit" calculation, which would then lead to "enforcing a social decision" on how much pollution to allow. A given amount of pollution (the granting of "pollution rights") would be licenced, establishing a corresponding graded scale with (penalty) taxes for the polluters.

Friedman said that "... *there's a case for the government to do something... because there's always a case for the government to some extent when what two people do affects a third party.... There is a case for the government protecting third parties, protecting people who have not voluntarily agreed to enter.... The way to do it is to impose a tax on the cost of the pollutants emitted by a car and make an incentive for car manufacturers and for consumers to keep down the amount of pollution...*" (Friedman, 1979, p.1)

4.5.2 Rothbard's Tort Law System versus Social Efficiency

As indicated, we consider Friedman's approach as unscientific, as any corresponding 'cost-benefit calculations' and corresponding 'tax scales' cannot be based on an 'objective value' and must therefore be arbitrary.

At a later stage of this thesis, we will argue that particularly in regard to negative externalities, also Rothbard's (1970, 1982) and Hoppe's (1993, 2006) concept of a tort law system within an

anarcho-capitalist private property order suffers from relevant flaws, for example for not being able to precisely quantify an 'adequate victim compensation'.

However, at this stage, we want to initially focus on the Austrian School critique of the neoclassical approach. Rothbard (1982) criticized Friedman's concept not only for being unprecise and highly bureaucratic, but also for overriding property rights in the name of collective decisions enforced by the state. Rothbard (1970), Hoppe (1993), and Block (2009) argue that the ethics of freedom and property rights is the natural law which allows humans a harmonious and peaceful social coexistence and development. Hoppe (1993) stated that the solution to conflicts arising from the scarcity of resources is the assignment of property rights, which provide exclusive control to proprietors. The right to property is a negative right of non-interference. Meanwhile, positive rights (which could imply certain duties towards others) can only arise by means of contracts (Rothbard, 1982).

Opposing Friedman's approach, Rothbard (1970, 1982) insisted that any form of public intervention is harmful. Based on Rothbard (1970), also Hoppe (1993, 2006) and Block (2009) considered any intervention of public authorities or central banks into the market process as a harmful coercion and misallocation of resources. They reject the neo-classical view that public interventions could maximise 'aggregate welfare', while instead favouring the concepts of truly free prices in an entirely free market. Consequently, Rothbard (1982), Hoppe (1989, 1995), Huerta de Soto (2005, 2009a) and Block (2009) consider taxes generally as distortions of and a harmful intervention in the market. A pricing system administered and steered by public entities will contradict with the actual market demand. Rothbard (1982) criticized economists such as Friedman for having attempted to develop theories of value-free property rights. These value-free rights would not be defined on the basis of ethical norms such as justice, but instead on some vague concept of 'social efficiency'. Coase (1960) was also generally sceptical of public regulations stating that legal rules which hamper free negotiations between private market participants should only be justified after a proper 'cost–benefit analysis'. Coase urged the courts to compare between the utility and the harm produced in order to decide if a harmful effect should be purely considered as a nuisance. Courts should only intervene in those transactions which cause an unreasonable amount of 'nuisances'. But if the corresponding costs related to a

transaction are 'sufficiently low', legal rules should be irrelevant. These transaction costs include, for example, the costs of identifying potential trading partners, as well as the costs of negotiating contracts and monitoring compliance. Coase (1960) referred to the 'problem of social cost' by indicating that in a world without transaction costs, market participants would bargain with each other to achieve the most efficient distribution of resources, regardless of the initial allocation. Coase argued that law and public regulations are not as effective at 'harmonizing the market process' as government officials often believe. Accordingly, Coase wanted to put the burden of proof for positive effects on the public institutions/ governments, which (by analysing the costs of action) should evidence the benefits of their interventions.

The so-called 'Coase Theorem' is a legal and economic theory on property rights, which states that in a free market without any transaction costs optimal decisions can be reached by freely negotiating (private) market participants. Thus, the 'Coase Theorem' indicates that when transaction costs are low, the corresponding market participants involved are expected to reach an efficient outcome without the need for public interventions. Thus, private citizens and/ or private companies can reach mutually beneficial, socially desirable solutions, while well-defined property rights help in promoting economic efficiency. Coase (1960) argued that legal entitlements have often been negotiated/ traded, and that trading partners can and should find effective solutions despite existing (ineffective) legal barriers. He assumed that in cases of private property right disputes which involve so-called 'externalities', the decision of courts on liability for damages would be irrelevant for the allocation of resources as long as the market transactions are 'costless'. However, Coase was not an Austrian School economist and particularly anarcho-capitalist economists such as Rothbard (1982) and Hoppe (2004) rejected Coase's approach to property rights, externalities, and liability (Rothbard, 1982).

Similar to his criticism towards Friedman, Rothbard (1982) also accused Coase of ultimately having developed a theory of value-free property rights, in which rights are only defined and protected on the basis of a 'social efficiency' concept. Based on Rothbard (1970), Hoppe (1993) wants to fully replace the state by private organizations in competition. In his 'natural order', also all scarce resources would be owned privately, and entry into every line of production, including justice, police, and defense services, would be free (Hoppe, 1993). As indicated, Coase justified

public interventions and regulations for those transactions which cause an ‘unreasonable’ amount of nuisances. By insisting that costs must not only be seen from a monetary but also a psychological perspective, Rothbard replied that costs are subjective and often not measurable in purely monetary terms. Thus, Rothbard considered Coase’s approach as immoral, as it would violate property rights by attempting to purely maximize the monetary value of production. Rothbard (1982) concludes that - whenever transaction costs are not zero - Coase advocates allocating the property rights to whichever route entails minimum social transaction costs. But if costs are subjective to each individual, they are unmeasurable and cannot be ‘objectively added up’, for which there cannot be any ‘social transaction costs’. Thus, Rothbard criticizes Coase for prioritizing an unspecific norm defined as ‘social efficiency’ over individual property rights. Rothbard indicated that only invasive actions which are concrete and physical shall be declared illegal and penalized by law. Accordingly, based on classical libertarian theory, Rothbard (1982) argues that it shall only be allowed to use coercion against someone if that person is a proven aggressor, and such aggression must be proven beyond a reasonable doubt.

In Rothbard’s (1982) alternative concept, the polluter must be shown causally responsible for a specific invasion of the victim’s rights in order to be forced to cover the costs for any caused negative externalities. In other words, no action should be considered illicit or illegal unless it invades, or aggresses against someone else or the just property of someone. This invasion must be concrete and physical. Rothbard (1984) defends an approach in which public interventions could be fully replaced by a tort law system within an anarcho-capitalist order. Environmental problems such as pollution and the protection of natural resources, should not be solved by bureaucrats or politicians, but by independent courts. In Rothbard’s concept, free market prices and the right to private property in a free market will assure the proper coordination of individuals in the pursuit of their individual ends, and whenever these ends come into conflict it would be the role of courts to intervene. If individual market participants pollute the environment causing concrete harm to another market participant’s body or property, then this would constitute a property right violation and the aggrieved party would have a legal claim against the polluter. Similar to other property rights violations, environmental problems could also be solved within a

legal system of tort law (Rothbard, 1982). In this scenario, the role of the court is to identify rights violations, evaluating whether the accused can be held liable for these violations. If so, the court can impose an end to the harmful activity and can order the convict to pay damages to those who were harmed (Benson, 2017).

However, we consider that particularly in regard to negative externalities, Rothbard's anarcho-capitalist, free-market tort law approach suffers from relevant flaws, such as the limited ability to precisely assign victim compensation. In regard to global warming, the most relevant uncertainty is the fact that the effects of climate change are expected to occur year by year over a very long period of time. As most industrial/ man-made impact on climate change is only expected to be truly visible in the upcoming decades or even centuries, its actual relevance and 'cost' is inevitably subject to a degree of uncertainty. The same logic applies for the difficulty in defining the impact of pollution on third party's health caused by the polluter's use of an internal combustion engine vehicle (ICE). Thus, it is impossible to properly measure the negative externalities of consumption occurring when thousands of individual vehicle drivers use different streets within one town. Therefore, being able to establish an indisputable causality between the health problems of one specific resident and the responsible polluter seem highly impossible. As under the Rule of Law, the principle of *'in dubio pro reo'* (Latin for *'when in doubt, for the accused'*) would (rightly) be applied, this would often have the consequence that defendants could not be convicted as long as the mentioned indisputable causality cannot be proven.

Rothbard argued that *"... the invisible and insensible crossing of another's air ... cannot be considered aggression because it does not interfere with the owner's use or enjoyment of his person or property. Only if such a boundary crossing commits provable harm - according to principles of strict causability and beyond a reasonable doubt - can it be considered a tort and subject to liability and injunction.... The overriding factor in air pollution law... should be libertarian and property rights."* (Rothbard, 1982, p. 98-99).

Thus, Rothbard (1982) insists that, as long as concrete evidence of serious harm cannot be proven by strictly applying the principles of causality between the wrongful conduct of one market participant and the injuries and harms caused to others, neither liability nor injunction can be applied.

However, if a judge assigns liability, it may be the case that the accused and the plaintiff can reach a mutual agreement. If such an agreement cannot be reached, it will be the role of a judge to make the accused pay an 'adequate' compensation. However, Rothbard (1970, 1982, 2003) does not clearly indicate the criteria on which the level of compensation should be set. The definition of the concrete compensation would not only have to quantify the corresponding economic costs from which the plaintiff suffered, but also any psychological and emotional damage to the plaintiff's well-being which was caused by the culprit's property right violation (Benson, 2017). Rothbard (1962) was absolutely right in indicating that no 'general market price' can be assigned to a good, as prices do not represent any objective economic value which could be generally determined. The price of social objects cannot be defined purely in physical terms, but will be based on subjective valuations, as within the market process, participants act on their own knowledge and preferences. From an Austrian School perspective, what is good for people is the realisation or satisfaction of their desires, for which the satisfaction of subjective preferences is beneficial for a person's well-being (Mises, 1940). However, it is neither possible for a judge to define which preferences were denied by a property rights violation, nor to substantiate the strength (meaning: the importance) of these preferences (Benson, 2017). Thus, we argue that it is the subjectivist Austrian School approach (Mises, 1940; Hayek, 1945, 1973; Rothbard, 1962, 1982) itself, which contradicts with Rothbard's (1970, 1982, 2003) concept of tort law. The understanding of 'well-being' is highly subjective and harm caused by property rights violations cannot be 'objectively quantified', for being individually experienced by the aggrieved party. Therefore, in an anarcho-capitalist tort law system which is fully based on an Austrian School subjectivist concept, calculating 'appropriate' financial compensations for the plaintiff appear impossible. The reason is, that a judge will be unable to properly define the strength of those preferences which were violated by the culprit.

Theoretically, compensation – even if applied to human health - could be set based on a 'general/average market price' of damages. However, from an Austrian School perspective, prices do not represent any objective form of economic value. Thus, particularly from a subjectivist approach it is impossible to define a generally valid 'fair compensation' for severe damages such as a malignant bronchial carcinoma. 'Well-being' is gained by the satisfaction of subjective preferences,

of whatever is subjectively desired by an individual, and the importance or value which individuals assign to their preferences is not 'objectively' measurable.

Moreover, as indicated, the complexity of ecological systems creates significant challenges to prove a legally binding causation with corresponding property rights violations. Being based on the principle of causation, the tortlaw system requires that the plaintiff must prove that the defendant (or group of defendants) are causally responsible for rights violations. Moreover, Rothbard's purely praxeologic approach would also prohibit courts to rely on probabilistic scientific studies, arguing that historic data does not allow to draw general conclusions, emphasizing that correlation is no proof of causation (Rothbard, 1957). Thus, we argue that for several complex environmental problems, the ability to establish causation is highly limited. Therefore, as it is difficult to prove that the accused pollutant actually caused a specific injury to the plaintiff, there are relevant challenges to establishing concrete links between an environmental pollutant and a plaintiff's rights violation.

We fully agree that the market economy has brought unprecedented prosperity to mankind across the globe, and that the increasing public interventionism in western countries has been destroying the essence of economic growth which are the concepts of individual freedom, free trade and private property. We also reject the recently seen extent of public interventionism, which has been justified by most European governments with the declared aim to reduce global warming and pollution. We agree with Reisman (2007) and Lomborg (2020), that possible challenges provoked by climate change must properly be traded off against the significant economic and social damages which governmental bureaucratic interventions and political oppression can cause. However, we have to conclude that from our point of view, Rothbard's concept does not seem to work for specific negative externalities of consumption, particularly not in the case of air pollution in urban areas caused by motor vehicles. We have not yet found any literature which realistically explains how a proper, fully privatized, alternative to a public road network and certain public interventions on air pollution could look like. Even if the definition of such theoretical concept is not among the key objectives of this thesis, we will elaborate more on this topic in the following chapter.

4.5.3 Private Property Allocation vs Government Interventionism

From Rothbard's (1970, 1982) perspective, taxes are distortions of and interventions in the market, imposing an administered price. Moreover, Rothbard points out that there are two areas in which pollution has become an important problem: the air and the waterways, particularly the rivers, stating that "*these are precisely two of the vital areas in society in which private property has not been permitted to function.*" (Rothbard, 1973, p. 317).

Rothbard (1982) states that environmental problems arise because one economic agent, such as a polluter, acts in a way that is inconsistent with the rights of others. Therefore, government must not have the right to intervene in market exchanges, if property rights had previously been allocated and legislative procedures already exist.

The anarcho-capitalist economist and philosopher H. Hoppe suggests to entirely privatize 'climate change policy', by repealing all existing climate change legislation (1993). Consequently, the tax treatment of fossil fuels would have to be revised, eliminating any tax contribution and other regulations which had been imposed with the intention of reducing carbon emissions. Official carbon emissions reduction targets and other 'climate change policy' objectives should be abandoned. Individuals or organisations who believed that AGW was infringing their health or property rights would need to seek justice in the courts. The courts would then build up a body of common law, establishing precedents to guide the actions of the users of fossil fuels. The elaboration of a theory of justice in property titles is not intended in this thesis. However, the basic axiom of such political theory would need to hold that every man is a self-owner, having absolute jurisdiction over his own body and no one else may justly invade, or aggress against him/ her. The courts would focus on their function of defending person and property rights against invasion. In Rothbard's (1982) concept, the polluter must be shown to be causally responsible for a specific invasion of the victim's rights.

However, with regard to global warming, we argue that the most relevant uncertainty is the fact that the effects of climate change are expected to occur year by year over a very long period of

time. This explains the significantly different outcomes of recent research papers which try to detect the monetary value of global warming. As most economic impacts of climate change are only expected to be visible in the upcoming decades or even centuries, their actual relevance and value is inevitably subject to a degree of uncertainty. The same applies for the impact of pollution on third party's health, caused by the polluter's use of an internal combustion engine vehicle (ICE). Rothbard referred to air pollution as "*a private nuisance generated from one person's landed property onto another and is an invasion of the airspace appurtenant to land and, often, of the person of the landowner*" (Rothbard, 1982, p. 98).

Moreover, Rothbard states that "*the tortfeasor or criminal is to be strictly liable for his aggression, with no evasion of liability permissible... However, the liability must be proven on the basis of strict causality of the defendant's action against the plaintiff...*" (Rothbard, 1982, p. 98)

Rothbard (1982) refers to the concept of homesteading when explaining his theory of property rights. In this concept, the first occupier and user of a resource makes it his own property. From our perspective, this argument might work in the case of certain negative externalities of production. In such scenario, producing a good will cause a harmful effect to a third party within a defined geographical region, for example a coal plant which creates pollution in its own neighborhood by burning coal. If a factory, located in a specific area, pollutes a certain neighborhood, the direct effects such as smog, acid rain, and toxic air pollution could be detectable. The ongoing technical advancements in the area of environmental forensic research and air quality monitoring could help to detect the originators of pollution, and its severeness by geographical area.

However, we argue that even in such a case, where there might only be one single factory in the region, it could be difficult to prove the direct, indisputable causality between the emitted (toxic) substances and diseases affecting those living next to the factory. The symptoms of maladies such as lung cancer may only be detected several years or decades later, at a point in time when the owner of the corresponding factory might have changed or when those citizens who had lived next to the factory might have moved to a different region. The complexity of such cases, the

difficulties in proving the corresponding causalities and the duration of complex legal disputes could lead to many cases in which either the aggrieved party or the culprit may have deceased before the final verdict.

In the case of negative externalities of consumption, the corresponding long-term effects of air pollution might be even harder to prove. In our specific case, thousands (or even millions) of individual consumers use their automobile to move between different locations, polluting the air, not only on highways in rural areas, but also in congested urban areas. In this case, a large number of consumers can cause a harmful effect to third parties through mentioned negative externalities of consumption. Thus, thousands of individual vehicle drivers will be using different streets within populous towns, leading to harmful air pollution, such as NOx emissions, by using internal combustion engines. We argue that by privatizing all streets, it is highly unlikely that all streets in one city will be owned by the same private company. Accordingly, if the various streets within one city district, or even within one neighborhood are owned by different companies, proving 'serious harm' and an 'undisputable causality' will be even more challenging. Consequently, we insist that (despite the ongoing technological advancements) as of today, establishing an indisputable causality between the health problems of individual residents and the responsible polluter(s) will in most cases be unfeasible.

Apart from the fact that the privatized streets within a city or region will potentially be owned by different entrepreneurs, also the individual owners of each mentioned street might change throughout the years. Thus, who will be able to legally prove the precise causes of individual diseases such as lung cancer or asthma? In addition, we argue that not only the owners and leaseholders, of the individual streets can change, but also the residents are likely to move between neighborhoods or cities, making it even less realistic to detect the "responsible" for specific health complaints of residents. Thus, to detect the long-term health impact of each vehicle's NOx emissions on a neighborhood's individual citizens will most likely be impossible.

Further analyses of historic data and additional elaborations regarding the appropriate theoretical approach are needed, as the impact of the automotive industry on CO2 emissions as well as on noise, air pollution, global warming and the citizens' health must be seriously considered when

defining reasonable long-term solutions. However, as of now, the exact impact and costs of these negative externalities cannot be precisely quantified, even though the importance of further attempting to minimize these externalities must not be ignored.

We agree with Rothbard (1982) that neither the purely monetary costs, and even less so the emotional effects of negative externalities can properly be quantified for each aggrieved party. However, we also partially agree with Benson (2017) on the inconsistency of Rothbard's tort law concept for negative externalities (1982), precisely because of Rothbard's subjectivist approach.

We must unfortunately conclude that we have not found any literature yet which realistically explains how in a fully privatized system the victims of negative externalities of consumption will be able to receive an 'appropriate' compensation for health problems caused by toxic emissions of vehicles. We indicated that from our perspective, the concepts of Rothbard (1970, 1982), Hoppe (1989, 1995) and Block (2009) show certain flaws when intending to properly defining and minimizing negative externalities in a tort law system within a state-free private order.

4.5.4 Alternatives to Keynesian Interventionism and Rothbard's Tort Law Concept

This thesis focuses mainly on the impact of monetary and fiscal policies on the automotive industry, by using historic data of the analysed period of time to illustrate the validity of our theoretical approach. Accordingly, the definition of a politico-economic or legal framework to deal with negative externalities is herein not among our main research objective. However, we insist that the impact of the automotive industry on CO2 emissions as well as on noise and air pollution must be taken seriously, for which it is crucial to further elaborate on more effective political and legal concepts to define reasonable long-term solutions. Accordingly, we decided to evaluate alternative concepts by Elinor Ostrom (1990, 2003), F.A. Hayek (1944, 1973, 1979), and Ayn Rand (1961, 1964, 1966) to potentially define a more effective theoretical framework,

The concepts of a 'common property system', further defined by Elinor Ostrom (1990, 2003) and Juan Ramon Rallo (2014), can be seen as a relevant progress. Ostrom's ideas provide sophisticated solutions for the privatization of possible common resources such as forests or rivers and other resources with clearly defined boundaries – and could potentially even be feasible for negative externalities of production such as air pollution caused by individual detached factories. Ostrom gained fame due to her elaborations on the concept of polycentricity, which is often defined as a social system of many decision centers having limited and autonomous prerogatives, while operating under an overarching set of rules (Aligica & Boettke, 2009). Polycentricity was first envisaged by Michael Polanyi (1951) in his book *'The Logic of Liberty'*. Polanyi hoped that liberalism might revive itself as a dynamic philosophy. Polanyi's concept of a free society differs from that of classical English liberals and Austrian school economists. Polanyi defended subsystems as the basic units of society, in opposition to classical liberalism's ontology of individualism. His concepts, particularly on 'polycentric organisation', was picked-up by several philosophers, sociologists and economists and influenced law studies, urban networks studies and, even more importantly, governance studies. The US-American political economist Elinor Ostrom (1990, 2003) raised significant attention to the concept. Ostrom, who won the Nobel Memorial Prize in Economic Sciences in 2009, was associated with the New Institutional Economics and the resurgence of political economy. Turning the notion of polycentricity into a key aspect of her proposed system of justice, Ostrom researched on questions such as: which legal issues should be settled in court, which should be settled by political means, and which should be left to the market? Ostrom's idea of market-like interorganizational arrangements or of 'public entrepreneurship' brings market-like attributes to public administration. Also the concepts of a 'common property system', further defined by Elinor Ostrom, can be seen as a relevant progress (Ostrom, 1990). Ostrom's ideas provide sophisticated solutions for the privatization of possible common resources such as forests or rivers and other resources with clearly defined boundaries – and could even be feasible for negative externalities of production. Elinor Ostrom's work *'Governing the Commons'* (1990) has been crucial for legal thinkers working on property rights and resource dilemmas. Elinor Ostrom believed that bureaucrats and politicians could not be more effective at centrally steering local aspects than the people 'on the spot' who have strong

incentive to find proper solutions for their local challenges. She spent significant time on investigating how communities succeed or fail at managing common pool (finite) resources such as grazing land, forests and irrigation waters. Her analyses on how communities could co-operate to share resources are still influencing today's academic and political debates about resource usage. When referring to the question of how to best protect forests from pollution and overharvesting, she assumed that when the users of a forest have a role in the definition of corresponding local usage rights, they will be more willing to engage in monitoring and protecting it. However, optimizing the monitoring of natural resources is a necessary but not the only crucial aspect to achieve long-term sustainability. In 2006, Ostrom analyzed factors, such as the structure of ownership/ land tenure, which potentially affect the state and evolution of forest areas. According to Ostrom & Nagendra (2006), citizens living in or close the forest should be involved in the related political decisions, as individual responsibility within society is crucial to optimize the maintenance and long-term sustainability of natural resources. Accordingly, when users are involved in the definition of corresponding usage standards, they are likely to follow these parameters to a much greater extent, than if a central authority simply imposes rules (Ostrom & Nagendra, 2006).

Ostrom's (1990) concept of common private property provides useful concepts for the efficient management of natural resources such as forest areas and rivers. Even in regard to certain negative externalities of production Ostrom's concepts of polycentricity and common private property are providing fruitful ideas. However, we must conclude that for negative externalities such as air pollution and global warming caused by ICE vehicles, her approach is not satisfying. Thus, to define a legal concept to properly evaluate and penalize negative long-term effects of air pollution caused by a multitude of consumers/ car owners (for example within major city centers), Ostrom's approach is a useful step forward, but not sufficient.

Ayn Rand's philosophical system called Objectivism is based on the following four pillars: 1) Metaphysics (objective reality), 2.) Epistemology (reason), 3.) Ethics (self-interest), and 4.) Politics (capitalism) (Rand, 1961, 1966). In this thesis we only want to focus on the fourth of the mentioned topics: politics. Rand's ideal political-economic system is laissez-faire capitalism, which she defines as the only system where men deal with each other not as masters and slaves/

victims, but as traders by free voluntary exchange to mutual benefit (Rand, 1961). She emphasized on individual freedom, self-responsibility and open markets, while condemning the initiation of force as immoral and opposing collectivism and statism (Rand, 1961).

As stated by Ayn Rand, *“the end does not justify the means. No one’s rights can be secured by the violation of the rights of others.”* (Rand, 1966, p. 256).

Rand believed that natural rights should be protected and strengthened by a constitutionally limited government. She supported her concept of the non-aggression principle, as from her perspective no man, or group, or society, or government has the right to initiate the use of physical compulsion against others. Government has only one function: to protect the rights of each individual by placing the retaliatory use of physical force under objective control (Rand, 1964, 1966). Democracy is seen critically, being a form of collectivism, which can easily deny individual rights to minorities. Thus, Rand (1964, 1966) favoured a constitutionally limited republic, in which the state is restricted to the protection of individual rights, limiting itself to providing jurisdiction in a legal framework, as well as homeland security (police) and national defense (armed forces). We sympathize with her general approach on politico-economic theory and the proposed legal framework, but we have not found any detailed, satisfying concepts related to negative externalities by Rand.

In previous chapters, we already referred to Hayek’s spontaneous order (Hayek, 1944, 1973; Boettke, 2012). It is a concept of unplanned social order, generated unconsciously by goal-oriented individual action, as self-organizing social phenomena transmit more relevant information than any centrally steered, conscious design. The extended order of human cooperation plays a central role in Hayek’s beliefs, which need to be understood and respected, to maximize prosperity and freedom of mankind (Hayek, 1973, 1979; Boettke, 1990). Hayek (1973, 1979) defines the “extended order” as a society based on a voluntary exchange within a free market, with limited government, with property rights, and the Rule of Law. The Rule of Law is the legal framework appropriate to the extended order. Hayek described it as a “political ideal”, which requires that laws are more than just legally binding and temporarily valid regulations. There

must be general rules which are universally applied. Hayek distinguishes between “Law” and “Legislations”. While true Laws are universal and can be discovered, actual “legislations” often and unfortunately are only orders defined by governments to control certain people/ groups (Hayek, 1973, 1979). The state’s power must be limited, only applying general rules to individuals, being without the authority to oblige certain individuals to do certain things. Within the range of these general rules, individuals have the right to pursue their goals. Hayek pointed out the importance to protect private property, as there is no true justice without property. However, Hayek also considered government as necessary, not only for law enforcement and ‘national defense’, but he also argued government raise funds by taxation to provide certain services which ‘cannot be provided adequately’ by the market (Hayek, 1979). Hayek defended restrictions on pollution by factories, limitations on deforestations, as well as the financing of schools. We believe that some of Hayek’s demands for state interventions went too far, for example in regard to deforestation. However, his concepts of the extended order and the Rule of Law are crucial enrichments to our discussion.

We already touched on the positions of Benson (2017) who stated that Rothbard’s concept of a fully-privatized tort law system suffers from methodological and theoretical flaws. For Rothbard, prices do not represent any objective form of economic value which can be measured by an observer, for which he rejected objective theories of economic value. We argued that the fully praxeologic and subjectivist approach of Rothbard (1970, 1982), contradicts with the aim to define and provide an ‘appropriate’ victim compensation to those harmed by corresponding negative externalities. Moreover, Rothbard’s concept of a privatized tort law system within an anarcho-capitalist order relies on the establishment of unambiguous causations in order convict the culprit and to compensate the plaintiff. We agree that, particularly in the case of complex negative externalities of consumption, such as air pollution and CO2 emission, the doubtless evidencing of such causalities is often practically not feasible. In a tort law system, judges must be able to define causations of doubtless rights violations, which, in the case negative externalities in complex biological and ecological systems, is often impossible.

Thus, if the individualist foundation of the traditional tort law concept often impedes the finding of proof for causation, a more collective approach could be considered a possible alternative. Thus,

based on the findings of Benson (2017) as well as of Ostrom & Nagendra (2006), we will look at more collective approaches on jurisdiction to possibly reduce the need for direct causation when dealing with complex environmental problems. Benson (2017) proposes that in such as collective approach, the simple 'evidence' that pollution is causing harm within a population could be sufficient proof for compensation, without the need to prove the exact cause of a particular injury to particular individuals/plaintiffs. Different to traditional neo-classical approaches, public entities would not need to calculate all the associated costs and benefits to determine the optimal policy. It would be sufficient to generally prove that the pollutant caused harm within the population, even if no particular cases of harm caused to individual plaintiffs can be legally associated with the pollutant. This more collective approach aims to establish a link between the polluters and the population generally, for which it only requires evidence that harm is generally caused by a certain activity, rather than evidence that harm is being caused to particular plaintiffs by specific defendants. We criticize Benson's approach for being clearly too collectivist, likely to cause more harm than the concepts of Coase (1960), Hayek (1944, 1973) and Ostrom (1990, 2003). A jurisdiction in which the plaintiff only needs to prove that general harm is caused, without the need to provide clear evidence of causation between concrete injuries and actions taken by the culprit, is not valid alternative.

We reject the traditional neo-classical approach, which indicates that most environmental problems are an example of a market failure. Thus, we do not believe that the primary solution to pollution and global warming can be the implementation of (further) emissions taxes, cap, traffic bans and other forms of taxations, regulations, and prohibitions. However, on the other hand, we see significant flaws and the free-market tort law concept of Rothbard (1970, 1982) and also reject the more collective alternative of Benson (2017).

Accordingly, we consider the approaches of Coase (1960), Ostrom (1990, 2003), Hayek (1944, 1973, 1979) and Rand (1961, 1964, 1966) as more useful theoretical frameworks to optimize individual freedom, justice and economic prosperity.

Coase (1960) was correct in indicating that public regulations are not as effective at 'harmonizing the market process' as government officials often believe. His 'Coase Theorem' must be seen as a useful legal and economic theory on property rights. It recognizes the importance of individual liberty and free markets without entirely rejecting the importance of 'socially efficient' solutions. Also Ostrom's 'polycentrism' and 'common property goods' concept (1990, 2003), as well as Hayek's (1944, 1973, 1979) 'Rule of Law' and 'spontaneous order' provide fruitful ideas for an optimized politico-economic and legal framework to maximize individual freedom and free trade while trying to protect citizens from property rights violations and individual harm caused by negative externalities.

As indicated, the main purpose of this thesis is not to thoroughly elaborate on the moral or economic justification of state coercion used for environmental protection purposes. Instead our main objective herein is to elaborate on the economic effects of monetary and fiscal policies on the automotive industry, establishing a theory and using historic data to illustrate our theory's validity for the specific scenario and analysed period in time.

Consequently, further studies on this topic are crucial and necessary, building up on their presented ideas. The aim must then be the definition of a consistent moral, legal and political framework which can minimize public coercion while protecting individual liberties.

We fully agree that a better fiscal and legal system could and should be developed, which should combine consumer rights and environmental protection in a more just and efficient way. But such research will be discussed in potential future papers, as it is not the priority of this thesis. Due to the mentioned aspects, the following chapters of our research will focus on analysing how recent fiscal policies have changed the automotive market. Thus, we herein focus on how dependent the entire "green technology/ alternative fuel vehicle" industry has been on public financial support and whether the seen significant market interventions through taxes, subsidies and other policies were necessary to 'properly steer automotive OEMs towards the development of efficient, progressive technologies'.

4.6 The Historic Perspective on the Evolution of the European AFV Market

Throughout decades, conflicts related to the access and usage of various energy sources have caused political tensions between states and confederation of states (Axsen *et al.*, 2015; Hartmann, 2018). Accordingly, as energy supply is of crucial geopolitical importance, several states have attempted to decrease their dependence on fossil fuels. In addition, already in 2007, the UN's Intergovernmental Panel on Climate Change released a summary of its report on global warming, in which it concluded that the existence of global warming was now 'unequivocal' (Reisman, 2007). Thus, in order to reduce global warming most governments have tried to limit and/or reduce carbon emissions and the use of the fossil fuels, such as oil, coal, and natural gas. Accordingly, throughout the past decades, a thorough transition towards renewable energies has been promoted by several regional and national governments as well as by multinational institutions such as the European Union. In this context the transportation sector, particularly the automotive industry, has also been held responsible for the production of negative externalities, such as global greenhouse gas emissions (GHG emissions), noise and air pollution. (Brand *et al.*, 2013). To a notable extent, these externalities have been caused by vehicles run on fossil fuels such as petroleum products, including gasoline, diesel fuel and fuel oil (Brand *et al.*, 2013; Diamond, 2009; Gass *et al.*, 2013; Lane & Potter, 2007). Thus, the impact of the transport sector on climate change and energy-related GHG emissions has shaped the political discussion throughout the past years. Accordingly, it is often argued that replacing vehicles run by internal combustion engines (ICEs) with so-called plug-in electric vehicles (PEVs) is crucial to increase the sustainability of the transport sector. Moreover, several EU-member states aim to reduce the vehicle-related petrol and diesel demand to decrease their dependence on foreign energy sources. However, one must consider that there are important economic costs related to such transition process (Dudenhöffer, 2016; Axsen *et al.*, 2015; Hartmann, 2018; Sinn *et al.* 2019). Accordingly, the automotive sector has seen significant changes within the past decade, strongly influenced by public incentives for alternative fuel vehicles and other public interventions. Moreover, within the decade of the 2010s, the political discussion in several countries changed

as the demand for AFVs was not only promoted through the implementation of corresponding public incentives, but also by systematically hampering the usage of vehicles with ICE technologies, for example with the introduction of additional taxes and (regional) driving bans, particularly for diesel vehicles (Sinn *et al.*, 2019).

Several economists such as Reisman (2007), Lomborg (2020), and Sinn *et al.* (2019) have strongly criticized most of the seen public interventions which have been introduced with the aim to potentially reduce global warming. The hypothesis that greenhouse gases, emitted by humans, have had an impact on the global climate system is generally supported by the overwhelming majority of climate researchers. However, there have been intense academic discussions on how precisely one can define causal relationships between observed climate changes and human behavior. Accordingly, Reisman (2007) and Sinn *et al.* (2019) deny that any empiric calculation could properly quantify the extent to which these changes have been truly 'man-made', and, on the other hand, to what extent naturally occurring fluctuations have caused these changes. In other words, indicating that humans have *also contributed* to global warming does not imply that humans *are* the main contributors to observed global warming. Thus, based on our praxeologic approach (Mises) and the findings of Reisman (2007), we argue that, if it has been impossible to precisely quantify the impact of human behavior on climate change throughout the past decades, it will be entirely impossible to make concrete predictions on the future causal relationship between human actions and global warming. Reisman (2007) thoroughly criticizes any interventionist environmental policies. He insists on a comparative valuation of the benefits which have been provided through free trade and industrialization since the industrial civilization versus the expectable negative economic long-term effects of economic policy measures aimed at fully avoiding further global warming. Reisman concludes that no political steps should be taken to stop global warming which could destroy our industrial civilization. Technological progress has helped to significantly increase the average life expectancy across all continents and income groups. Reisman (2007) defines environmentalism as a destructive, misanthropic philosophy. He insists that, if there was a relevant impact of mankind on global warming, the corresponding challenges could only be solved with further technological progress and politico-economic principles which are based on capitalism and the foundations of industrial civilization.

This section of the thesis focuses on evaluating the short-term and long-term effects of fiscal policies on the European automotive market in the period from 2010 to 2018, looking at the impact of mentioned public incentives for alternative fuel vehicles (AFVs). This public interventionism is critically evaluated to examine the effectiveness of government incentives in promoting AFVs, particularly of plug-in electric vehicles (PEVs).

Throughout the first decade of the 21st century, Western automotive markets were mainly shaped by those European and US-American automotive OEMs which had already been in the market for several decades. These OEMs focused on the production of traditional internal combustion engine vehicles (ICE vehicles), mostly operating in a low margin business, with complex supply chains while pushing sales volumes, trying to assure economies of scale. Automotive OEMs have been focusing on constantly updating the vehicles' design as well as improving engine powertrains in regard to performance and consumption, but fierce competition, and the mentioned low margins have kept most OEMs from focusing on courageous long-term planning with truly revolutionary product developments (Dudenhöffer, 2019; Amblard, 2018).

Then, in 2003, the US-American company Tesla Motors (today operating as Tesla, Inc.) was founded. The company's name is a tribute to the inventor and electrical engineer Nikola Tesla, as the company focuses on the production and distribution of plug-in and battery electric passenger cars, with the declared purpose to support the transition from a mine-and-burn hydrocarbon economy towards a solar electric economy. In 2004, the business magnate Elon Reeve Musk joined the company as its chairman and product architect, and became Tesla's CEO in 2008. In 2009, Tesla began the production of its first car model, the Roadster, which became the first serial production all-electric car to use lithium-ion battery cells. Then, in 2012, Tesla Motors, Inc. introduced its Model S, an all-electric five-door liftback sedan. At that time, only a few automotive OEMs, such as Nissan, Renault, Mitsubishi and General Motors had started the mass production and selling of battery electric vehicles. In 2013, Tesla's Model S became the first all-electric passenger car to top the monthly new-car-sales ranking of any country, becoming the most sold passenger car in Norway, in September and December 2013 (Vance, 2015). Roughly 10 years later, with the launches of a large variety of battery electric vehicles (B-EVs) and plug-in hybrid electric vehicles (PH-EVs), the situation has significantly changed throughout the past 10 years

(Jiménez *et al.*, 2016). While by now, all major Western automotive OEMs have launched models with the corresponding AFV engine technologies, also several new automotive companies, such as the Chinese OEMs BYD Company Limited, SAIC Motor Corporation Limited, Great Wall Motors Company Limited, and Geely Holding Group Co (including its new brands Polestar, Lynk & Co. and Zeekr), as well as NIO Inc., Xiaopeng Motors (Xpeng), Aiyas Ltd., and Chongqing Sokon Industry Group's new subsidiary 'Seres' are entering the European market with PEV models. Particularly in regard to SUV models with PH-EV and B-EV technologies, the mentioned Chinese manufacturers have become extremely competitive (Amblard, 2018; Dudenhöffer, 2019). Alternative fuel vehicles (AFVs) are vehicles which can be fuelled either partially or entirely by alternatives to fossil gasoline and diesel. The market of alternative fuel vehicles is comprised of battery electric vehicles (B-EVs), plug-in hybrid electric vehicles (PH-EVs), and hybrid electric vehicles (H-EVs) as well as fuel-cell electric vehicles (FC-EVs). As previously indicated, in several statistics, PH-EVs and B-EV are often combined and shown as PEVs (Plug-in electric vehicles). Thus, we will take a closer look at these four main alternative fuel technologies which have been most successful in Europe throughout the past years. B-EVs do not require gasoline at any point during their operation, relying purely upon electric battery power. PH-EVs, just like B-EVs, use a lithium-ion battery and runs on an electric engine (Axsen *et al.*, 2015). However, PH-EVs will switch to the gasoline engine once their electric battery runs low. H-EV models do also have an electric engine and powertrain but still run on gasoline. In this research, we mostly combine these technologies under the term 'alternative fuel vehicles' (AFVs), in comparison to the traditional internal combustion engine vehicles (ICEs). However, particularly when looking at recent developments, we will also often refer to the mentioned term 'plug-in electric vehicle', abbreviated by 'PEVs'. A PEV is any vehicle that can be recharged via an external source of electricity, e.g. wall sockets, and the electricity stored in its rechargeable battery packs moves, or contributes to move, the vehicle's wheels. The abbreviation 'PEV' can be seen as an umbrella term for electrified vehicles, which includes all-electric, or battery electric vehicles (B-EVs), as well as plug-in hybrid vehicles (PH-EVs).

Several aspects, such as vehicle prices, fuel prices, and maintenance costs, as well as circulation, registration and luxury taxes for petrol and diesel vehicles, or alternatively sales tax waivers and

income tax credits for AFVs can have a crucial impact on the success or disappearance of entire fuel type technologies (Lieven *et al.*, 2011; Jansson, 2017; Dudenhöffer, 2019). The desire to reduce one's own carbon footprint by using low-emission vehicles, and the often-provided usage benefits of AFVs, e.g. preferential urban parking space or the permission to use bus and taxi lanes during rush hours, have been relevant AFV purchase reasons (Achtnicht, 2012; Egbue & Long, 2012; Graham-Rowe, 2012). However, one significant difficulty in analysing the effectiveness of AFV adoption by using time series data is to truly define the proper correlation between the specific independent ('public incentives') and the dependent variable ('customer demand'), as the status and impact of several intervening, moderating and control variables has changed throughout the evaluated period of time (Jansson, 2017).

However, for many customers, the main reason to purchase alternative fuel vehicles can clearly be found in the (often significant) government subsidies provided for these new technologies, which minimize the customer's actual vehicle purchase price (Lieven *et al.*, 2011). For a more thorough understanding, we will also look at different known models to penalize negative externalities caused by air pollution, while also looking at different concepts related to customer behaviour patterns.

4.6.1 Environmental Protection & the Rise of Public Incentives for AFVs

By the year 2007 more than 88% of all analyzed Spanish companies within the automotive industry had already defined their own internal quantitative objectives related to 'environmental protection' (Carrasco *et al.*, 2009). In the case of larger analyzed corporates (with more than 250 employees), even 96.6% had already defined such objectives. In mentioned study, members of the companies' senior management were asked how well their companies were prepared to face both, increasing consumer and public demand, related to environmental protection.

On a Likert-scale from 1 ('strongly disagree') to 7 ('strongly agree'), the research participants indicated that environmental aspects were clearly considered when taking strategic corporate

decisions (score: 5.03 / 7) and that increasing concern for environmental issues is seen as an opportunity (score: 5.86 / 7). Only 20% of all considered companies did not see an entrepreneurial opportunity related to the increasing awareness for environmental issues, whereas 78.7% of the companies intended to proactively elaborate on related market opportunities and future public requirements. By the end of 2007, 76% of these companies had already implemented an internal corporate strategy on environmental protection, and even 81.3% had implemented a related certified management system such as ISO 14001 (Carrasco *et al.*, 2009). These interesting numbers indicate that, far before significant public incentives for AFVs had been implemented, entrepreneurs and managers within the automotive sector had already recognized the need to consider environmental concerns in the definition of future corporate priorities and strategies. We intend to evaluate whether, as soon as AFV technologies had become a serious competitive alternative to ICEs for consumers, the market would have embraced such new technologies without any public interventionism.

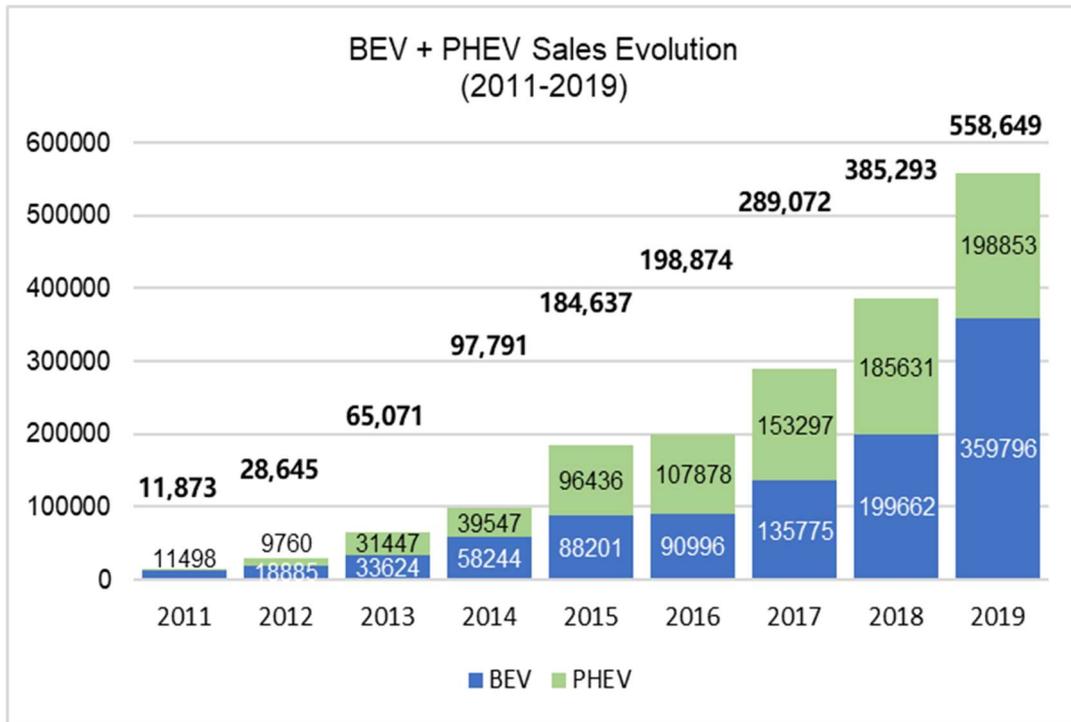
Public support for OEMs by providing public incentives or even by offering public bailout packages, differ between the individual countries, but the main purpose of these public interventions is generally said to be to “stabilize the economy while protecting workers”. We argue that, to assure a long-term stability of the market, sustainability needs to be assured, and product distribution must primarily be based on an actual customer demand, not on public incentives.

For this, our analysis emphasized on the long-term importance of free prices (Friedman, 1962), crucial to properly allocate resources, since on the contrary, (long-term) governmental interventions on pricing via taxes and subsidies lead to a market distortion (Hayek, 1931), which could ultimately cause a new crisis of the automotive sector (Sinn *et al.* 2019). Throughout the past years, public entities on EU-, national and municipal level have tried to promote alternative fuel vehicle technologies with different forms of fiscal and legal support. These incentives have clearly increased the awareness of AFVs and have overall led to a notable growth of the AFVs’ sales evolution (Brand *et al.*, 2013; Sinn *et al.*, 2019; Carlucci *et al.*, 2018). By December 2019, all EFTA member states and the UK combined accounted for 25% of all PEVs globally in use.

Whereas in 2016 PEVs only had a market share of 1.3% of all new car registrations in the EFTA+UK region, the share rose to 3.6% in 2019 (IEA, 2020).

Chart N° 51: Europe (EFTA+UK): Annual Sales of New PEVs

(passenger cars + light commercial vehicles)



Own elaboration, based on data from: IEA (2020)

The above chart shows the annual increase of vehicle registrations with a ‘full-electric’ engine (B-EVs) or a plug-in hybrid technology (PH-EVs) within the EFTA region (including the UK). The public support for AFVs, which was particularly focused on PH-EVs and B-EVs, has differed between individual countries and often even between municipalities. Meanwhile, the most common justifications for the increase of public incentives are the aim to minimize the dependency on fossil fuels, as well as to decrease greenhouse gas (GHG) emissions (Achtnicht, 2012; Kasper, 2007; Jiménez *et al.*, 2016; Noppers *et al.*, 2014).

Particularly in populated cities where mobility activities significantly contribute to generating negative externalities, the optimization of environmental sustainability in transport solutions requires new technologies, such as an optimization of vehicle engines. Thus, the diffusion of AFVs shall play a major role in reducing environmental pollution. Around the world, policy-makers have intensified the implementation of new strategies in order to increase the market share of AFVs (Axsen *et al.*, 2015; Campell *et al.*, 2012; Harrison *et al.*, 2017).

Several automotive experts define the currently available AFV technologies as superior to ICE from an environmental perspective, and consider them, as an important step towards the transition to a truly more sustainable transportation system. Several frame-works and theoretical models have been used to come to concrete conclusions. Up until the late 2010's, it was unclear whether PEVs would remain niche market products in Europe, only adopted by a small fraction of consumers, or whether they could truly become a mass product. Axsen & Kurani (2012) as well as Jansson (2017) focused on the influence of sociodemographic factors on the adoption decision, whereas Jensen *et al.* (2013) as well as Lieven *et al.* (2011, 2015) mainly focused on fuel consumption and tax incentives. Egbue & Long (2012) looked into attitudinal psychological factors such as moral values and environmental awareness, whereas Harrison & Thiel (2017) emphasized on the recharging infrastructure.

Most of the mentioned literature shows that apart from the driving range and the actual vehicle costs, also the public charging infrastructure has been an important factor, although the concrete causalities cannot be precisely quantified. Thus, apart from the vehicle purchasing price, two main aspects considered by potential customers of B-EVs (and FC-EVs) have been the status of the (public) recharging network as well as the actual recharging time for these vehicles (Axsen *et al.*, 2015; Harrison *et al.*, 2017). Therefore, a stronger growth of B-EV sales will require improved battery technologies and a more extensive charging infrastructure. By the end of 2016, there were only 1,403 public fast charging points in Germany, 523 fast chargers in Sweden but already 1,052 fast chargers in Norway (Carlucci *et al.*, 2018). Most consumers have been reluctant to switch to B-EVs as re-charging infrastructures have been limited in many regions, for which they have

consequently preferred conventional ICE technologies (or PH-EVs, if heavily subsidized). The question of how much public charging infrastructure is needed cannot be precisely answered, as this will also strongly differ between countries and by region (Achtnicht, 2012; Kasper, 2007; Jiménez *et al.*, 2016; Noppers *et al.*, 2014). First of all, a regular charging option, such as home or workplace charging, is considered as crucial for the success of PEVs in the early market phase (Harrison *et al.*, 2017). In this context, a significant difference can also be seen between most urban areas on the one hand, and sub-urban and rural areas on the other hand. Consumers with their own garage or private parking space may rely on their personal charging infrastructure to assure regular re-charging, while most consumers living in inner-city areas may mostly depend on public charging infrastructure or privately-run recharging stations. Despite the high amount of academic research papers written on the AFV sales evolution, they have mostly come to rather unprecise and often contradicting findings on the concrete effectiveness of corresponding government incentives (Dudenhöffer, 2016; Axsen *et al.*, 2015). Results with precise conclusions shall be the aim of scientific publications. However, a useful comparison of results from mentioned papers has proven to be rather difficult since the authors' approaches and assumptions have often been quite different. Our research shows different approaches while also trying to detect common findings.

On the one hand, in several markets, such as the Netherlands, Scandinavia and several metropolitan areas like London and Paris, AFVs (including Hybrid vehicles) gained notable market shares throughout the second decade of the 21st century. On the other hand, and in particular in southern and eastern EU countries, the total number of AFVs in usage has been relatively low and rather disappointing, despite the positive environmental implications, such as a reduction of carbon dioxide (CO₂) and nitrogen oxide (NO_x) emissions. Thus, despite the proliferation of such incentive programs, their efficacy in actually leading to a significant adoption of AFVs is unclear.

The purpose of this thesis is to evaluate whether AFVs (and of these, primarily the so-called 'PEVs') are truly a sustainable and competitive long-term solution or whether the often mentioned 'green revolution' has been mainly based on public incentives and other public interventions.

PEVs are considerably different to internal combustion engine ('ICE') vehicles due to their innovative technological features (Adnan, 2016), while still struggling due to their high initial purchase prices, still relatively low driving ranges, and a limited network of recharging stations (Axsen *et al.*, 2015; Carley *et al.*, 2013). These financial and operational disadvantages have restrained many consumers from adopting these new technologies (Brand *et al.*, 2017).

To detect the actual price competitiveness of PEVs with traditional internal combustion engine vehicles, independently from any public support, we consider 'total cost of ownership' comparisons (TCO comparisons) of ICEs versus PEVs, including all costs related to the vehicle ownership and usage, such as fuel costs and insurance costs as well as repair, maintenance and service costs (RMS costs). Within this thesis, we raised the hypothesis that, to assure a long-term and pan-European success of mentioned PEV technologies, sustainability needs to be assured, and product distribution must primarily be based on the actual customer demand, not on public incentives.

We argue that without strong public interventionism, the seen sales increase of AFVs/ PEVs between 2010 and 2018 would have been impossible. A natural shift of the European mass market towards alternative fuel technologies could only occur if price competitiveness was given versus ICEs, which as of today (status is the year 2021) is not the case. However, the seen significant public interventionism has also led OEMs to tremendous investments into the optimization of AFV (PEV) technologies (Dudenhöffer, 2016). Dudenhöffer (2016, 2019) argues that, if significant public interventions are held-up until the year 2024/ 2025, PEV technologies might actually reach price competitiveness with ICEs for which as of 2025, public interventions (and the corresponding public incentives for PEVs) could be minimized, and customer demand for PEVs could 'naturally' continue growing.

4.6.2 Customer Behaviour and its Impact on AFV Adaptation

Tidd, Bessant and Pavitt (2005) argue that properly understanding consumer behavior is crucial in order to design policies which could notably increase the uptake of new products and technologies. Steve Jobs once said: “*You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new*” (Jobs, 1989, p. 1). The well-known studies in the field of customer behaviour still remain restricted to the work of a relatively small number of authors, of which the most recognized is possibly the sociologist Everett M. Roger. Rogers, a professor of communication studies, popularized his theory of ‘Diffusion of Innovations’ (1962). Rogers defined innovation as “an idea, practice or object that is perceived as new by an individual or another adoption unit (Rogers E., 2003). Tigre (2006) states that a true innovation only occurs by the actual effective application of an invention. Tidd, Bessant and Pavitt (2005) defined innovation as the process of transforming opportunities into new ideas, putting them into practice.

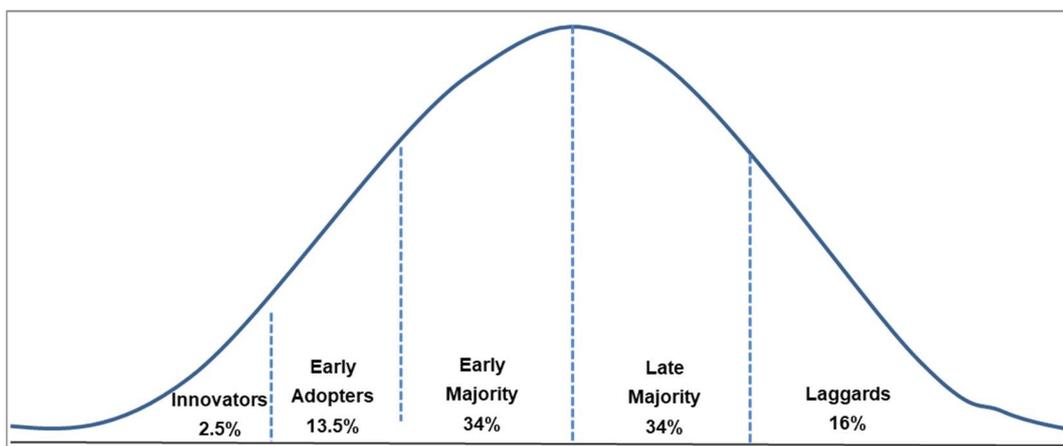
The theory of planned behaviour (TPB) by Icek Ajzen (1985) links people's individual beliefs and behaviour. Ajzen argues that attitude towards behavior, subjective norms, as well as perceived behavioral control, together shape an individual's behavior. Sovacool and Hirsh (2009) state that the majority of Western consumers, while making choices, stick to “notions of traditions and familiarity”. Christensen's notion of disruptive and sustaining innovation (1997), rooted in industrial analysis, can be seen as a helpful tool to measure innovation-driven growth (Christensen, 1997). Several other studies on innovation management (Tidd *et al.*, 2005), and transition challenges (Struben *et al.*, 2006) must also be considered. “Innovation” does not only involve the pure perception of a new idea. It also involves the practical use development process. Management efforts and capabilities need to be used towards its effective adoption, actual implementation and exploitation for the benefit of the organization. Rosegger evaluated the impact of competition and cooperation on the invention and application of technologies in the automotive industry, establishing a comparison between American and Japanese automakers (Rosegger, 1991). Rosegger concluded that the superior performance of the automakers from Japan during the 1980s was also partially caused by strategic partnerships they formed with their

suppliers. These partnerships enabled the diffusion of innovations among them, replacing the traditionally vertically integrated structure with a collaborative network, accelerating the dissemination of technologies in the industry.

Accordingly, we want to highlight those three concepts, which we consider as most helpful in regard to customer behaviour analysis, namely the 'Diffusion of Innovation' models (Rogers, 1962), 'Gartner's Hype Cycle' (Gartner, 2015) as well as the 'Willingness to Consider Method' (Struben and Sterman, 2008).

a.) Diffusion of Innovation: As stated, the most recognized researches on innovations are possibly those of Everett M. Rogers who popularized his theory of 'Diffusion of Innovations' (1962). Under Rogers' theory, a product will encounter 5 types of purchasers as it moves through its life cycle:

Chart N° 52: Roger's 'Diffusion of Innovations' Theory



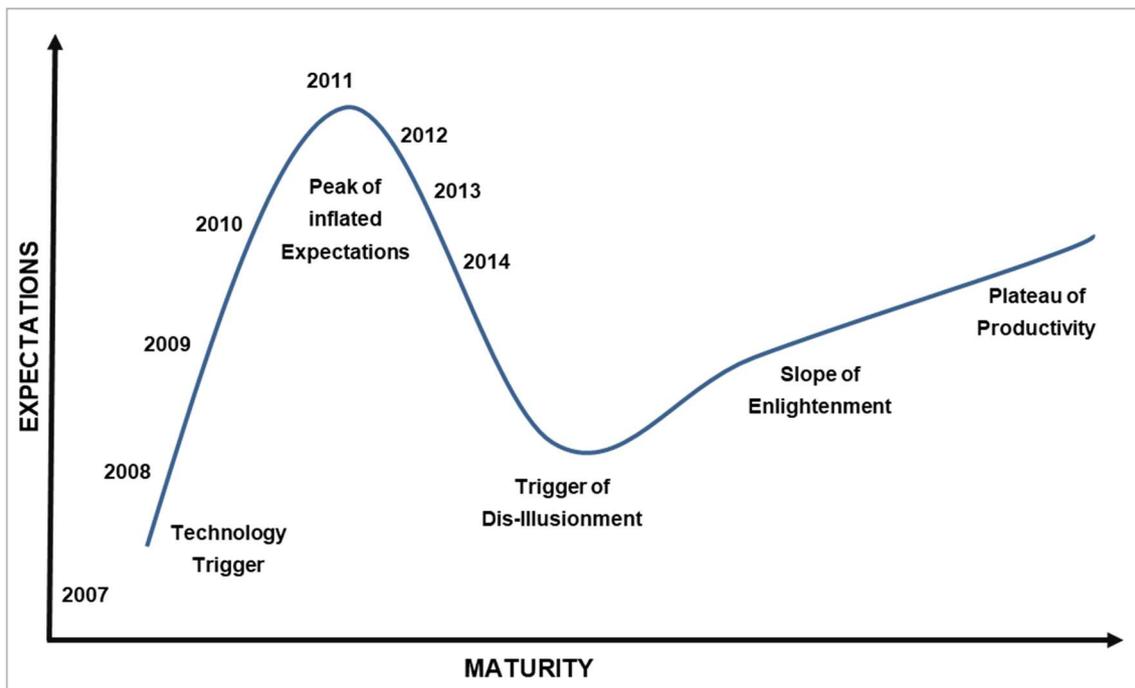
Own elaboration, based on E. M. Rogers (1962)

At first, the adoption rate is low and the innovation remains restricted to a few individuals ('the innovators'). At the next stage, a greater number of people adopt the innovation ('early adopters'),

accentuating the growth curve (late-majority) until eventually it begins to decrease, turning into an asymptote, the laggards being the last to embrace the innovation (Rogers M. , 2003). Thus, the analyzed period from 2010-2018 can be considered as the transition phase from 'innovators' to 'early adopters', where we may assume that nowadays (in the year 2019) the AFV technology is in its transition phase from 'early adopters' to 'early majority'. Thus, in regard to the herein analyzed topic, the transition phase from only attracting a few "innovators" to already reaching the wider group of the so-called "early adopters" can be seen as key phase to determine the success or the failure of a the individual AFV technologies.

b.) Gartner's Hype Cycle: John German, senior fellow at the International Council on Clean Transportation, states that the seen criticism towards AFVs and the assumption by several 'automotive experts' that AFVs would not be able to conquer the mass market, was caused by the "hype cycle". A perfect illustration of this phenomena can be seen in "Gartner's hype-cycle", invented by the IT research and advisory firm Gartner. It shows the natural and historic pattern of adopting new technologies. The hype cycle gives a graphical and conceptual presentation regarding the maturity, adoption, and social application of emerging technologies, by indicating five major phases: Initially, the 'technology trigger', followed by the 'peak of inflated expectations', the 'trough of disillusionment', and the 'slope of enlightenment', as well as in the last phase the 'plateau of productivity'.

Chart N° 53: Gartner's Hype Cycle for the AFV Industry



Own elaboration, based on 'Gartner's Hype Cycle' (Gartner, 2015)

Amara's Law, defined by the scientist Roy Amara, states that: "we tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run" (Searls, 2012, p. 257). Also this tool can be used to indicate an assumption on the future mid-term potential of AFVs in the European market, assuming that in the early 2020's, we will experience the beginning of a more constant growth phase.

c.) Willingness to Consider Method: Struben and Sterman (2008) developed the 'Willingness to Consider' concept (WtC) which captures the "emotional, cognitive, and social processes through which drivers gain enough information about, understanding of and emotional attachment to a platform/ powertrain for it to enter their consideration set." This model was later enhanced by Walter *et al.* (2010) and Shepherd *et al.* (2012). WtC develops over time through social exposure to the different power trains. Following up on these studies, Harrison and Thiel (2017) studied the impact of incentives and infrastructure on the competitiveness of alternative fuel vehicles within

the European automotive market. They combined the WtC with the relative financial attractiveness (based on total cost of ownership), as well as with perceived values and importance of attributes which characterize the different ICE and AFV powertrains.

1.) In calculating the “combined utility of powertrains”, they used the following formula:

$$P_i = \sum_A (\text{Attribute value}_{P_i} \times \text{Attribute importance}_{P_i}) \\ \times \text{Willingness to Consider (WtC)}_{P_i} \\ \times \text{Financial attractiveness}_{P_i}$$

(Attributes: choice, convenience, environment, performance, reliability, safety, popularity)

2.) Calculating the desired charging point installation (density/ n° of points)

$$\text{Desired CP installation: } \frac{\text{Forecast revenue} - \text{Current revenue}}{\text{Running costs} + \text{Installation cost} \times (1 + \text{desired ROI})}$$

Both conclude that even extremely high purchase subsidies alone would not lead to a long-term market success of AFVs with “mainstream customers” due to a lack of refuelling infrastructure, the limited driving range and a general rejection of new technologies by many customers. Moreover, incentives for current EVs can significantly hamper the dynamics of technology competition, leading to a technology lock-in. Stringent but general fleet emission targets are seen as more efficient to assure a decisive transition of the industry. Their study indicates that early PEV adopters were less dependent on the provision of public charging stations as they have often been able to rely on ‘home charging’. However, improved recharging facilities and a minimized recharging time are seen as crucial aspects if the ‘early majority’ and ‘late majority’ should be conquered.

4.6.3 Quantitative Research on AFV Competitiveness

In regard to fiscal policies, particularly with reference to public incentives for the automotive industry, the following proposition for a praxeologic *a priori* truth had been defined in this thesis: *'Fiscal policies distort the free market process, and will lead to unsustainable misallocations, ultimately lowering people's average standard of living, hampering free entrepreneurship and free consumer choice'*. In this context, two corresponding hypotheses had been raised. On the one hand, we argued that the AFV sales evolution in the different European countries has not only been influenced by public incentive schemes, but also by the individual local geographic, cultural and economic particularities. Moreover, we argued that in several markets such as Norway and the Netherlands, a clear correlation can be seen between the recent growth of 'green technology' vehicle sales and the simultaneously implemented public incentives.

4.6.3.1 Quantitative Research Approach with Automotive Experts

Also in regard to the competitiveness of alternative fuel vehicles, quantitative research was applied by distributing a questionnaire among a sample of automotive experts. As the raised questions require a thorough knowledge of the automotive market, the sample size was limited to 40 automotive experts working for an automotive OEM or for known mobility providers, such as vehicle leasing and car-sharing companies. Based on the concept of purposive sampling, we wanted to gain detailed knowledge from a sample which has proven experience in the analysed research topic. Thus, out of the total sample of 40 individuals, a total of 10 participants are Managers working in the 'New Mobility & Alternative Fuel' section. Another 15 participants are Managers in sales departments and the remaining 15 participants work in the Product Marketing department of OEMs or mentioned mobility providers. To avoid sampling bias, the sample was selected based on their work experience and latest job description, without previously knowing their personal approach towards AFVs and public interventionism. An interval measurement

structure with an itemized rating scale was used, while rating the level of agreement or disagreement. Consequently, for most of the questions, an interval 5-point Likert scale was applied. The sample of automotive experts generally agreed with the hypotheses raised in Chapter 1. Out of the sample of 40 participants, 22 fully or mainly agreed that even by the year 2025, PEVs will not be price/TCO competitive with ICEs without significant public incentives support/ incentives. Moreover, 27 participants assumed that (despite the seen fiscal support for B-EVs) the mass market can only be conquered once battery driving ranges and the refuelling station network are heavily improved. In addition, 22 participants of the sample fully or mainly agreed that stronger taxation on petrol/ diesel vehicles would distort the market, only creating an artificial demand for AFVs. Consequently, the experts' feedback supports our hypothesis that a massive public support for 'green technology' vehicle sales via public incentives is unsustainable from a macroeconomic perspective, leading to a significant market distortion.

Further details on the used questionnaire and its outcome can be found on the following page.

4.6.3.2 AFV Questionnaire Results:

Table N° 16: Automotive Experts on the Impact of Public Incentives for AFVs

Definition	Item Text	Manager in Mobility/ Alternative Fuel Dept.	Manager in Sales Department	Manager in Product Marketing Dept	TTL Participants
Questionnaire Questions	Job Title of Sample Participant	10	15	15	40

Dimension	Definition	Item Text	Strongly agree	Mainly agree	Neutral	Mainly disagree	Strongly disagree
Fiscal Green Technology Incentives	Support sales of environmentally friendly vehicles	'Wise' public incentives, promoting PEVs, can lead to relevant CO2 emission reductions without hampering the profitability of automotive OEMs?	18	12	5	5	0
		Even by 2025, PEVs will not be price/TCO competitive with ICEs without significant public incentives support/ incentives	6	16	8	10	0
		Even if fiscal support is provided for B-EVs, the mass market can only be conquered once battery driving ranges and the refueling station network are heavily improved.	15	12	7	6	0
Taxation on Petrol	Taxation on petrol/ diesel vehicles	Stronger taxation on petrol/ diesel vehicles will guide customer demand towards green technologies?	15	11	8	6	0
		Stronger taxation on petrol/ diesel vehicles will distort the market, creating an artificial demand for AFVs	6	16	10	5	3

Item Text	Improvement of the refilling network	Special highway lanes/ parking lots for PEVs	Increased driving range of B-EVs/ FCEVs	Further public incentives for PEVs	Higher taxes & restrictions on ICEs
What should be the main driver to significantly increase PEV sales in Europe?	6	5	18	7	4
	Hybrid (H-EV)	Plug-in Hybrid (PH-EV)	Battery-EV (B-EV)	Fuel Cell (FC-EV)	Others
What will be the most successful PEV technology by 2030 in Europe?	7	5	16	6	6

Source: Author's own design (shown results from questionnaires)

4.6.4 Other Research Conclusions on Customer Acceptance of AFVs

Looking at previous academic papers on this topic, the exact impact of the individual variables on vehicle preferences still remains unsolved. Several studies have shown that psychological variables have a stable effect on customer preferences. Also the relevance of certain socio-economic and demographic variables can significantly vary between individual markets. Moreover, several other variables are only included in a few studies, therefore their effects are as yet inconclusive.

There are several different models and perspectives related to consumer behaviour (Solomon, 1994, 2016). However, the two main research approaches are the positivist perspective which emphasizes on the objectivity of science and the customer as a rational decision maker, and on the other hand the interpretivist approach which stresses the subjective meaning of consumers' individual experiences and the idea that any behaviour is subject to multiple interpretations. The rising phenomenon of the 'political consumer' who bases product selection on political or ethical viewpoints, is gaining more relevance. Consequently, 'ethical behaviour' can lead to a higher customer satisfaction and customer loyalty, and can therefore lead to a company's long-term business success if properly handled.

One can find several quantitative studies in the literature with the aim to obtain formulas to characterize the behaviour of the pace of adoption of certain innovations in presumed stable circumstances. To do so, the prediction model developed by Frank Bass, known as *Bass diffusion model*, has often been used. It consists of a differential equation describing the rate of adoption of an innovation over time (see Bass, 1969). It is mostly used in determining diffusion rates of new durable goods products by consumers to quantify the diffusion process.

More research is definitely necessary to clarify their impact. Further research and optimized methods seem needed to add more rigour and consistency to the results.

As stated, for customer behaviour modelling, we will also refer to the theory of planned behaviour (TPB) by Icek Ajzen (1985) which links people's individual beliefs, perceptions and actions. Egbue

& Long (2012) emphasised on the barriers to a widespread adoption of electric and fuel-cell vehicles. Based on Sovacool and Hirsh (2009), Egbue and Long also analysed the socio-technical aspects which have hampered AFVs to be successful in the mainstream consumer market. Egbue & Long's (2012) main concerns include the limited driving range of current AFV models, the relatively time-consuming recharging processes, the lack of recharging stations as well as concerns on the actual Total Cost of Ownership (TCO) due to uncertainties on the AFVs' residual values. The key cost driver in the TCO equation of B-EVs has mainly been the battery pack. Bluh (2009) defines TCOs as "an estimate of all direct and indirect costs associated with an asset or acquisition over its entire life cycle".

Oliver and Rosen (2010) state that consumer acceptance of H-EVs was initially clearly limited by the eventual risks related to new products and trade-offs regarding fuel efficiency and price. Angus Deaton evaluated in his work 'Understanding Consumption' (1992) theories related to price theory, utility theory and demand estimation, studying liquidity constraints and ways to properly model heterogeneity across groups and households. Deaton showed us that properly understanding customer behaviour remains a core task of economists. Sovacool and Hirsh (2009) state that the majority of Western consumers, while making choices, stick to "notions of traditions and familiarity", rather than to look for new technologies. Thus, common barriers to the adoption of new technologies include lack of knowledge and low risk tolerance by potential adopters as well as high initial costs (Graham-Rowe, 2012). While keeping in mind the concepts of 'creative destruction' by Schumpeter, and 'entrepreneurial alertness' by Israel Kirzner (1973), we must not forget to consider to what extent 'sales boosts' purely caused by public interventionism are disrupting 'the order' within the automotive industry. Christensen's notion of disruptive and sustaining innovation, rooted in industrial analysis, has proven to be a useful tool to measure innovation-driven growth (Christensen, 1997).

In Christensen's typology, sustaining innovation supports improved product performance. Christensen distinguished between new-market innovations which are serving new users (such as personal computers produced for the mass market, for those that previously had not used any computers), and low-end market innovations which focuses on reducing prices of existing

products, by producing them at lower costs. Companies can achieve competitive advantages due to disruptive innovation by being quick movers or at least quick followers. 'First movers' are often benefitting from high profit margins due to a monopoly-like status. On the other hand, second-movers may benefit from the "free-rider" effect, for example by learning from the market introduction strategy of the first-movers and by potentially being able to reduce R&D costs. As Dijk and Kemp (2013) argue that Christensen's analysis is not properly considering changing consumer perspectives and government regulations, they insist that in regard to the automotive industry, those aspects need to be considered more thoroughly.

Windrum and Birchenhall (2005) state that: "...the probability of disruption depends on there being at least some positive differential between the provision of consumer receptiveness for the new technology goods opposed to the receptiveness for old technology goods." For customers there must be an actual benefit in using the new technology (Bockarjova, 2014) and for manufacturers there must be a benefit in producing and offering the new good (Windrum *et al.*, 2005).

Without significant public incentives, the actual costs of AFVs have been drastically higher than those of gasoline powered ICE vehicles.

While Gallagher and Muehlegger (2011) showed that consumers' decision to buy H-EVs had been strongly related to the evolution of gas prices and government incentives, the general average extra cost of owning H-EV vehicles (excluding incentives) was still expected to be between US\$ 2,500-14,000, compared to a corresponding ICE vehicle. An internet-based survey by Egbue & Long (2012), evaluating 481 responses of potential AFV vehicle buyers was analysed. Potential future AFV customers stated that the main purchasing reasons would be the aim to reduce petroleum usage and greenhouse gases as well as the hope that overall maintenance costs could soon be lower than those of traditional ICE vehicles.

One crucial aspect which has limited the success of AFVs is the uncertainty about the vehicles' total cost of ownership (TCO) as residual values (RVs) for these new technology vehicles can hardly be predicted. Thus, from a financial perspective, one major challenge to the success of PEVs, in particular for B-EVs and FC-EVs, is the uncertainty about the vehicles' actual total costs,

as the depreciation of PEVs has been rather volatile and difficult to predict (Jenkins, 2015; Jimenez *et al.*, 2016; Kalmbach & Bernhart, 2011). A residual value forecast describes the future value of an existing good. In the automotive industry, residual value calculations are usually based on the assumption of a vehicle holding period of 3 years (36 months) and an average annual mileage of 30,000km. Specialized companies called 'RV guidebooks' like AutoVista (Eurotax-Schwacke), L'Argus, BFF and CAP have gained significance in the European automotive industry for providing so-called residual value forecast reports, giving (non-binding) indications on the expected value of current vehicle models after a specific period of time. However, due to the significant progress in the AFV sector, including new engine technologies, new model launches and generally a high dependence on public interventionism, it has been extremely challenging to forecast the residual value ('RV') of B-EVs, PH-EVs, and FC-EVs. This uncertainty makes it difficult to realistically predict the total cost of ownership (TCOs) of these vehicles. TCOs are a key aspect in any corporate fleet tender, as it is ultimately not the new-car transaction price, but its TCO which defines the competitiveness of a vehicle in the Fleet business (Lebeau *et al.*, 2013).

On the other hand, Dijk *et al.* (2013) note that already by 2012, the development of social connotation of B-EVs and PH-EVs technologies showed some impressive evolution: Social connotative attributes such as "environmental-friendly" and "high-tech", ideally combining the reduction of CO₂ and NO_x emissions with "connectivity & infotainment", started to play a more significant role in the development of new vehicle models and engine technologies.

However, as indicated by Windrum and Birchenhall (2005), customers need to see an actual benefit in using the new technology and manufacturers need to detect a benefit in producing the new good. However, according to Rezvani *et al.* (2015) and Aksen *et al.* (2015), the main constraint to the commercialization of PEVs has been the limited energy storage while the evolution of battery technology has been limited by the trade-off between power, energy, longevity, cost, and safety. The durability of a battery depends on a number of factors such as the climate, the frequency of charging and the amount of energy involved in the charging process. Fiscal incentives are used to directly influence the vehicle purchase decision of individuals and companies, mainly provided through total or partial tax exemptions, or direct subsidies (Lieven T.,

2015). Despite the general good intentions by most consumers to 'help protecting the environment', fiscal incentives - if sufficiently high to offset cost differences between AFVs and conventional vehicles - are still the most important reason to switch to green technologies, according to a survey among Norwegian battery electric-vehicle (B-EV) drivers (Bjerkan *et al.*, 2016). A main purpose of the corresponding research remains to be to detect if significant public incentives for AFVs are sustainable from a macroeconomic perspective, or if they ultimately lead to instable market distortion.

4.6.5 The Relevance of Fiscal Policies for the Competitiveness of Alternative Fuel Vehicles

Thus, even if there are several psychologic/ emotional as well as cultural/ sociologic aspects which certainly influence customer decisions, we conclude that ultimately, customer intend to take rather rational decisions when purchasing a vehicle, mainly based on a 'value-for-money calculation'. A vast majority of corresponding studies concluded that financial, technical and public-infrastructure attributes are the key aspects in regard to AFV adoption. Thus, the sales evolution of AFVs must mainly be evaluated from the perspective of customers' financial benefits/ disadvantages. And this is mainly driven by the question whether AFVs have been able to compete with traditional ICE vehicles in regard to their TCOs.

Thus, the impact of government incentives for alternative fuel vehicles must be primarily examined, analysing how political interventionism led by fiscal policies has shaped the automotive industry in the period from 2010-2018 regarding the sales growth of 'green technology' vehicles.

Apart from official EU fleet emission regulatory targets, and member-state funded R&D projects, also the 'European Green Vehicle Initiative' was launched in 2008 in the EU as a public-private partnership, which funded several activities under the EU framework program for research and innovation. Already by 2017, there were more than 300 different R&D programs ongoing in the

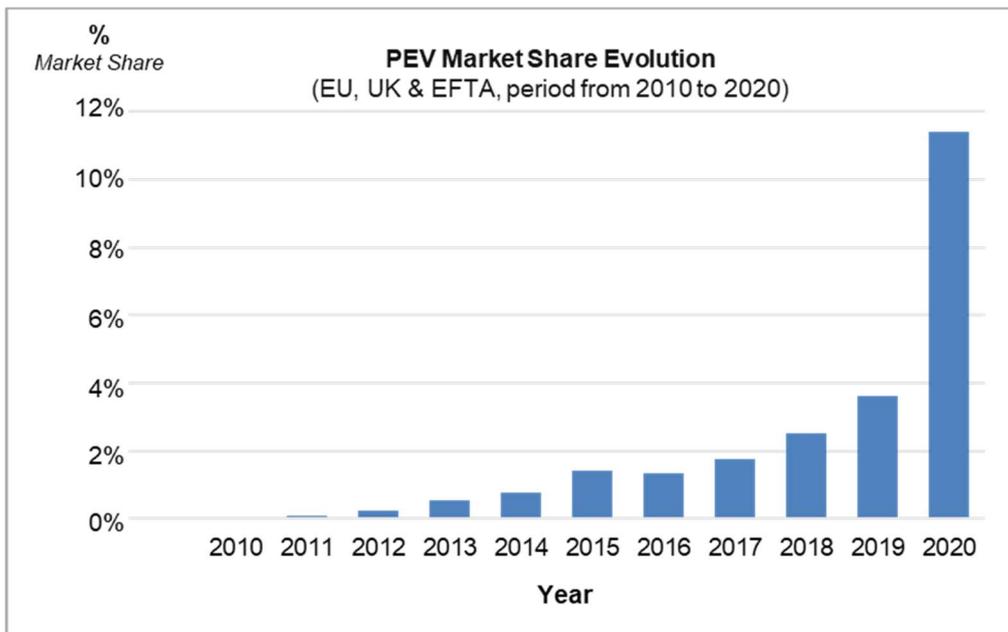
EU, related to technologic improvements such as energy storage and control devices, with a total budget of nearly 3 billion Euros, co-founded by the EU and the corresponding member states (Harrison & Thiel, 2017). Previous research has already evaluated the impact of fiscal incentives for AFV users (Drossinos, 2017; Carlucci *et al.*, 2018; Gass *et al.*, 2013; Lane & Potter, 2007; Mock & Yang, 2014; Tran *et al.*, 2013) as well as of regulations directly effecting manufacturers (Canes, 2003; Walther *et al.*, 2010; Thiel *et al.*, 2014).

However, we consider it as essential to constantly update and optimize the research results, trying to 'connect-the-dots' of the different findings from previous studies. Most of the mentioned automotive experts argue that since the first decade of the 21st century, Europe can be found in the adoption phase of electric vehicles, with initially rather low, but constantly growing sales rates, in particular in north-western European countries such as the Netherlands and Norway (Kok, 2015; Jiménez *et al.*, 2015). As indicated, in this thesis, we only focused on vehicles which use one or more electric motors or traction motors for propulsion, including hybrid electric vehicles (H-EVs). Thus, vehicles run on alcohols (such as ethanol and methanol) or methane (including natural gas and biogas), as well as biodiesel and synthetic fuels, are herein not considered as AFVs. Instead, we focus on those electrified alternative fuel technologies which have been the most relevant ones up until 2018, namely: Hybrid Electric and Plug-in Hybrid Electric vehicles as well as, Battery-Electric-Vehicles and their 'sub-category' of Fuel-Cell- Electric vehicles. (Fuel Cell-Electric vehicles generally use a fuel cell, instead of a battery, to power their on-board electric motor, generally using oxygen from the air and compressed hydrogen. They only emit water and heat and might be seen as the most future-oriented technology if the needed recharging network can be developed.).

Special attention needs to be paid to two European markets - Norway and the Netherlands – where significant public incentives had early been implemented to 'promote' AFVs (Noppers *et al.*, 2014; Kok, 2015; Skonhoft *et al.*, 2014). Backed by different sorts of public interventions, a notable market change has taken place in these two countries, shifting the market from ICE to AFV engines (Drossinos *et al.*, 2017; Skonhoft *et al.*, 2014; Mock & Yang, 2014; IEA, 2020).

A broad literature review was carried-out, including customer behaviour/ customer adoption, apart from a thorough analysis in regard to alternative fuel vehicles. This review was meant to clarify the following aspects: How have previous academic studies on AFVs been done in regard to the methodology? Which are the key decision factors for consumers when choosing among specific models and fuel types? What research gaps can be detected from the currently available academic papers so far?

Chart N° 54: Market share evolution of PEVs in Europe (PCs and Light-duty PEVs)



Own elaboration, based on data from: International Energy Agency & ACEA (March 2021)

The impact of the transport sector on climate change and energy-related greenhouse gas (GHG) emissions has become a major aspect of political discussion throughout the past years (Dudenhöffer, 2019; Aksen *et al.*, 2015; Hartmann, 2018; Sinn *et al.* 2019).

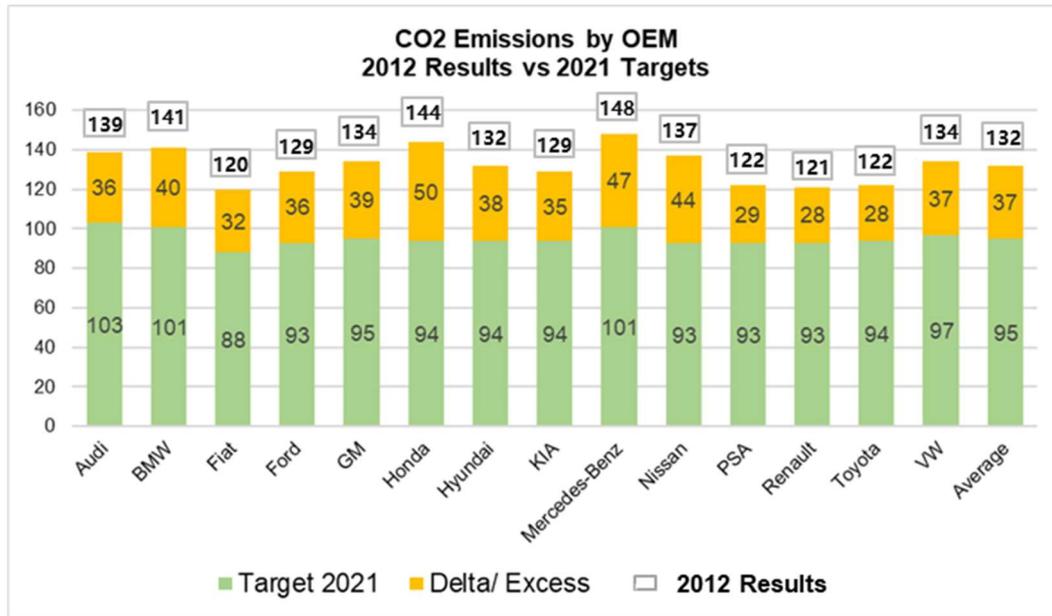
Vehicles run by fossil fuels like petroleum products such as gasoline, diesel fuel or fuel oil are not only criticized for mentioned global GHG emissions, but also for causing noise and local air

pollution, hampering people's health, in particular in urban environments (Dudenhöffer, 2016, 2019; Brand *et al.*, 2013; Gass *et al.*, 2013). Moreover, certain EU-member states have criticized the car-related petrol and diesel demand for having created a strong dependence on foreign energy sources, depending on providers from non-EU and non-NATO countries (Brand *et al.*, 2013).

Sovacool & Hirsh (2009) argue that based on these reasons, national and local governments in Europe, but also in other parts of the world, have adopted a wide range of measures to increase the use of alternative fuel vehicles: As mentioned, the four main alternative electrified engine technologies of this decade will be in the focus, which are Hybrid (H-EV) and Plug-in Hybrid Electric (PH-EV) as well as Battery-only (B-EV) and Fuel Cell (FC-EV) engines.

In 2014, European Union nations had agreed that carmakers should limit CO₂ emissions across their model range. Thus, from 2020 onwards, the average emissions across all models of a manufacturer should not exceed 95 grams of CO₂ per kilometre. However, models with higher CO₂ emissions can therefore be legally offset against vehicles with lower emissions. Accordingly, AFVs have been seen as a promising way to help OEMs in cutting CO₂ emissions to meet the corresponding EU targets. Based on data from the European Commission Amsterdam Roundtable Foundation, in 2012 the CO₂ emissions of all major OEMs had clearly exceeded these initially agreed targets for 2021 (European Commission, 2014).

Chart N° 55: CO2 Emissions of Selected Brands in Europe: 2012 Status vs. 2021 Targets



Own elaboration, based on data from: European Commission Amsterdam Roundtable Foundation (2014)

Therefore, OEMs have seen an increasing need to sell more AFVs, particularly PEVs, to meet the corresponding quotas. Also in the USA, particularly in the state of California, 'regulatory credits' have been given by public entities (such as the state and the federal government) to manufacturers for contributing towards minimizing pollution of the environment. Automotive OEMs have been required by law to meet certain minimum emission standards, as otherwise they could face significant fines. The legal set-up of this process has also permitted the trade of emission certificates between automotive OEMs. Thus, automotive OEMs which did not sell the sufficient volume of low-emission vehicles, have been able to purchase 'CO2 emission credit' from competitors in order to optimize their own annual emission results. In other words, automotive OEMs which could not meet the emission standards with their own product portfolio, can purchase regulatory credits from other OEMs which have excess credits, such as Tesla.

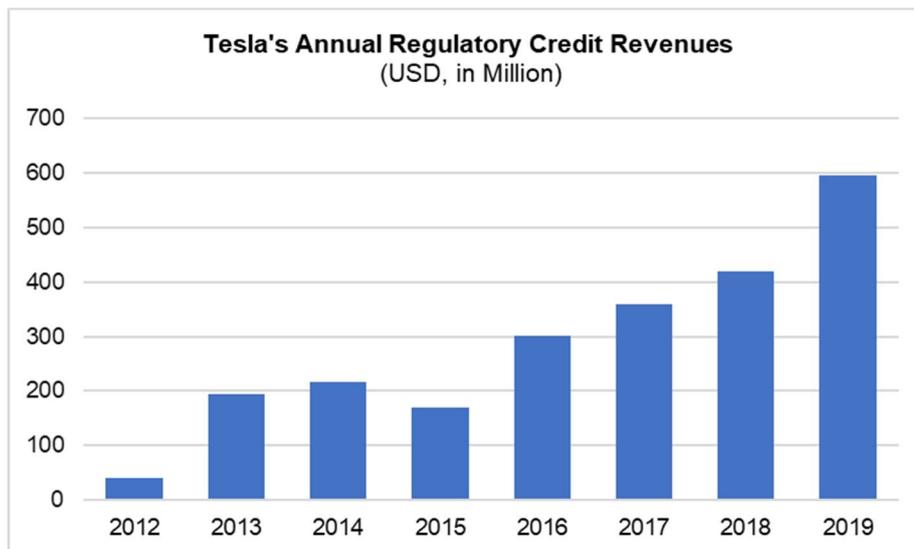
Accordingly, OEMs like General Motors Company and Fiat Chrysler Automobiles N.V. (FCA) admitted to have purchased emission certificates from Tesla Inc. in order to avoid such fines for excessive CO2 emissions. Throughout the past years, Tesla has been able to create additional

revenues by selling such 'regulatory credits': From 2010 to 2018, Tesla Inc. achieved significant revenues of almost \$2 billion by selling mentioned greenhouse gas credits. In the USA, Fiat Chrysler disclosed agreements on the purchase of mentioned credits from Tesla for the years 2016, 2018 and 2019 (Randall, 2019).

The chart below shows Tesla's revenue from regulatory credits for the period from 2012 to 2019 on a yearly basis. Accordingly, in the year 2018, Tesla achieved annual revenues of USD 419 million by selling regulatory credits.

Chart N° 56: Tesla's Annual Regulatory Credit Revenue (in USD million)

Annual Revenue's achieved by Tesla Inc. from 2012 to 2019 with mentioned regulatory credits:



Own elaboration, based on data from: Bloomberg (2019)

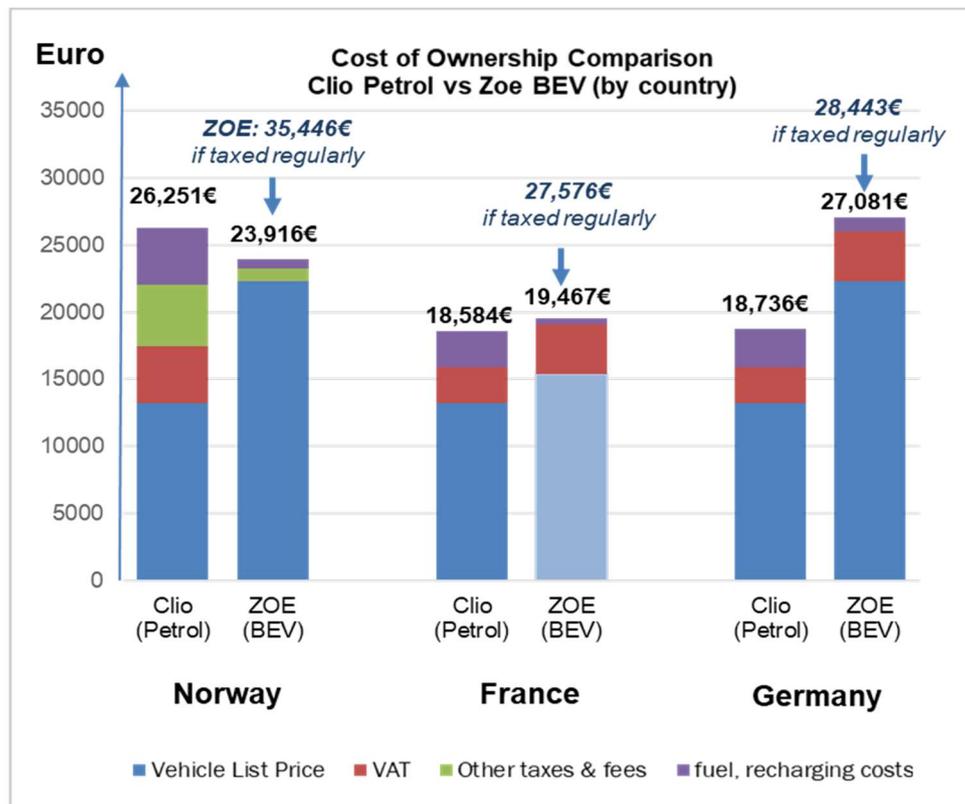
In the USA, already back in 2015, Fiat Chrysler Automobiles NV had purchased greenhouse gas emissions credits from Tesla Inc., Toyota Motor Corporation and Honda Motor Company. Regulations on CO2 emissions have become increasingly challenging to those carmakers which did not adapt their model range to the interventionist policies of US-American and EU law-makers.

Fiat Chrysler argued that the trading of such certificates was an effective tool as long as environmental regulations were not in line with the actual customer demand for PEVs. However, one must not ignore that this legal loophole provided a significant advantage to Telsa Inc., that was able to gain relevant additional revenues through this certificate trading (Randall, 2019). These additional revenues for Tesla, Toyota and Honda caused by public interventionism, further intensified the herein explained market distortion. It particularly gave Tesla an important advantage in competition, while further hurting those OEMs which had based their vehicle production on the actual situational customer demand.

4.6.5.1 Net Customer Costs: Comparison of Gasoline vs Electric Engines by Country

It is crucial to analyse the corresponding final total cost of ownership (TCO) of AFVs, and of B-EVs in particular, with and without public incentives. By comparing the examples of different European countries, we can evaluate if there has been a significant causality between public incentives and the corresponding local AFV sales evolution (ICCT, 2014; Jiménez *et al.*, 2016; Noppers *et al.*, 2014). In this regard, one must critically evaluate the sustainability and market competitiveness of the AFV technology without public incentives.

Chart N° 57: Impact of Public Incentives on Price Competitiveness (Status 2013)



Own elaboration, based on data from: ICCT, Mock & Yang (2014)

As shown above, only because of heavy incentives could PEVs such as the Zoe B-EV compete with their ICE counter-parts. In 2013, the B-EV model Renault ZOE had a lower market share in Germany than in France or Norway. A correlation can be found in the ICCT report from 2013, showing us the estimated total cost of ownerships for a Renault Clio (with a gasoline engine) versus the mentioned Zoe (battery electric vehicle), including the corresponding local public incentives. Consequently, the higher the public incentives (example Norway) the more significant has been Zoe B-EV's market share (ICCT, 2014).

Hayek (1931, 1939) had already considered prices and profits to be knowledge-conveying devices. Prices as well as profits convey information regarding the supply of and demand for goods and services, and the effectiveness of individuals in producing/ providing them (Hayek, 1931, 1939). The development of the price system started to allow us to decide rationally about

the allocation of scarce resources (Hayek, 1990). Prices must be seen as signals on the relative scarcity of goods and resources. Prices also help to coordinate human activities, as “...prices can coordinate separate actions of different people in the same way as subjective values help the individual to co-ordinate the parts of his plan” (Hayek F., 1945, pp. 84-85), As Carl Menger already stated, “value is a judgement which economising men make about the importance of goods at their disposal for the maintenance of their lives and well-being” (Menger, 1951, p. 121). Already in his early works, Hayek (1931, 1939) constantly emphasized on the coordinating role of freely adjusting market prices. As we can see in the above chart, a free market is not provided in the European automotive market, since the implemented high incentives and taxes have significantly distorted the market.

Different public incentive approaches with the aim to increase AFVs registrations were adopted by the individual European countries: Based on a study from 2015 written by the International Energy Agency (IEA), the use and/or purchase of fossil fuel vehicles causing negative externalities was penalized with taxes in several countries such as Norway, Netherlands, and Italy, from which B-EVs and FC-EVs were partially or fully exempt (Thiel *et al.*, 2017). On the other hand, in the UK and France direct subsidies were given to B-EV owners upon vehicle purchase. Whereas in Poland no incentives at all were given, fiscal incentives in Norway have been the most generous within Europe (Bjerkan *et al.*, 2016). The Norwegian vehicle taxation system has been heavily taxing fossil fuel vehicles based on curb weight and engine power, as well as on CO₂ & NO_x emissions. In addition, there was generally a high 25% VAT rate for vehicles, from which B-EVs were exempt (Thiel *et al.*, 2017).

In addition, several other benefits and incentives were implemented, such as the mentioned access to bus lanes, free parking and road toll exemption, and a wide availability of public charging stations providing free electricity for EVs.

In the Dutch taxation system, the vehicle fuel type has also played a significant role, as in 2014, a diesel surcharge of Euro 73 per gram of CO₂ emitted was imposed on emissions above 70

g/km. Moreover, the rate of the annual circulation tax has depended on the fuel type (petrol/diesel), while PH-EVs and B-EVs were exempt (McKinsey, 2014).

However, unlike in Norway, B-EVs were not exempt from VAT, which made the financial benefit of owning a B-EV less attractive in the Netherlands than in Norway.

In the UK, the purchase subsidy covered 25% of the EVs purchase price with an upper limit of £5,000. Other benefits differed locally such as the exemption from city congestion charge (e.g. London), or reduced parking charges. In France, a 'bonus-malus system' was introduced, based on type-approval CO₂ emissions. It can be concluded that the Norwegian concept of providing tax exemptions, e.g. for the registration and circulation tax, mainly promoted big alternative fuel vehicles, whereas the lump-sum subsidies provided e.g. in France favoured the purchase of small AFVs. Moreover, due to a lack of Budget transparency, it cannot be assured that taxes and fines related to 'penalizing pollution' have mostly been 'ring-fenced', meaning that the corresponding government gains were truly allocated to projects protecting or enhancing the environment.

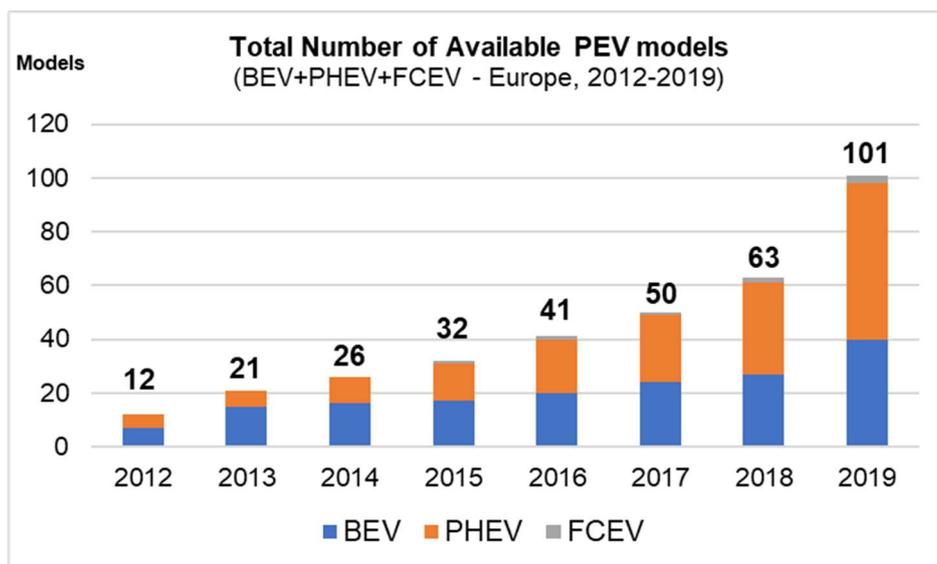
However, also other important, non-fiscal/ non-purchase price related factors can influence the sales development. Erik Figenbaum *et al.* (2016) states that B-EV sales significantly increased from 2010 to 2015 in Norway, Netherlands, UK, and France, even if simultaneously direct public incentives for B-EVs remained stable. Consequently, it is argued that the significant growth was mainly due to four aspects (Figenbaum *et al.*, 2016):

- 1.) a general customer awareness increase for AFVs,
- 2.) new B-EV model launches leading to a wider product variety,
- 3.) an optimization and densification of the re-charging network (charging stations),
- 4.) an optimized driving range due to improved technologies.

4.6.5.2 Green Technology Vehicles: Alternative Propulsion Model Launches

From 2012 to 2016, the number of available PEV models within Europe significantly increased from only 12 to 41 models. More diversity and more availability of PEV models on the market was considered of major importance to increase the PEV market share (IHS, 2021). A particular focus was on PH-EV model versions, as the PH-EV technology is often considered as the most appropriate transition technology from ICE to B-EV technologies (McKinsey, 2014)

Chart N° 58: Evolution of PEV Model Availability in Europe



Own elaboration, based on data from: IHS & JATO (2021)

Moreover, a research done by Lieven confirms that the customer motivation to purchase B-EVs (as well as fuel cell electric vehicles, herein abbreviated by FC-EVs) is heavily connected to the number of available charging stations.

Additionally, separate local policies, implemented by municipal or regional governments, such as the right to use bus lanes, or special parking space for AFVs were implemented to convince consumers to purchase AFVs (Lieven T., 2011).

4.6.5.3 Fiscal Incentives & their Impact on Price Competitiveness & Sales Evolution

In order to define the impact of fiscal incentives on the purchase decision of consumers, one needs to calculate all fiscal incentives and see them in comparison with the net price of the individual PEV (Jenkins, 2015; Jiménez *et al.*, 2016). The total amount of all monetary direct incentives is the sum of all direct subsidies (e.g. upfront discounts) as well as the monetary differences in regard to dues and taxes such as the VAT, registration tax or circulation tax for PEVs versus their most similar ICE counter-parts. With this relatively basic calculation in which other aspects such as local/ municipal taxes or possible free parking spaces for PEVs are not yet included, we still get a helpful indication, on how significant public intervention has been on PEV market competitiveness (ICCT, 2014). By doing so, we can roughly divide European markets into three groups, considering the status of incentives schemes by year-end 2017: The first 'group' consists of Norway only, with the highest incentives ranging between 39-67% of the net price for B-EVs and 17-23% for PH-EVs. In 2014, as shown in a research by Drossinos, Levay and Thiel (2017), a battery-driven Volkswagen e-up! (B-EV) had a net list price of 21,898€ whereas its petrol counterpart had a net list price of only 11,153€. However, by adding the VAT (2,788€) and registration tax (4,839€), which are both not applicable for the B-EV vehicle, the gross price of the petrol version already increased to 18,781€. For a proper cost calculation, other aspects, such as the higher fuel costs, and the circulation tax must still be added. In the second group we found the Netherlands, France and UK with calculated incentives of 10-40% of the net B-EV price (status: 2017). In the third group, countries like Germany and Italy were found, where incentives did not even reach 10% of the net B-EV prices (Drossinos *et al.*, 2017).

Several studies have used cross-sectional sales and registration data from different countries and regions to examine factors influencing automobile adoption. These studies include Button *et al.* (1993), who used cross-sectional data on car adoption in low income countries, as well as the research by Cao *et al.* (2004), who looked at car ownership in California, and Kahn (2007), who chose census track data to evaluate hybrid registrations in Californian cities.

Apart from fiscal incentives to promote AFVs, there are also clear signs of European governments to generally ban petrol and diesel vehicles from the market. In 2018, the French government announced that France will end sales of diesel and petrol and vehicles by 2040. Prof David Bailey from Aston University said this French law would provide a clear signal to automotive manufacturers and consumers that the transition towards the increased importance of electric cars is being significantly accelerated. The European Environment Agency had confirmed that the French car manufacturers Peugeot, Citroën and Renault ranked first, second and third on a 2016 list of large car manufacturers with the lowest carbon emissions (Asthana & Taylor, 2017). Consequently, one may speculate that the official aim of “environmental protection” should actually camouflage a new form of protectionism, as the laws passed by the French government were likely to benefit first and foremost the local French brands.

Even more radical are the targets of Norway, where already by 2025, only vehicles with a PEV technology should be sold (Jacobs, 2016). The Dutch government followed a very similar plan and also other countries have floated the idea of banning cars powered by an internal combustion engine, but without having passed concrete laws yet. In this scenario, PEVs which are currently already heavily state-subsidised, would no longer have to compete with petrol and diesel vehicles at all. Public interventionism would completely distort the market, not allowing any form of competition between PEVs and vehicles with an internal combustion engine.

4.6.5.4 PEV Sales Evolution

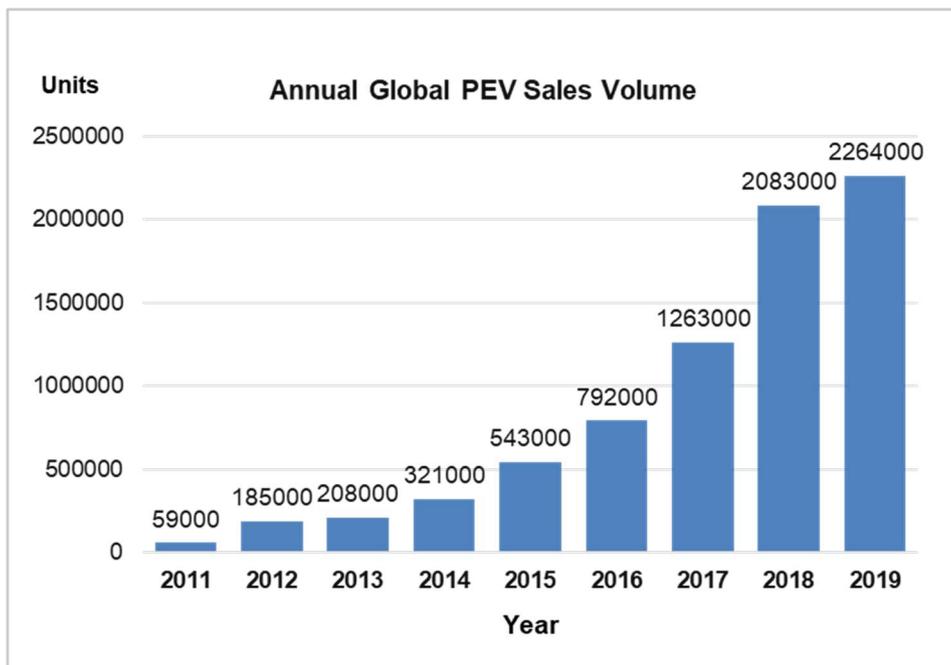
The following charts demonstrates the annual plug-in car sales' evolution from 2011 to 2019. The term plug-in electric vehicles (PEV) refers to both Battery electric vehicles (B-EV) and Plug-in hybrid vehicles (PH-EV). In 2011, the global PEV sales had only reached a total of approximately 60,000 units, whereas six years later, in 2017, the annual PEV sales already reached 1.26 million

units. However, in 2017 the PEV total market share was still relatively low, at 1.3% of the total market (Pelegov & Pontes, 2018). Thus, even if the uptake of PEVs has been notable, most of the official PEV adoption targets set by public institutions at the beginning of the 21st century were not met by 2018.

In 2017, global sales of new electric vehicles (combining B-EVs and PH-EVs of passenger cars and light-duty vehicles) passed for the first time ever 1 million units (Pelegov & Pontes, 2018). In 2017, pure electric vehicles (B-EVs) made up 66% of all global PEV sales, while B-EVs sales grew faster than those of PH-EVs (Hertzke *et al.*, 2018).

Chart N° 59: Global PEV Sales Evolution

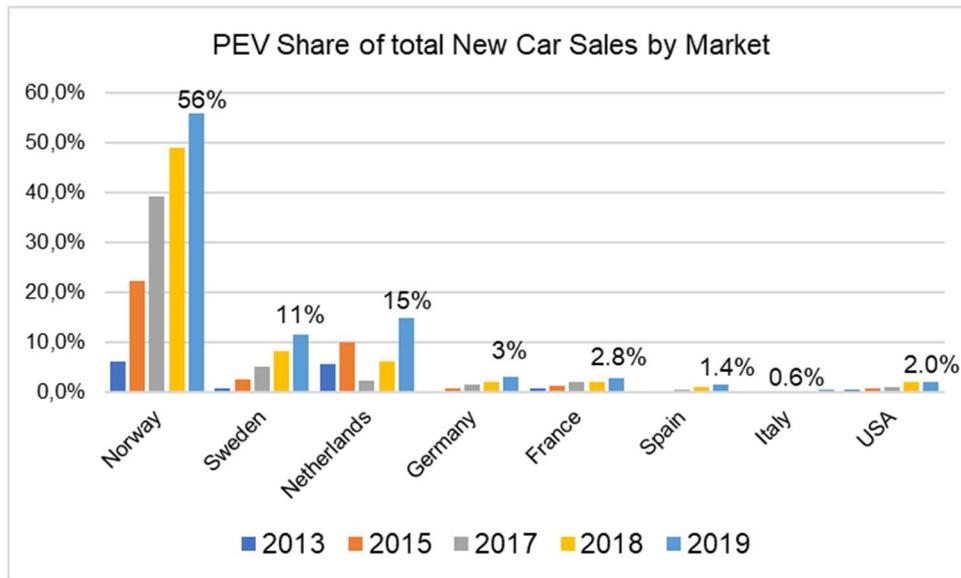
(2011-2019, passenger cars & light duty vehicles)



Own elaboration, based on data from: JATO, Hertzke et al. (2018)

However, this general global picture does not properly reflect that the specific individual markets have shown very different powertrain preferences, also being influenced by public regulations and other public interventions (Dudenhöffer, 2019).

Charts N° 60: PEV Volume Share of Total New Car Sales (2013-2019)



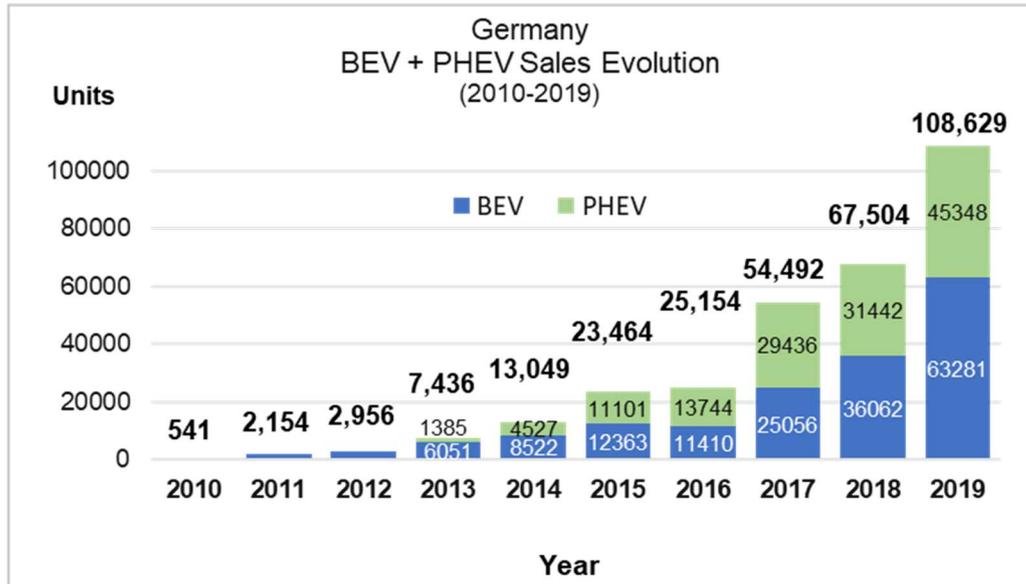
Own elaboration, based on data from: ACEA (2020)

In France, the annual registrations of new B-EVs increased from only 184 units in 2010 to 32,203 units in 2018. The market share of PEVs within the total volume of all annual new car registrations increased in France from 0.0% in 2010 to 1.19% in 2015 and 2.11% in 2018. By 2019, the PEV sales share of the mentioned total passenger car market in France increased to 2.8%. The most sold Plug-in Electric vehicle (PEV) from 2013 to 2019 was Renault’s Zoe. As previously stated, in 2008 the French government introduced a ‘bonus-malus system’ which was based on a purchase incentive for low emission vehicles and a penalty fee (malus) for the purchase of high-emission vehicles. Moreover, in 2015, the French government introduced an additional bonus for purchases of all-electric vehicles (B-EVs) connected to the simultaneous scrappage of diesel-powered cars if they had been in circulation before 1 January 2001. (IEA, 2020)

In Germany, cumulative registrations of all PEVs totalled 305,787 units between January 2010 and December 2019, consisting of 168,396 all-electric cars (B-EVs) and 137,391 PH-EVs. Although a constant volume growth cannot be denied, the evolution has been significantly less impressive than what had been foreseen by several politicians, journalists and consultancies (IEA,

2020). In 2010, and under its 'National Platform for Electric Mobility', German Chancellor Angela Merkel had set the target of putting one million electric vehicles on German roads by 2020.

Chart N° 61: Annual Sales of New PEVs in Germany (passenger cars only)

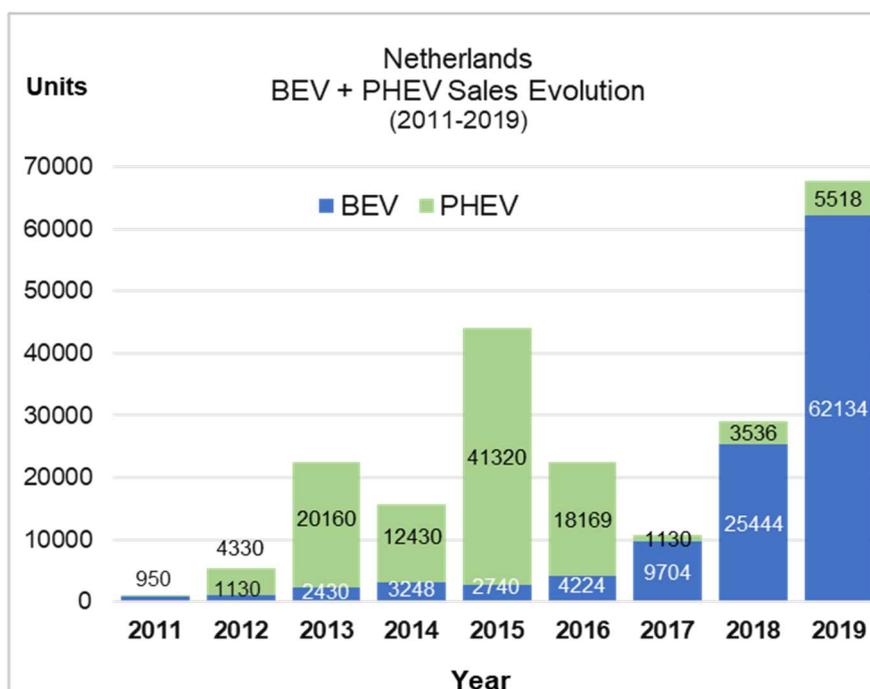


Own elaboration, based on data from: IEA (2020)

In 2016, a national incentive scheme was approved for Germany, including purchase subsidies and public support for the expansion of the charging station network. Although Merkel's mentioned PEV volume target was missed, corresponding vehicle sales have significantly increased throughout the past years, thanks to optimized vehicle technologies with increased driving ranges, a (subsidized) growing recharging infrastructure as well as other public incentives and tax benefits. In particular PH-EV sales had only seen a rather disappointing sales evolution up until the year 2019 (Sinn *et al.*, 2019), but experienced a significant boost in 2020, mainly due to further optimized public incentives, such as a new car purchase bonus and tax benefits, particularly for company car users (IEA, 2020).

In the Netherlands, new car sales of B-EVs have significantly increased throughout the past years, whereas registrations of PH-EVs had meanwhile even decreased. Until 2016, the Dutch PEV market had been dominated by plug-in hybrid electric vehicles (PH-EVs), when the Dutch government decided to reduce the relative tax advantages of PH-EVs. In 2016, as of January 1st, the registration fee for PH-EVs increased from 7% to 15% of its list price whereas for all-electric vehicles (B-EVs) and vehicles with conventional internal combustion engines, the fees remained stable at 4% and 25% respectively. Moreover, B-EVs have special access to parking spaces in Dutch cities like Amsterdam, and free charging is provided in public parking spaces (Kok, 2015).

Chart N° 62: PEV Sales Evolution in the Netherlands



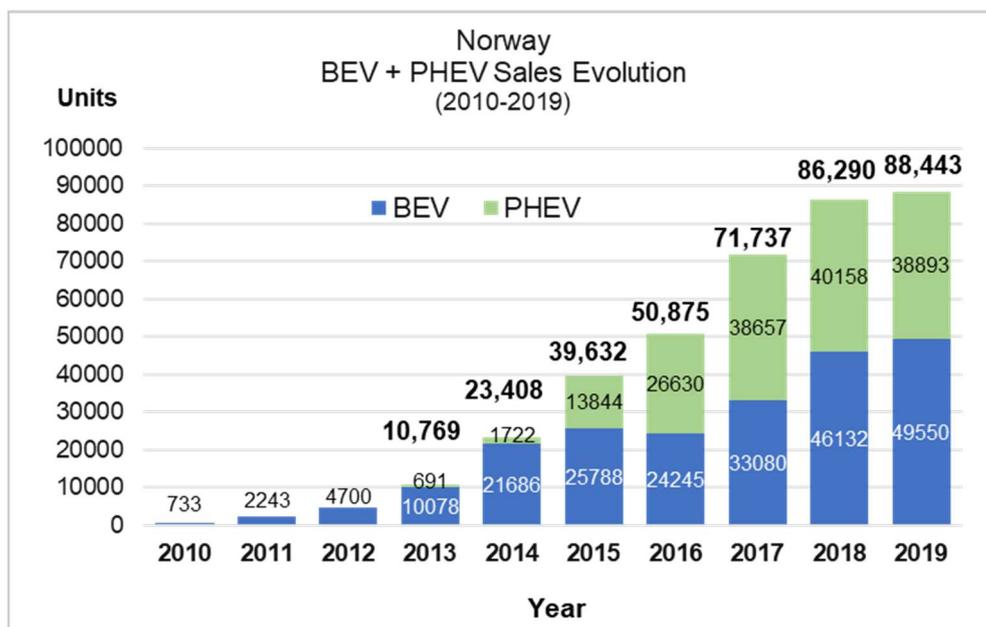
Netherlands (Year)	2013	2014	2015	2016	2017	2018
Total new B-EV registrations (units)	2,430	3,248	2,740	4,224	9,704	25,444
Total new PH-EV registrations (units)	20,160	12,430	41,320	18,169	1,130	3,536

Own elaboration, based on data from: IEA (2020)

The previous chart clearly illustrates the mentioned shift in the Netherlands from PH-EVs to B-EVs throughout the second half of the 2020's. Whereas in the period from 2012 to 2015, the Dutch market saw an impressive volume growth of PH-EVs, Dutch customers then shifted towards vehicles with a full-electric engine technology (BEVs) (IEA, 2020).

Meanwhile in Norway, the market growth of PEV sales has been even more stable and impressive than in the Netherlands. Norway has the world's largest PEV ownership per capita. The Norwegian government implemented several incentives to promote the adoption of PEVs, such as an exemption of B-EVs from the annual road tax, public parking fees and toll payments. As of January 2018, at least 24 out of 58 major municipalities kept the free parking for B-EVs. By 2016, PEVs had already captured a market share of 29.1% of the total Norwegian new car registrations, which rose to 39.2% in 2017, and then to 49.1% in 2018. In 2019, the PEV market share of new car registrations even rose to 55.9%, which meant that in 2019 more than every second new passenger car sold in Norway was a B-EV or PH-EV. In October 2018, Norway became the first country globally in which 1 in every 10 registered passenger cars was a PEV (IEA, 2020; Hertzke *et al.*, 2018).

Chart N° 63: PEV Sales Evolution in Norway



Norway (Year)	2013	2014	2015	2016	2017	2018
Total new B-EV registrations (units)	10,078	21,686	25,788	24,245	33,080	46,132
Total new PH-EV registrations (units)	691	1,722	13,844	26,630	38,657	40,158

Own elaboration, based on data from: IEA (2020)

In Poland, public incentives have been significantly lower than in the previously mentioned markets, such as Norway, Netherlands and Germany. In 2009, the Polish charging station infrastructure was developed in cities like in Gdańsk, Katowice, Kraków, and Warsaw with EU funds, but public support by local governments have been rather limited. Consequently, due to the lack of market distorting public incentives, and only relying on the actual customer demand, sales figures for PEVs have been extremely low in Poland. Sales of new B-EVs rose from 70 units in 2015 to only 620 units in 2018, representing an insignificant 0.12% of the Polish automotive market in 2018 (ICEA, 2020).

Also in Italy, the sales growth of PEVs was slower than in other European markets. By December 2015 the cumulative registrations of all PEVs had only reached approximately 6,100 units, consisting of 4,580 B-EV units and 1,550 PH-EVs. Even in 2018, the annual volume of PEV sales was relatively low, at a total of approximately 10,000 units in Italy (IEA, 2020; Hertzke *et al.*, 2018).

Overall, we can say that while manufacturers have shown progress in developing more competitive PEVs with a wider driving range, well-performing engines and superior styling, there are still several significant challenges to accelerate PEV sales in a sustainable way. Simultaneously, several new automotive brands and mobility providers have been founded or restructured with a strong focus on PEVs. These interesting new start-ups include the Chinese companies NIO Inc. and Aiyways Ltd., as well as the Chinese-US-American corporate Lucid Motors and Fisker Automotive Inc. While the Chinese brands NIO and Aiyways focus on electric SUVs, such as NIO's coupe SUV 'EC6' and Aiyways 'U5', Lucid Motors plans to initially target

luxury customers with its sporty model 'Air'. Other OEMs entering the European market with PEV technologies are the Vietnamese Vingroup with its brand VinFast, as well as the Chinese OEMs Great Wall Motors (with its brands WEY and ORA) and 'SAIC Motor Corporation Limited' (with the formerly British automotive brand MG), as well as the brands Polestar and Lynk & Co by Geely Auto Group, but also Chongqing Sokon Industry Group's new subsidiary 'Seres' (Amblard, 2018). Whether these new brands, particularly the recently-founded start-ups, will succeed in Western markets cannot be defined at this stage. The author of this thesis assumes that ultimately not more than 2 or 3 of the mentioned new players will be able to successfully establish themselves in the European market. For them, it will be crucial to establish an efficient supply chain and a manufacturing structure which successfully combines fast production processes and high-quality products with a reliable after sales & service network. Even more so, a customer friendly network of service points and a fast supply of spare parts must be assured.

Table N° 17: Market Share of PEV (B-EV + PH-EV) New Car Sales

(Evolution of PEV Share from 2013 to 2019, Passenger Cars only)

Country	2019	2018	2017	2016	2015	2014	2013
Norway	55.9%	49.1%	39.2%	29.1%	22.4%	13.8%	6.1%
Iceland	22.6%	19%	14.05%	4.6%	2.93%	2.71%	0.94%
Netherlands	15.1%	6.5%	2.6%	6.7%	9.9%	3.87%	5.55%
Sweden	11.4%	8.2%	5.2%	3.5%	2.62%	1.53%	0.71%
Finland	6.9%	4.7%	2.57%	1.2%	n/a	n/a	n/a
Portugal	5.7%	3.6%	1.9%	n/a	n/a	n/a	n/a
Switzerland	5.5%	3.2%	2.55%	1.8%	1.98%	0.75%	0.44%
China	4.9%	4.2%	2.1%	1.31%	0.84%	0.23%	0.08%
Andorra			5.6%	0.81%	n/a	n/a	n/a
Denmark	4.2%	2%	0.4%	0.6%	2.29%	0.88%	0.29%
Austria	3.5%	2.6%	2.06%	1.6%	0.90%	n/a	n/a
Belgium	3.2%	2.5%	2.7%	1.8%	n/a	n/a	n/a
Ireland	3.1%	1.57%	0.72%	0.48%	0.46%	0.27%	n/a
Germany	3.0%	1.9%	1.58%	1.1%	0.73%	0.43%	0.25%
Canada	3.0%	2.2%	0.92%	0.58%	0.35%	0.28%	0.18%
UK	2.9%	2.53%	1.86%	1.37%	1.07%	0.59%	0.16%

(Redesigned by the Author. Source: EAFO & Dataforce, 2020)

In smaller Nordic countries, such as Norway, the Netherlands, Iceland, and Sweden, an impressive sales growth of PEVs had occurred. However, by 2019, in the larger European markets such as France, Germany, and the United Kingdom, PEVs were still a niche product (Hertzke *et al.*, 2018; Dataforce, 2020). Due to the increasingly strict CO₂-emission regulations, a growing range of PEV models and the mentioned economies of scales, the market share of PEVs is expected to keep increasing across Europe (IEA, 2020; Dataforce, 2020).

4.6.5.5 Quantitative and Qualitative Status of the AFV Implementation

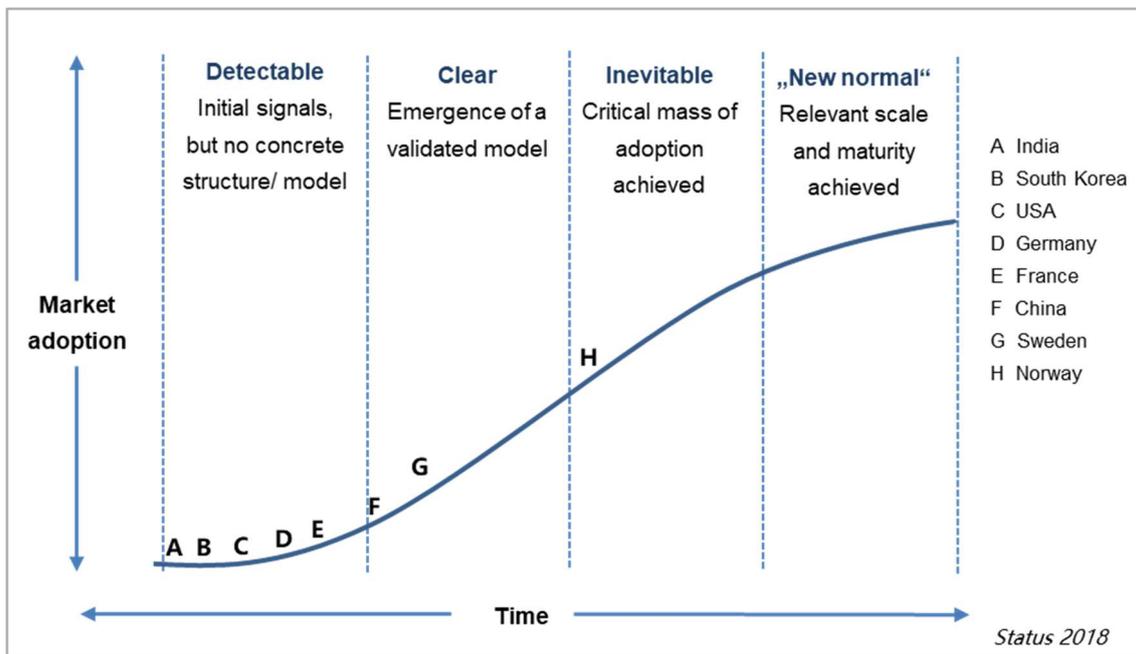
In the following section, we want to illustrate the evolution of PEV adaptation within the different markets throughout the recent years. We will not only refer to the pure quantitative evolution of PEV sales, but also on how automotive experts at companies such as McKinsey and Bloomberg consider the individual competitiveness of automotive OEMs.

The following chart, based on an analysis by McKinsey in 2018, shows the four stages of a disruptive trend. It indicates that the so-called 'electric vehicle disruption' is already inevitable in Norway, which has seen a significant growth of PEV-sales. Apart from significant public incentives for PEVs, also the rollout of more attractive, better-performing PEV modes in key high-demand segments has been a major driver for a relevant sales uptake in several markets (Thiel & Drossinos, 2017; Pelegov & Pontes, 2018). As noted, the increased investments by automotive OEMs into alternative fuel technologies are also driven by ambitious emissions targets (especially in China and Europe) and announcements by several national governments (or individual states and cities) around the world, to set end-dates for the registration of diesel- and gasoline-powered vehicles (Asthana & Taylor, 2017; Jacobs, 2016). Accordingly, the US-American state of California, as well as France and the United Kingdom announced that local sales of ICE vehicles shall be terminated by the year 2040 (Hertzke *et al.*, 2018). In 2017, PEVs made up 32% of the

total vehicles sales in Norway. Several analysts consider Norway to be ahead of time, therefore representing the future PEV sales proportions in other European markets (Jacobs, 2016; Hertzke *et al.*, 2018).

Chart N° 64: The 4 Stages of Disruptive Trends

Focus on Electric Vehicle Market Adoption (Status of selected markets by 2018)



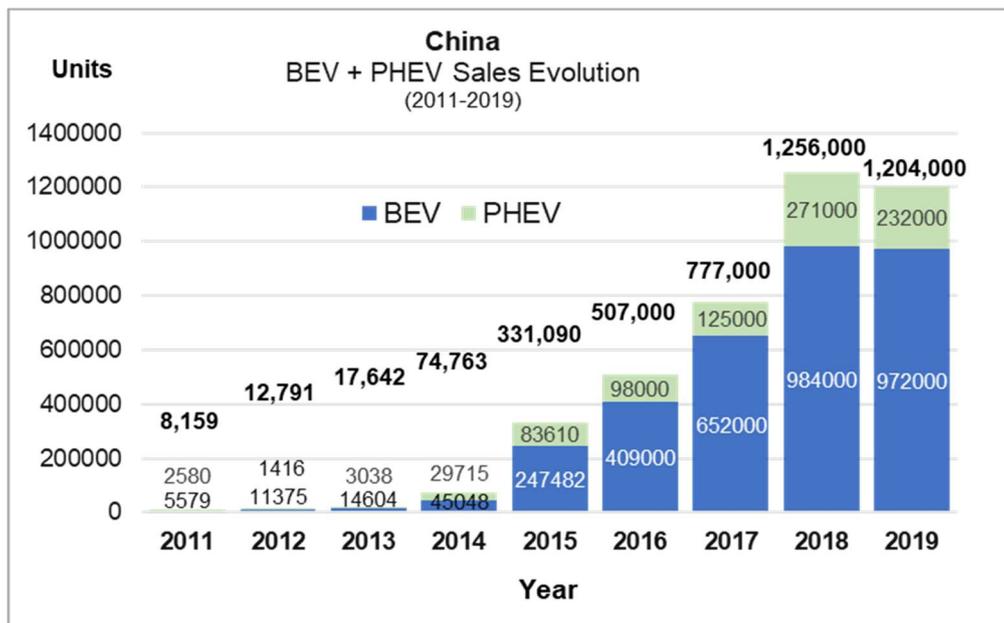
Own elaboration, based on Hertzke *et al.* (2018)

The above shown chart is based on a previously mentioned McKinsey (2018) research. It indicates that by 2018, markets like India, the USA and Germany were still in the first phase of the PEV market adoption. Markets like China and Sweden were already considered to be more 'advanced', being in the second phase, although a truly critical mass of market adoption has not been achieved. By 2018, only Norway achieved an PEV market adoption by a considerable critical mass (Hertzke *et al.*, 2018). Thus, the mentioned considerable public supports to increase the

competitiveness and general customer acceptance of PEVs in Norway, have apparently been effective (Jiménez *et al.*, 2016).

However, due to its tremendous size, the evolution of the Chinese automotive market is likely to have a significantly morer relevant global impact than that of Norway. Correspondingly, we want to illustrate in more details the sales evolution of PEVs in China. The following chart shows the annual volume evolution of B-EVs & PH-EVs, within the period from 2011 to 2019. The stated numbers indicate the impressive volume increase which had occurred, particulalry from 2014 to 2018.

Chart N° 65: China: Annual Sales of New PEVs (passenger cars)



Own elaboration, based on data from: IEA (2020)

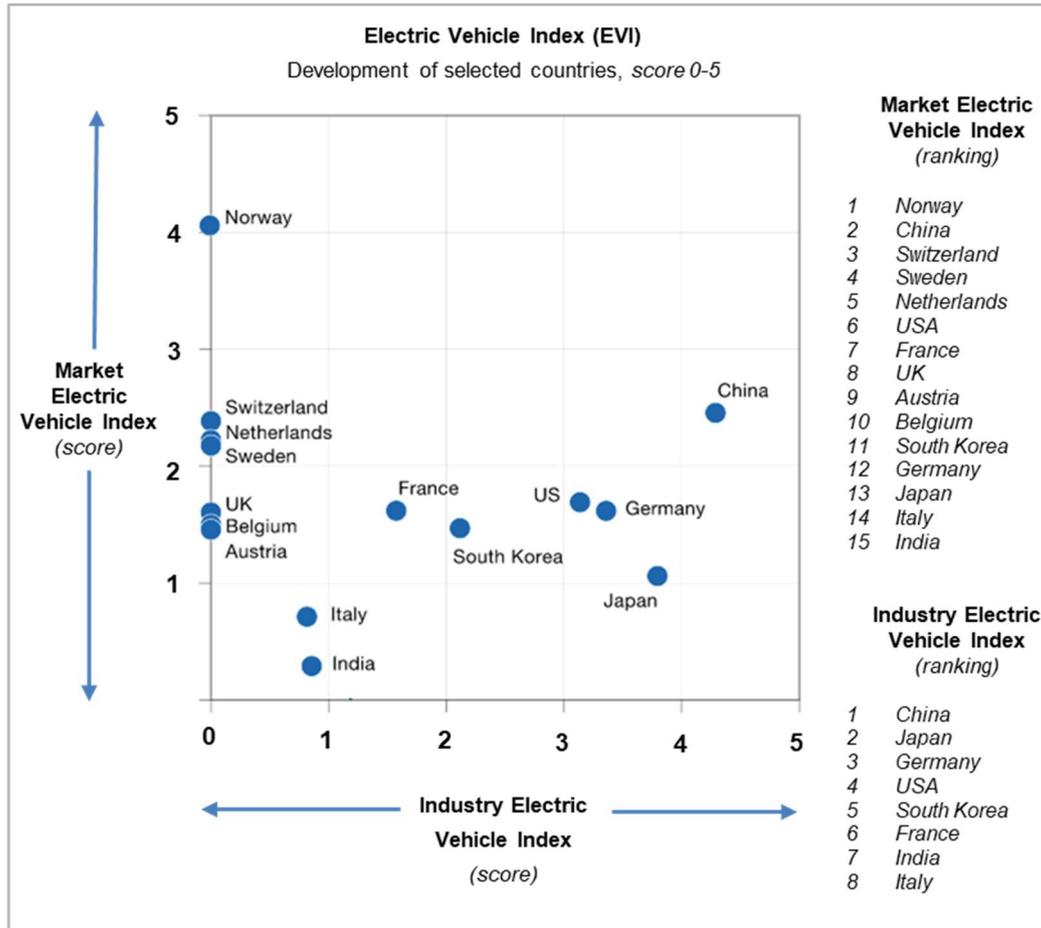
In 2019, China was by far the largest PEV (B-EV + PH-EV) market in the world, with a total of 3.4 million highway-legal PEV passenger cars in use, representing 47% of the global PEV fleet at that point in time. Since 2011, the combined sales of all classes of PEVs (passenger cars and commercial vehicles) totalled almost 4.2 million by the end of 2019. Domestically-produced

vehicles accounted for approximately 96% of the total PEV sales (IEA, 2020; Hertzke *et al.*, 2018). These figures show that a strong protectionism of the Chinese automotive market by the Chinese government has led to a situation in which market expansion for foreign OEMs has been extremely challenging, if their vehicles had not been produced locally.

In the following chart we want to illustrate how well individual economies are prepared for the transition towards an automotive market that is likely to be shaped by PEVs. This analysis shows the countries' individual status by the end of 2018, and is done from two perspectives: from a consumer perspective as well as from an automotive producer point of view. A comparison of EVI performance over time indicates that China had already overtaken the United States and Germany when combining these 2 'EVI scores'. In McKinsey's 2018 overall EVI rankings, China was only outperformed by Norway in the 'EVI market score' (representing the consumer demand side) while reinforcing its leading position in the 'industry EVI analysis' (which represents the "supply" side of the equation) (IEA, 2020; Hertzke *et al.*, 2018). In other words, while Norway is considered the most advanced market (consumer wise) in regard to the expected shift towards plug-in vehicles, China is seen as the economy in which local automotive producers are most prepared for this structural shift.

Chart N° 66: Electric Vehicle Index (Status 2018)

Index for Selected Markets (Score out of 5 Points)



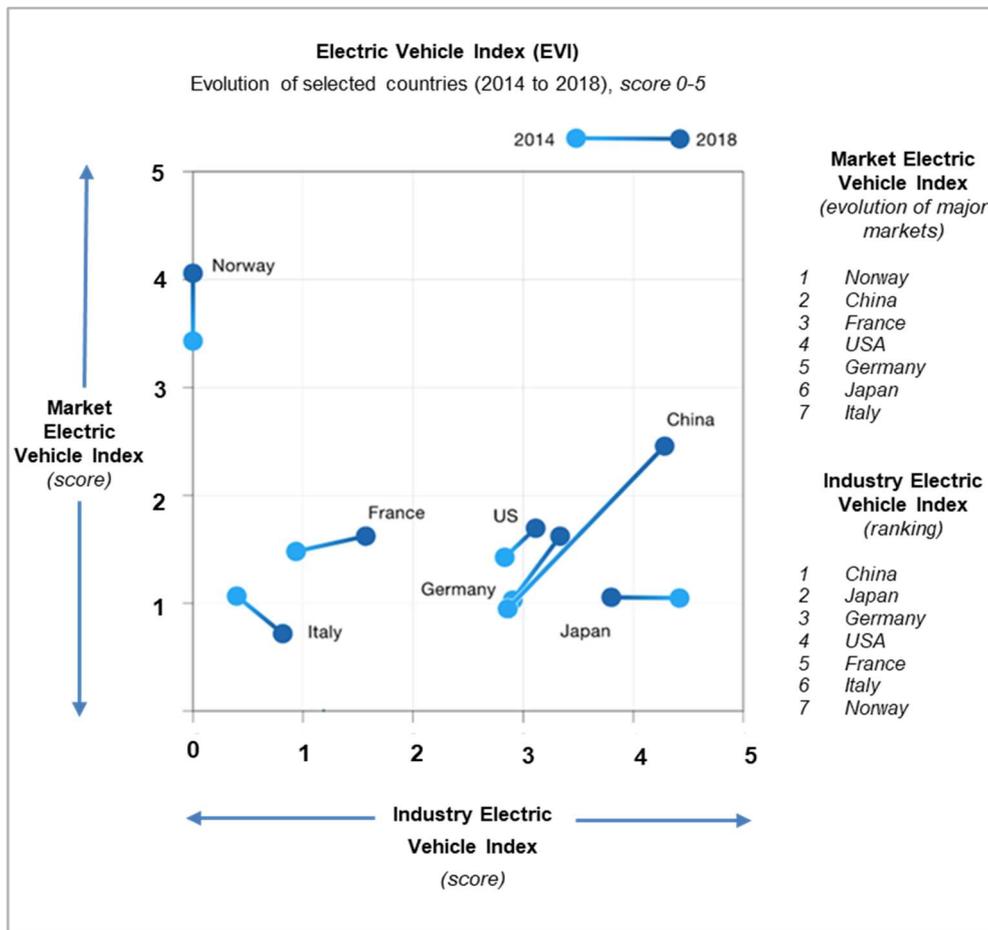
Redesigned by the author, based on Hertzke et al. (2018)

Based on mentioned analysis done by McKinsey (2018), we also want to illustrate how the index of each mentioned market has changed within the period from 2014 to 2018. It indicates that China has outperformed other countries in regard to the evolution of its market index as well as in regard to its industry index. In regard to the 'market EVI scoring', China improved its position by providing significant monetary and non-monetary incentives, offering its consumers a wider range of models, as well as by increasing investments into the charging infrastructure. Moreover, China clearly optimized its 'industry EVI scoring', significantly increasing its EV production and

component shares. Whereas France and Germany only slowly advanced in regard to increasing the local EV market share and the domestic production of EVs, Italy's corresponding market-side performance even decreased (Hertzke *et al.*, 2018).

Chart N° 67: Electric Vehicle Index Development (2014-2018)

Index for Selected Markets (Score out of 5 Points)



Redesigned by the author, based on Hertzke et al. (2018)

Thus, within the period from 2014 to 2018, some markets such as Italy did not show a relevant progress in regard to a PEV adaptation. In the same period, the USA showed a slow adaptation, while the development in France and Germany was already slightly larger, but still at a relatively

low level. The only market which significantly increased its EV development index, in regard to both, its market index as well as its industry index, is China.

However, we must insist that due to the limited price competitiveness of current EV-batteries, China's & Norway's leadership in EVI scores has only been possible due to significant public interventionism (Hartmann, 2018; Drossinos *et al.*, 2017; Dudenhöffer, 2019). China and Norway have some of the world's highest levels of spending on consumer and supply-side subsidies, which can only be financed at the taxpayers' expense (Hertzke *et al.*, 2018; Dudenhöffer, 2019). Already in 2009, the Chinese government adopted a thorough plan to turn China into the world leader in EV production, focusing on four main goals: creating a world-leading PEV industry, assuring energy security while also reducing urban air pollution, as well as to reduce local carbon emissions. In June 2012 the Chinese state Council published a plan to develop the domestic car industry, providing public incentives with the aim to achieve an annual target of 5 million new PEV sales by 2020 (IEA, 2020; Hertzke *et al.*, 2018).

Correspondingly, in a truly free market economy, it is highly unlikely that alternative fuel vehicles could have gained such significant market share before the establishment of a true price competitiveness versus ICE vehicles (Jiménez *et al.*, 2016; Sinn *et al.*, 2019). Thus, the self-critical question all laissez-faire economists and those defending the concepts of the Austrian School of economy must ask themselves is: "*Do the ends justify the means?*" In other words, has public interventionism been necessary to create a world with less pollution, less global warming, and less negative externalities? More importantly, can the seen public incentives and other forms of public interventionism be justified if ultimately automotive OEMs (due to their significant R&D investments and the expected economies of scale) are able to produce and sell PEVs at competitive prices without any public incentives? To go a step further, will those automotive OEMs which are directly influenced (and protected) by their national government be more competitive than traditional western OEMs which have been less controlled by public structures, such as BMW? Dudenhöffer (2016, 2019) agrees that Chinese automotive OEMs could have never become so advanced in the development of Plug-in electric vehicles without the significant interventionism and financial support by the Chinese state. In other words, can China serve as

an example which demonstrates that public interventionism is successful in preparing local OEMs to be more competitive in the future global automotive market?

Even opponents of any public interventionism must agree that ultimately, Chinese OEMs such as NIO Inc. XPeng, and Aiyways Ltd, as well as Zhejiang Geely Holding Group Co. Ltd, Great Wall Motors and 'SAIC Motor Corporation Limited' have also been able to gain competitiveness abroad due to the public protectionism provided by the Chinese government to Chinese companies within their domestic market.

4.6.6 Main Reasons for the 'Need' of Public Incentives for AFVs

Throughout the first two decades of the 21st century, one crucial barrier to the purchase of vehicles with alternative-fuel engines has been their relatively high purchase price compared to internal combustion engine vehicles. In particular throughout the past decade, several fiscal incentives have been launched by governments in Europe, Asia, North America and other regions to 'positively influence' and minimize the total cost of ownership (TCO) of alternative fuel vehicles with the aim to increase their competitiveness and market share users (Brand *et al.*, 2013; Diamond, 2009; Jenkins, 2015; Jiménez *et al.*, 2016). Therefore, fiscal incentives are used to directly influence the vehicle purchase decision of individuals and companies, mainly provided through total or partial tax exemptions, or direct subsidies (Gass *et al.*, 2013; Mock & Yang, 2014). Despite the general good intentions by most consumers to 'help in protecting the environment', fiscal incentives - if sufficiently high to offset cost differences between AFVs and conventional vehicles - are still the most important reason to switch to green technologies, according to a survey among Norwegian battery electric-vehicle (B-EVs) drivers (Bjerkan 2016). By 2014 the EV market share (of new car registrations) was already above 5% in Norway and above 4% in the Netherlands, while still at only 0.5% in France and the UK (Dataforce, 2016). As seen, the individual B-EV market shares vary significantly between countries and do not seem to strongly correlate with the national GDP/capita levels, for which several automotive experts suggest that

the differences in the B-EV market share between individual countries are mainly linked to the national fiscal incentives and ultimately to the total costs associated with B-EV ownership (Brand *et al.*, 2013).

It must be clearly stated that in the absence of public incentives, AFVs have not been cost-competitive in any European market - despite the significant recent growth rate in AFVs sales. This increase was mainly caused by public interventions on local, regional or national level (Dudenhöffer, 2016). Previous research related to AFVs have thoroughly analyzed the impact of fiscal incentives for AFVs users (Brand *et al.*, 2013; Diamond, 2009; Gass *et al.*, 2013; Lane & Potter, 2007; Mock & Yang, 2014; Tran *et al.*, 2013) as well as of regulations directly effecting manufacturers (Walther *et al.*, 2010; Thiel *et al.*, 2014). Price preferences also vary among populations as several studies discovered that people with high incomes are less price-sensitive than others (Achnicht, 2012). The vehicle's car size also has an impact on price sensitivity, as concluded by Li *et al.* (2013) who concluded that buyers of smaller cars have a higher marginal utility of price. By December 2016, the world's top selling highway legal all-electric car in history was Nissan Leaf with global sales of over 250,000 units, followed by the Tesla Model S with more than 158,000 units globally.

As initially, stated, the implemented public incentives to increase the attractiveness of AFVs for consumers is often justified by the aim to protect the environment and to reduce negative externalities, such as air pollution and CO₂ emissions (Noppers *et al.*, 2014; Hartmann, 2018). We do not deny that Battery electric vehicles (B-EV) can reduce greenhouse gas (GHG) emissions if powered with truly 'clean' renewable energy. Accordingly, many consumers consider full electric vehicles to be more sustainable than hybrid vehicles, given that as of today, the latter still create some air-polluting emissions while driving. However, when referring to environmental protection and negative externalities, one must also consider that electric vehicles create a demand for additional electric power generation, and, more importantly, that the current electric power generating industry has failed to properly switch to more sustainable energy sources (Hartmann, 2018; Sinn *et al.*, 2019). Thus, in most countries, the power generation which is necessary to fuel 'green' B-EVs still depends on the use of fossil fuels (Sinn *et al.* 2019). Also Louis Lambilliotte (2015) argues that current electric vehicle technologies are causing significant

pollution. Firstly, as already indicated, PEVs have been run on electricity which in most European countries and the United States has mostly been generated from the combustion of fossil fuels. Moreover, current PEVs are run by intricate lithium-based batteries which are difficult to dispose of and which are harmful to the environment, containing toxic metals such as nickel, lead and copper, as well as toxic and flammable electrolytes (Carlucci *et al.*, 2018; Hartmann, 2018; Sinn *et al.* 2019). New technologies are being developed for which it is impossible to foresee which fuel technology will be most successful (in terms of market share) within the next decades. We argue that from an environmental perspective, other engine technologies, such as FC-EV engines could be more sustainable than today's B-EVs. However, due to the recent focus of public entities on promoting B-EVs in the passenger car industry, investments into other (potentially more efficient) alternative concepts have been rather limited. Thus, the narrowed focus of public entities on promoting B-EVs has led to a reduced willingness of researchers and entrepreneurs to develop other, more effective vehicle technologies.

4.6.7 New Car Sales Evolution: Annual Global Light Duty Vehicles – ICEs vs EVs

Total global sales of battery-electric vehicles are still on a much lower level than those of Hybrid electric vehicles. In September 2016, cumulative global sales of highway-capable light-duty pure electric car vehicles passed the one-million-unit milestone (Bloomberg, 2017). When seriously considering the methodology of Praxeology, we shall be sceptical when empirical data is used to forecast market developments, knowing that it is impossible to precisely foresee and quantify future events with historic data. However, we do want to briefly refer to the expectations of automotive market experts from 'Bloomberg New Energy Finance' consider as potential future scenarios. Bloomberg New Energy Finance (2017) forecasted that by the year 2040, electric cars will dominate the global automotive market, stating that PEVs (with all its variances) will make up 28% of all passenger vehicle sales by 2030, and 58% by 2040. This significant increase was expected to be driven by falling lithium-ion battery prices, reduced per-unit production costs,

further public regulations and fiscal policies to shift new car sales towards AFVs, a wider range of AFV model availability and an increasing acceptance by consumers as well as by the increasing role of car-sharing and other 'new mobility concepts'. Based on the same study, Bloomberg New Energy Finance considers production cost for certain PEVs to achieve price parity versus internal combustion engines (ICEs) already by 2030. This calculation is based on the assumption that production costs can mainly be decreased, due to economies of scale as well as due to possibly reduced per-unit research and development costs (McKerracher *et al.*, 2019; Büttner, 2020).

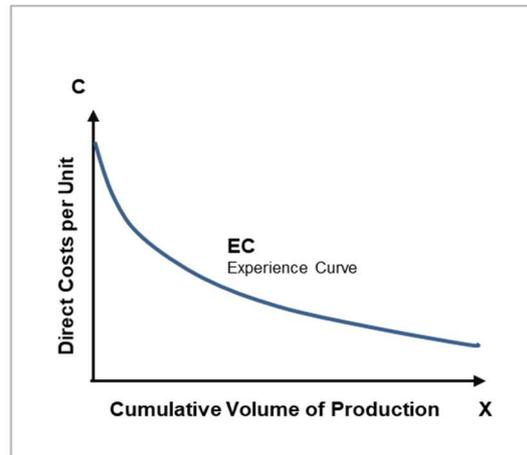
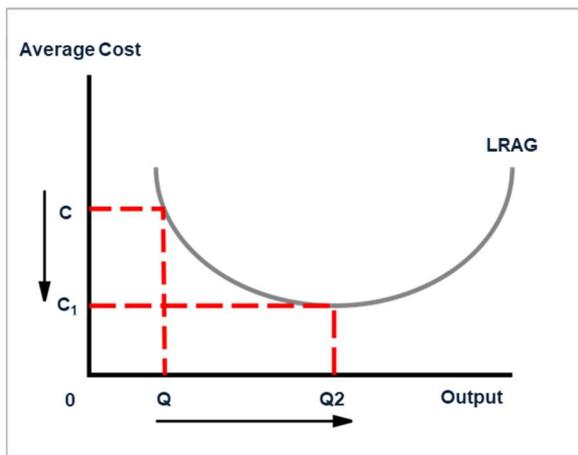
Also Jenkin (2015) states that one must not ignore the impact of economies of scale, which will help manufacturers to produce cheaper PEVs. Concrete indications for increasing PEV sales volumes will reassure car manufacturers to invest into larger production facilities for PEVs, leading to reduced *per-unit*-costs. Correspondingly, in particular regarding B-EVs, economies of scale will drive down battery costs, reducing total production costs of electric vehicles, enabling them to achieve much wider-scale adoption (Jenkins, 2015; Büttner, 2020). The analysts of the previously mentioned Bloomberg study assume that by 2025, PEVs will become price competitive on an unsubsidized basis. In this optimistic scenario, all vehicle segments are expected to reach price parity with comparable diesel and petrol vehicles by the year 2029. Dudenhöffer (2016) agrees that mentioned economies of scale could then occur, leading to cost advantages obtained by their scale of operation (typically measured by the amount of output produced). Thus, consequently, the increased total volume is expected to lead to a decrease of the cost-per-unit of output.

We also need to consider what is called 'the experience curve' which refers to the effect that the higher the cumulative volume of production (X), the lower the direct cost per new unit produced (C). Theodore Paul Wright (1936) argued that the more times a task has been performed, the less time is required on each subsequent repetition. There shall generally be a reduction in the average cost of production of a particular product, as a consequence of an increase in the company's experience. Accordingly, when cumulative volumes increase, value-added costs (including administration, distribution, and manufacturing costs) are expected to fall by a constant percentage. As a consequence, the time and cost of producing *a unit of output* will then be

reduced (Wright, 1936). Thus, an experience curve is convex and has a downward slope, as shown in the following diagram (Jenkins, 2015)

Chart N° 68: Economies of Scale

Chart N° 69: Experience Curve



Redesigned by the author, based on Smith (1776), Mill (1848), Wright (1936)

Additional crucial aspects are the constantly increasing mileage/ driving range of new, optimized PEV concepts, as well as the growing network of recharging stations (Harrop, 2017; Brand *et al.*, 2017).

In 2017, the analysts of mentioned Bloomberg study assumed that already by 2025, PEVs would become price competitive on an unsubsidized basis. In this very optimistic scenario, all vehicle segments are expected to reach price parity with comparable diesel and petrol vehicles by the year 2029. Moreover, it can be expected that Plug-in hybrid electric vehicles (PH-EVs) will lose relevance within this period, being replaced by Battery-only vehicles (B-EVs including its subcategory fuel cell electric vehicle (FC-EV)), for which competitiveness is constantly being increased due to optimized engines with longer driving range. Also Bloomberg (2017) declared that while plug-in hybrid electric vehicle (PH-EV) sales would play a significant mid-term role in PEV adoption until the year 2025, pure battery-electric vehicles (B-EVs) would subsequently

account for the vast majority of all PEV sales for the following years (McKerracher *et al.*, 2019). The share of full-electric vehicles is expected to grow particularly in the passenger car segments, whereas fuel-cell electric vehicles are rather expected to succeed in the case of commercial vehicles/ medium and heavy-duty vehicles. Several chemical companies in the industrial gas sector, such as Linde plc, Air Liquide S.A., as well as Air Products & Chemicals shifted their focus towards hydrogen. Despite the growing general interest in hydrogen technologies in regard to energy production, sales results of FC-EVs in the European automotive market have been rather disappointing, particularly for passenger cars. Up until 2018, only a very small range of passenger cars with FC-EV technologies had been launched in Europe, led by models of Asian OEMs, such as Hyundai's ix35 FC-EV and its successor model NEXO, as well as Toyota's FC-EV model Mirai. Throughout the second decade of the 21st century, FC-EVs are forecasted to become significantly cheaper from a TCO perspective, as vehicle development and production costs are expected to decline due to technologic advancements and economies of scale (Büttner, 2020). However, most analysts agree that throughout the running decade (2020-2029), a full price competitiveness versus ICEs (without public incentives) cannot be achieved by any FC-EV model (McKerracher *et al.*, 2019; Büttner, 2020). Apart from the 'positive discrimination' (public incentives, free parking spaces, tax reductions... etc.) for PEVs by local governments and public institutions, it is also expected that the 'negative discrimination' of ICE vehicles (such as the introduction of additional fees & taxes, driving constraints in urban areas etc.) will further increase. In July 2021, the European Union proposed an effective ban on the sale of new petrol and diesel cars (ICEs) from 2035 onwards. Moreover, it proposed a 55% cut in vehicle CO₂ emissions already by 2030 versus the corresponding 2021 emission levels. Accordingly, *IHS Markit* estimates that if the EU raised its CO₂ emission reduction targets to more than 50% by 2030, it would bring ICE car sales down to virtually zero by then (Carey & Steitz, 2021). Meanwhile, it is argued by ambassadors of the 'electric revolution' that temporary public incentives were only needed for a limited period of time to 'steer' the automotive industry into a more sustainable future. This perspective could present the latest developments on the automotive market as a success story, justifying public interventionism by arguing that in this case 'the result seems to justify the deeds.'

To be a competitive mass market automotive OEM, it is necessary to reach significant sales volumes across the globe in order to achieve relevant economies of scale (Jenkins, 2015; Büttner, 2020). Without a truly global market presence, relevant economies of scale can hardly be reached, which are crucial to reduce production costs and to properly invest into further research, such as the development of new safety and mobility features (including autonomous driving) and new fuel technologies. We must admit that mentioned long-term protectionism by Chinese public entities for local automotive OEMs has helped companies like NIO Inc., Great Wall Motors and 'SAIC Motor Corporation Limited' to strengthen their market position in China. These 'public guidelines' helped the mentioned OEMs to initially grow in the Chinese market, as well as to significantly invest into research and development projects in order to then offer their (increasingly competitive) products in foreign markets.

However, based on the ideas of Mises (1940), Hayek (1944), Garrison (2001), Huerta de Soto (2005, 2009a) and Hülsmann (2008), we argue that it is neither morally nor economically appropriate to simply manipulate the market by implementing certain monetary and fiscal policies to increase the competitiveness of a specific product, even if the product then ultimately achieves price competitiveness caused by optimized economies of scale. In other words, the ends do not always justify the means, even if long term price competitiveness of technologies was achieved by initial short-term public interventionism to boost research and development investments into the corresponding new technology. A study by Bicer & Dincer (2017) showed that electric vehicles have yielded significantly higher human toxicity values than FC-EVs, due to the respective manufacturing and maintenance stages. Hydrogen driven vehicles are clearly more environmentally friendly with respect to global warming and ozone layer depletion potentials than B-EVs.

One example of an interesting new vehicle technology (even if, for multiple reasons, this concrete vehicle model might not achieve a significant market share) is the hydrogen-electric hybrid sports car 'RG Nathalie'. It is the first model produced by the new car manufacturer RG, founded by Roland Gumpert. The vehicle is equipped with a fuel cell which operates on methanol. The 'RG Nathalie' works with methanol, which provides energy using an electrochemical reaction. The vehicle's methanol reformer device divides methanol into carbon dioxide and hydrogen (Zoellter,

2020). This interesting new concept, in which methanol is used to generate hydrogen, can be the basis for further technological advancement. Also BMW is about to launch its SUV model 'iX5 Hydrogen' with hydrogen fuel cell technology, while the American automobile manufacturer Hyperion Motors will launch its hydrogen-powered sports car 'Hyperion XP-1' in 2022. Thus, in line with these findings, we argue that from an environmental perspective, several FC-EV technology approaches would be clearly more sustainable than today's B-EVs. However, due to the recent focus of public entities on promoting B-EVs (particularly in the passenger car industry), most western automotive OEMs are not expected to primarily concentrate their investments on the further development of FC-EV technologies for passenger cars. Accordingly, we argue that the narrowed focus of public entities on promoting and protecting primarily B-EVs and PH-EVs has led to a reduced willingness of researchers and entrepreneurs to develop other, more effective vehicle fuel technologies.

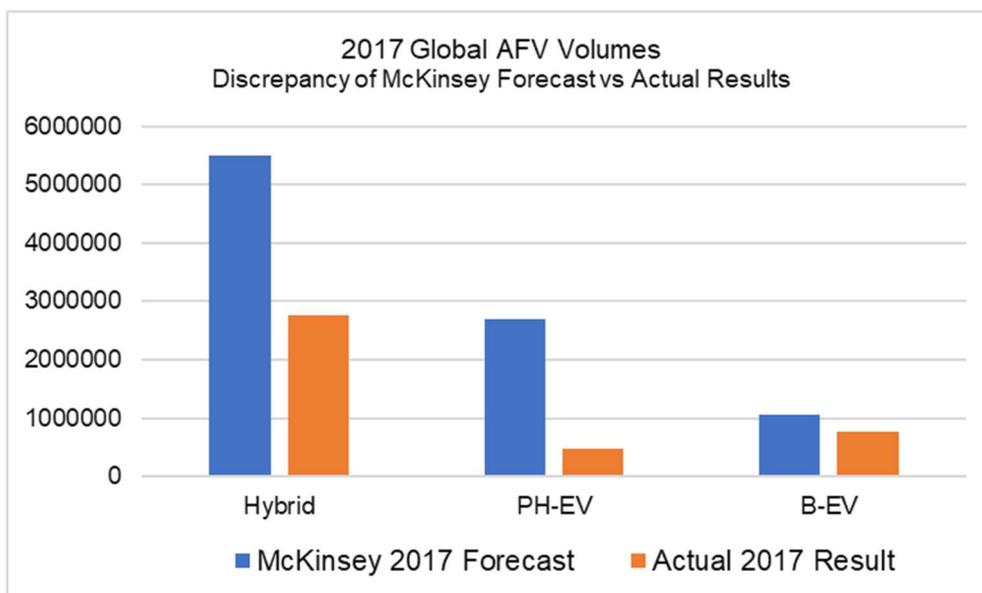
4.6.8 McKinsey, Deutsche Bank and the Limitations of Economic Forecasts

As shown, this thesis does consider empirical evaluations for the analysed period from 2010-2018. However, when looking at forecasts made by well-known consulting companies, automotive service providers as well as by automotive OEMs on the expected mid-term and long-term adaptation rate of AFVs, it becomes obvious that their expectations have differed significantly. Moreover, most of such market studies made in the period from 2001-2010 on how the European AFV market would look like by 2015-2020 have not turned out to be accurate and have mostly been far too optimistic. One example is a research by Deutsche Bank which in 2008 assumed *"profound changes in the global auto industry over the next five...years. Industry market share, mix, competitive advantages, vehicle content levels, used vehicle values, the frequency of consumer purchases, and powertrain technology – all could change more dramatically over the next five years than they have in the past 50"* (Lache, 2008, p. 2).

Looking at these assumptions in its proper context, we need to highlight that the mentioned 'next five years' would have been the period from 2009 to 2014, and based on all relevant market data, the expected 'dramatic changes' did certainly not occur within the mentioned time frame. The same can be said about a market research done by McKinsey in 2009 on the global volume potential of AFVs throughout the second decade of the 21st century. McKinsey's calculation (2009) was based on the assumption of a total global volume of 61 million new vehicle sales in 2010, 75 million new vehicle sales in 2020 and 90 million new vehicle sales in 2030.

Charts N° 70: Global Annual AFV Sales in 2017

Forecast by McKinsey (made in 2009) vs. actual 2017 results



Own elaboration, based on data from: McKinsey (2009), IEA (2020)

The indicated new car sales forecast for B-EVs and PH-EVs in 2020 was based on McKinsey's (2009) 'mixed technology scenario'. For 2017, even in the conservative forecast ('medium scenario'), a global annual volume of ca. 5.5 million Hybrids ('H-EVs') and approximately 2.7 million PH-EVs was forecasted. However, based on IEA (2020) market data, the actual 2017 total global alternative fuel vehicle sales were only 4.02 million. Of these, 2.76 million units were H-

EVs, while approximately 777,000 units were B-EVs, and only 485,000 PH-EVs. Thus, even forecasts based on thorough studies by global major corporates have proven to be quite unrealistic. We therefore agree with von Mises (1957) in his praxeologic approach that quantitative economic forecasts, based on empiricism, econometrics or pure 'wishful thinking', cannot be academically justified.

Up until 2019, the market share of PEVs in most western automotive markets was significantly lower than what had previously been forecasted by most governments and several market analysts (McKinsey, 2009; IEA, 2020). In 2020, with the rapid global spread of the Covid-19 pandemic, a significant economic crisis hit most economies, also aggravating the situation within the automotive sector. In order to 'support' this sector, several governments implemented public incentive schemes, primarily incentivizing the purchase of PEVs. These incentives were a crucial reason for the increase of PEV sales in the years 2020 and 2021. However, we must acknowledge that the growing variety of available PEV models, the increasing driving range of electric vehicles, as well as their decreasing production costs due to economies of scale have also helped to make PEVs become more competitive (Jenkins, 2015; Büttner, 2020). Mentioned public incentives for AFVs, and other forms of public interventionism have themselves often been the result of politico-economic decisions related to foreign affairs, energy independence, and economic crises. Thus, based on the analysed historic data, and the theoretical concept of Mises (1957) we consider attempts to provide concrete quantitative forecasts on the future vehicle sales evolution as unsound and unscientific.

4.6.9 Summary on Fiscal Policies in the Automotive Industry

Despite the shown optimistic volume forecasts for PEVs by Bloomberg (2015, 2017), the recent fiscal policies used to promote these technologies must still be criticized for distorting the market, using tax payer's money to promote products which would not have been competitive on a truly

free market. With the recent fiscal policies and legal settings, a proper definition of free market prices is not possible due to massive public interventionism such as taxes, fines and other regulations (Sinn *et al.* 2019). It can be argued that the economic boom and real estate bubble seen in the early years of the 21st century showed similarities to the current 'sales boom of eco-friendly car'. The ultra-loose monetary policies combined with artificial credit expansions that led to the financial crisis of 2007-2009, was caused by monetary policies which distorted the market, creating an artificial demand for credits, increasing unproductive investments into the early-stages of production (Huerta de Soto, 2009b; Bagus *et al.*, 2012). We argue that similarly, the recent growth of AFV sales would not have been possible without public interventionism and the market distorting fiscal policies. Milton Friedman once properly said "*I think the government solution to a problem is usually as bad as the problem and very often makes the problem worse*" (Friedman, Sept. 1974).

One may certainly argue that the development of the recharging infrastructure for PH-EVs and B-EVs would have been a challenge without any public support, as these engine technologies rely heavily on a proper fuelling infrastructure. This interdependence between necessary, costly fuelling station investments and the competitiveness of AFVs in the market had caused a certain "chicken and egg" problem for which governments, automotive OEMs, and gas station providers had blamed each other. Nevertheless, we argue that, if automotive OEMs (or gas station owners) had really seen a significant market demand, proper solutions certainly would have been found by the free markets, as truly free markets have always been able to adapt to changes (Rothbard, 1962; Huerta de Soto, 2009a). Mises once stated that "*it is the speculative capitalists who create the data to which he has to adjust his business and which therefore gives direction to his trading operations.*" (Mises, 1951, p. 121)

It can therefore be argued that the seen significant governmental interventions up until now have only been needed because the AFVs offered so far would not be competitive in a truly free market. Once AFVs become competitive, once the customer demand for mentioned technologies reaches a truly relevant level, automotive OEMs would certainly start providing these products by

themselves for their own entrepreneurial interest – even if no fiscal support was given. Therefore, the recent increase of AFVs cannot be seen as a sustainable development, as it is not occurring in a free market. Friedman was right in saying that “*one of the great mistakes is to judge policies and programs by their intentions rather than their results.*” (Friedman, Dec. 1975). Consequently, we argue that as in the case of monetary policies by central banks, also fiscal policies implemented by governments directly lead to market distortions which have often led to negative long-term results, ending in economic crisis.

However, when looking at the reality in several corporations, it must also be remembered that in particular within the automotive industry, most OEMs are no more steered by ‘entrepreneurs’, but rather by ‘Managers’. Consequently, whereas only a very few brands are still family-owned enterprises, the majority has become global corporations, often driven by short-term results necessary to optimize the company performance at the stock markets. Consequently, the traditional concept of entrepreneurs, *being* alert and creative to discover new business opportunities (Kirzner, 1963), personally investing time and money into their company’s long-term success, does not match with often unsustainable, shortsighted decisions by managers and executives in several large corporations. The so-called ‘principal-agent problem’ is an example of moral hazard, in which economic agents (such as managers/ employees as well as stock holders of a company) are motivated to act in their own best interests, which are contrary to the long-term interests of the corresponding company (Eisenhardt, 1989). The principal–agent problem often occurs when the two parties have different interests and/or asymmetric information. These discrepancies are likely to increase if the employer (principal) does not implement effective tools to align the employees’ interests with those of his own.

This may also explain the focus of many Executives within the automotive industry on short term success, even if only caused by artificial share bubbles at the stock market. Thus, from our perspective, to fully appreciate the relevance of entrepreneurial long-term success and long-term competitiveness, an understanding of the concepts of ‘entrepreneurship and competition’ developed by F.A. Hayek (1939, 1944, 1945, 1948), Israel Kirzner (1963, 1997, 2002), Krause

(2004) and Huerta de Soto (2009a) is seen as crucial. Kirzner (1963, 1973) criticised the approach of many neo-classical economist who have mainly concentrated on the concept of 'economizing', referring to their focus on the allocation of given means to achieve as fast as possible a set of given (competing) ends. Kirzner argued that this was not sufficient to guarantee entrepreneurial success in a dynamic market. Instead, Kirzner proposed (1963, 1997) the broader concept of human action developed by Mises, which incorporates the crucial element of alertness to new opportunities.

Markets reflect consumers' subjective valuations, and with economic calculation entrepreneurs constantly intend to adjust to the (changing) demands of consumers. In a free market, no-one is able to tell the consumer what to buy. Each of us has own subjective preference scale. From a dynamic perspective, it is much more relevant to be alert, discovering new opportunities, than to purely focus on "preventing waste"

From a dynamic perspective, it is much more relevant to be alert, discovering new opportunities, than to purely focus on 'preventing waste'. For long-term entrepreneurial success, it is crucial to move from a passive selection among alternative actions that are somehow given ("economizing"), to the active generation of actions, as the exercise of entrepreneurship within a dynamic market generates a succession of new choice-situations. As stated by the deceased entrepreneur Steve Jobs (2011): *'Innovation is the ability to see changes as an opportunity – not a threat'*. Also within the automotive industry, major decision makers should consider to truly act like creative, alert entrepreneurs, focusing on the long-term success of the company.

Henry Ford (1863-1947), the US-American industrialist and founder of Ford Motor Company, had already pointed out that innovation is not only about optimizing existing products based on customer feedback. Instead, it is said that Ford stated: *"if I had asked people what they wanted, they would have said faster horses"* - considering true innovation as creations by visionaries who ignore the 'status quo' and customer input.

Nevertheless, the author of this thesis insists that the seen massive public incentives for AFVs (recently these incentives have primarily been provided for PEVs) are unsustainable from a macro-economic perspective, leading to a significant market distortion and possibly to a new artificial market bubble. Moreover, from a geostrategic perspective, the transition of the European automotive industry towards electrification is likely to reduce the EU's dependency on imported fossil fuels, but enables several non-European (mainly Chinese) automotive brands to conquer a significant share of the European market with their new competitive plug-in electric vehicle technologies.

Consequently, we argue that the public incentives which have been provided to 'promote' AFVs were not only exaggerated, but actually harmful and inefficient from a long-term perspective. We argue that in a free market, once customer demand for AFVs had naturally increased, providers and consumers would have found truly adequate solutions by themselves, without public interventions. However, the automotive manufacturers have used these recent years of strong fiscal interventionism to optimize their AFV models in regard to crucial aspects such as product quality, reliability, driving range, and needed recharging times. Consequently, due to the seen public subsidies and other public interventions, as well as due to the corresponding expected economies of scale, we consider it as a realistic scenario that by the early 2030's, several PEVs are expected to be price competitive without any further governmental support.

5 A Thorough Approach to Sustainable Monetary & Fiscal Policies

In the case of health protection, it has become common knowledge that, to assure a body's long-term well-being, it is important to pay attention to the actual causes of an illness, instead of only starting to worry once its symptoms are visible. Accordingly, also in the case of the discussed boom-and-bust cycles and economic crisis, it is important to define the actual causes of market distortions, instead of only covering the symptoms. We indicated that our ethical concept is based on the non-aggression principle (Rand, 1964) and the benefits of human cooperation in a free society (Mises, 1912, 1940, 1957; Hayek, 1939, 1944), defending the free market concept with unrestricted prices (Kirzner, 1963), as well as the spontaneous order concept as defined by Hayek (1944, 1948, 1973). Thus, we strongly disagree with the Marxists Hardt, & Negri (2017) as well as with the Keynesian economists Krugman (2008), and Piketty (2014), who argue that the subprime crisis of 2007-2009 was caused by 'laissez-faire capitalism and the deregulation of the financial market. We indicated that, in line with Huerta de Soto (2008, 2009b), Hülsmann (2010), Ravier (2011), Bagus *et al.* (2012), and Alonso Neira (2013), we argue that national governments and other institutions, such as central banks, the US Congress and the European Union, are the actual originators of the recent crises. Accordingly, the expansive monetary policies by the US Federal Reserve System, the European Central Bank and other central banks, which increased the money supply while reducing interest rates to an often unsustainable level, led to mentioned subprime crisis. Thus, we argued that the seen Keynesian policies not only led to the subprime crisis, but also to the corresponding crisis in the automotive industry.

From an Austrian School perspective, economists such as Rothbard (1962, 2003) and Huerta de Soto (1998, 2009b) insist that the following key aspects must be considered as essential to properly resolve the economic challenges caused by boom-and bust cycles:

- First, the abolishment of the current fractional reserve banking, consequently establishing a banking system subject to a 100% reserve requirement on all bank demand deposits and equivalent. This approach would stop the current artificial credit expansions, limiting the risks of artificial booms (Rothbard, 1962; Huerta de Soto, 1998). Loans could no longer be granted by

simply creating new credits and instead would have to originate from real savings. The end of the fractional reserve banking has been requested by several major economists throughout the past decades. As mentioned, already in 1933, Irving Fisher, Frank H. Knight, Lloyd W. Mints, Henry Schultz, Henry C. Simons, Garfield V. Cox, Aaron Director, and Paul H. Douglas published the 'Chicago plan' calling for an end to fractional-reserve banking which was followed in 1939 by the similar 'Program for Monetary Reform' by Paul H. Douglas, Irving Fisher, Frank D. Graham, Earl J. Hamilton, Wilford I. King, and Charles R. Whittlesey. Also Laurence Kotlikoff and Stephen Zarlenga (2009) supported the idea of 100% reserve banking.

- Second, the suspension of the current structure in which central banks act as lenders of last resort should be targeted. Under free banking and a 100% reserve requirement, a lender of last resort would no longer be necessary (Rothbard, 1962; Huerta de Soto, 1998). In this scenario, a central bank influencing the interest rate and money supply is no longer necessary and the central banks' complete elimination should be the logic next step.

- Consequently, the privatisation of the current monopolistic state-issued money. Privatisation will ensure that money supply is under the control of business enterprises which will only be able to make constant, long-term profits by providing a stable and competitive currency in the free market. Maturity mismatching would be restricted and currency competition would be possible. This process shall be linked to the replacement of the current fiat money system by a commodity standard, e.g. the classic gold standard. Also other famous economists such as B.R. Ambedkar and the laureate of the 1999 Nobel Memorial Prize in Economic Sciences Robert Mundell, as well as Ludwig von Mises (1940) favoured the introduction of the gold standard (Rothbard, 1962).

Unfortunately, we will not be able to discuss each mentioned proposed aspect thoroughly enough in this thesis. As it is not among the main research objectives of this thesis, we will not be able to elaborate a detailed evaluation of the herein raised alternative theoretical approaches and monetary concepts. However, it should be mentioned that there are sophisticated alternative

models to the expansive monetary policies and public interventionism we have seen in the EU and USA throughout the past decades, in particular throughout the 21st century. Thus, the herein presented concepts will be evaluated in more detail in future research papers.

5.1 The Gold Standard & Full-Reserve Banking

Rothbard (1962) stated that from a legal perspective, reserves of less than 100% constitute fraud on the part of banks and should be illegal. From an economic perspective he stated that full-reserve banking would eliminate the risk of bank runs. The debate over the benefits and costs of full-reserve banking trace back over centuries. In 1933, as a response to the 'Great Depression' notable economists such as Irving Fisher, Frank H. Knight, Lloyd W. Mints, Henry Schultz, Henry C. Simons, Garfield V. Cox, Aaron Director, and Paul H. Douglas published a six-page memorandum on banking reforms. In the so-called 'Chicago plan' (1933), these economists asked for the abolition of the fractional reserve system and the imposition of 100% reserves on demand deposits. After an apparent recovery in the mid-1930s, the USA was again in recession and in 1939 economists circulated a draft proposal entitled 'A Program for Monetary Reform' calling once more for an end to fractional-reserve banking (Douglas *et al.*, 1939). This proposal for reforming the banking system in the United States was signed by six prominent economists, namely Paul H. Douglas, Irving Fisher, Frank D. Graham, Earl J. Hamilton, Wilford I. King, and Charles R. Whittlesey. Even Milton Friedman, monetarist and laureate of the 1976 Nobel Memorial Prize in Economic Sciences, once supported a 100% reserve requirement for checking accounts. Also the economist Laurence Kotlikoff called for an end to fractional-reserve banking (Solow, 1982).

With the occurrences of the financial crisis of 2007-2010, some monetary reform advocates are again calling for an end to fractional-reserve banking and a return to full-reserve banking (Bagus, 2010a). One proposal was defined by Stephen Zarlenga (2009) and the American Monetary Institute; which was known as the *American Monetary and Financial Security Act*. In April 2009,

Kotlikoff and Professor Edward Leamer called for the implementation of 'Limited Purpose Banking', which would turn banks away from fractional-reserve banking activities only allowing them to conduct "pure" financial intermediation, in a manner similar to pooled mutual funds (Kotikoff & Leamer, 2009).

In 2010, two British MP's, namely Douglas Carswell and Steve Baker, asked in the British Parliament for the introduction of a legislation which would allow depositors to decide if their money should be lent out at all, and if so for which period. Consequently, if the requested legislative reform had been passed, British depositors would have had the option to save their money in full-reserve bank accounts.

Under full-reserve banking the full amount of each depositor's funds is kept in reserve, as deposits available for immediate withdrawal would not be lent out for extended periods but rather would be retained by the bank to allow the depositor immediate access to the funds (Bagus, 2010a). Only certificates of deposit (or term deposits) would be used for normal lending activity. Full-reserve banking was practiced historically by the Bank of Amsterdam (also known as 'Wisselbank'), the 'Hamburger Bank' (1619–1875) and some other early banks. It is argued that, in contrast to fractional-reserve banking, full-reserve banking guarantees a more stable money supply, ensuring that the means of exchange is not debased over time. Huerta de Soto (1998b, 2006) states that the full-reserve system is the logical and inevitable solution for a truly free capitalist order, as the structure of private property rights must be seen as inseparable from a free market capitalist system. Thus, fractional-reserve banking would amount to violating the nature of the law of property rights (Huerta de Soto, 1998b). In line with Huerta de Soto, also Hoppe, Block, and Hülsmann noted that *"any contractual agreement that involves presenting two different individuals as simultaneous owners of the same thing (or alternatively, the same thing as simultaneously owned by more than one person) is objectively false and thus fraudulent."* (Hoppe et al., 1998, p. 22). Consequently, with a full-reserve banking system, the efficiency of the price mechanism would be improved, providing greater confidence in the financial system, encouraging sustainable, non-speculative, productive investments (Huerta de Soto, 1998; Bagus, 2010a). Full-

reserve banking is often criticized for not properly serving the need for financial intermediation and capital formation (Selgin *et al.*, 1996). In line with Selgin, Whelan (2007) argues that under full-reserve banking, deposits available for immediate withdrawal could not be used for credits to entrepreneurs, significantly reducing the capital available to borrowers and therefore harshly reducing total spending and aggregate demand in the economy. And according to Salin (1998, 2001), the transitioning to a full-reserve banking system would likely cause significant economic dislocation and a severe credit crunch. Selgin (2001) proposed a concept which he defined as the 'monetary equilibrium', using some analytical elements from the Monetarist and Keynesian Schools with the aim to show that fractional-reserve free banking could adjust the creation of fiduciary media to the actual public demand. Accordingly, Selgin assumed that fractional-reserve free banking could be rather effective in achieving such 'monetary equilibrium' by adapting the supply of money to its demand. Huerta de Soto (1998, 1998b) strongly criticizes both, Selgin's theory of 'monetary equilibrium', as well as the general concept of fractional-reserve free banking. Huerta de Soto (1998b) argues that with fractional-reserve free banking, bankers could reduce the risk of insolvency by reaching agreements among themselves, to merge or by demanding the creation of a last resort lender (central bank). This 'last resort lender' could then provide these (private) banks with liquidity, while potentially also 'orchestrating' a growth of credit expansion.

We appreciate Huerta de Soto's arguments, and acknowledge his corresponding concerns.

However, in line with Salin (2001) and Selgin *et al.* (1996), we do not agree that a mandatory full-reserve banking would be the 'perfect long-term solution'. Rothbard (1982) is right when indicating that costs are subjective. However, we argue that by establishing such mandatory full-reserve banking system, not only for a temporary transition period but as a long-term solution, will hamper entrepreneurial freedom, free trade and ultimately profit maximization. Instead, we argue that in a perfectly free banking system any customer must be free to choose the kind of notes and the system of payments for services he or she prefers. Thus, optimality cannot be defined independent of the wants of the individual. Huerta de Soto (1998, 1998b) disagrees with this approach, indicating that a proper free banking system subject must stick to 'traditional legal principles' (i.e., with a 100 per cent reserve ratio), in which all transactions, in which a fractional reserve is established, are considered illegal and a breach of public order. Huerta de Soto (1998b)

argues that the practice of banking with a fractional reserve involves a logical impossibility from a legal point of view. By granting loans against money, which had been deposited with the bank at demand, a dual availability of the same sum of money is created by the corresponding bank, being available to the original depositor as well as the loan receiving borrower. For Huerta de Soto, any manipulation of money, as the official means of exchange within an order, implies that third-party participants will also be affected.

We do consider Huerta de Soto's concerns. However, while not fully agreeing with the ideas of Salin (2001) and Selgin *et al.* (1996), we do support the general approach of Hayek on the 'denationalization of money' (Hayek, 1976). We argue that, as long as the individual market participants bear the consequences of their own decisions, the exact contract design should ultimately be up to the contractual partners. In line with Selgin *et al.* (1996), we argue whether a bank is committing a 'fraud' by holding fractional reserves does ultimately depend on the terms of the title-transfer agreements between the bank and its customers. We agree that, if a bank properly informs its clients about its fractional reserve practice and the corresponding consequences, then fractional reserves do not violate the contractual agreement between a bank and its customers. Many bank account owners might actually prefer the current fractional reserve banking system, as in a full-reserve system, customer costs for account maintenance (e.g. the depositing of money) are likely to be significantly higher. If all forms of public bailouts and other public subsidies for failing companies are entirely banned, adult market participants should not be stopped from becoming customers of independent private banks which transparently operate with a fractional-reserve system. Thus, we would consider a permanent, mandatory full-reserve system for all adult and mature citizens within a certain monetary area as a new form of interventionism, even if its justification is based on the desire to 'properly separate between deposit and credit'.

The author of this thesis agrees that the government monopoly on money production has been harmful, having led to political abuse and inflation. However, even if a private property order with a full-reserve banking system, as proposed by Hoppe (1993, 1998, 2006), could lead to a more solid and sustainable order, its 'implementation' (or ideally its 'natural evolution') seems to be

highly challenging from a political perspective. The exact economic - and consequently political - effects throughout such transition period cannot be fully foreseen, and this uncertainty would bear significant risks for current governments and to the general Western economic and political structures. Moreover, as indicated, and in line with Salin (2001) and Selgin *et al.* (1996), a mandatory long-term return to an official commodity standard, such as the classic gold standard, is seen critically by the author. One must also consider that, by officially reintroducing the gold standard, the money supply would be significantly influenced by the rate of gold production. In other words, when the gold stocks increase more rapidly than the economy, there is inflation and vice versa. Even if the gold standard brings long-run price stability, it is historically associated with high short-run price volatility (Eichengreen & Temin, 2000). Thus, it has been argued by several economists such as Eliot Parket that instability in short-term price levels can lead to financial instability as lenders and borrowers become uncertain about the value of debt (O'Brien, 2012). Consequently, alternative ways to thoroughly improve monetary (and fiscal) policies must be defined, which need to be pragmatic, accepting that current monetary institutions are not expected to disappear within this decade.

5.2 Alternative Banking Systems

This thesis is focusing on the impact of (former) monetary policies and public incentives on the automotive industry at the beginning of the 21st century. It is not meant to be a thorough research on banking and finance. Consequently, it is not our aim to define the 'ideal financial system'. However, we want to give a short outlook on alternative banking concepts which might become more popular in the future. Several banking and currency concepts have raised awareness throughout the past years, including high-reserve banking, ethical banking, Islamic banking, as well as blockchains and crypto currencies. We intend to give a short introduction into these models, but if they can truly stabilize the economy, helping to avoid boom-and-bust cycles, must be analysed in future research paper.

5.2.1 High-Reserve Banking

One of the most well-known banks which focused on 'high-reserve banking' was 'The Bank of Amsterdam' (1609-1819, in Dutch: Amsterdamsche Wisselbank). It maintained high reserve requirements until the Fourth Anglo-Dutch War (1780-1784), when its reserve ratio plummeted from nearly 100% in 1778 to around 20% by 1788. Most of the bank's capital originated with deposits of gold and silver bullion. The Bank of Amsterdam gave credit for deposits of gold and silver worth about 5 percent less than their mint price. In return, it granted the depositors a receipt, allowing them to claim his deposit 6 months later, upon returning to the bank the same value of bank money for which credit was given, and payment of a fee for the keeping—a storage fee of 0.25% for silver, and 0.5% for gold. Several economists have praised the historical 'Wisselbank' as an exemplary full-reserve bank "from its opening in 1609 until it yielded to the temptation of financing Dutch wars in the late eighteenth century" (Rothbard, 1994). The Wisselbank was not the only historical high-reserve bank. Kindleberger (1984) also mentioned the 'Hamburger Bank' (1619–1875), but the Wisselbank deserves special consideration as one of the most promising historical examples of a prominent full-reserve bank whose banking principles were relevant in averting harsh business cycles in Amsterdam.

However, defining the Wisselbank as an entirely 'full-reserve' bank is not fully accurate, as also in its earliest days, the Wisselbank frequently engaged in lending and fractional-reserve banking, but only on a limited scale (Mulligan, 2015). Historically speaking, the Wisselbank's rapid conversion in the 1780s from a high-reserve bank to a low-reserve one was clearly related to the exogenous factor of the Dutch war with Great Britain. Thus, in the case of the Wisselbank, exogeneous aspects, such as the war with Great Britain, as well as the impact of fractional-reserve banking were clearly intertwined. The appropriate weighting regarding the importance of each of these factors is challenging and is likely to be distorted by the individual theoretical approach of the corresponding researcher (Guzelian & Mulligan, 2015). Unfortunately, we have not found any research paper which was able to clearly define which aspect was crucial for the bank's declaration of insolvency - either the confounded effects of war or its switch to fractional

reserve banking system. We prefer the previously mentioned free banking concept instead of an official and mandatory national 'full-reserve' system. However, as an individual business model for private banks, we consider the Wisselbank's 'high-reserve concept' as an interesting alternative, in particular in economically challenging times in which bank account holders might fear the freezing of bank accounts and the forbiddance of withdrawals in order to prevent bank runs.

5.2.2 The Free Banking System

The US-American economics Lawrence H. White (1984, 1991), a professor at George Mason University who supports the theory of 'free banking', argued that fractional-reserve was already standard in the 18th century Scottish free banking system. In his classic work '*Free Banking in Britain – Theory, Experience and Debate 1800-1845*' White compares the Scottish banks with British ones during the mentioned period, stating that at that time, Scotland had no monetary policy, no central bank, and virtually no political regulation of the banking industry. Consequently, entry was completely free and the right of note-issue was universal. Yet the Scottish finance sector happened to appear much more stable than its British counterpart. In his work '*Free Banking in Britain*' (1984), White analyzed the efficiency of free banking in Scotland until it was suppressed by the British Parliament. White and his student George Selgin (1987) believe that the creation of fiduciary media by banks is necessary to prevent the market economy from plunging into depression if households and businesses increase their demand to hold cash, effectively reducing total spending in the economy. In contrast to Mises (1940), Rothbard (1962), and Huerta de Soto (1998), the economists Selgin and White (1987) argue that the natural evolution of a free banking system would lead to the reasonable replacement of gold ("outside money") in people's cash holdings by currency and demand deposits ("inside money") which would be issued by freely competing banks. We concede that a free banking system is certainly not perfect. Bankers could take wrong entrepreneurial decisions, making bad loans and investments, and several banks are likely to fail. Moreover, exogenous fluctuation regarding the

output of commodity money could occur, caused by technological innovations, and such fluctuations would be a cause of monetary disequilibrium. However, we consider the free banking system to be more flexible than the 100% reserve, giving more room to negotiate for banks and consumers. Under the full-reserve banking, banks would not be permitted to lend out funds deposited in demand accounts (Rothbard, 1962; Huerta, 1998). However, depending on the final legal and political overall scenario, this function could then be taken over by unregulated institutions (such as high-yield debt issuers), which could potentially also cover the economically necessary roles of financial intermediation and maturity transformation, therefore possibly destabilizing the financial system.

Thus, even among libertarian economists, different solutions are offered for the question; "*Which is the best banking system: fractional or 100% reserve?*" But, in line with Hayek (1976), we conclude that the best possible solution seems to be: let the truly free market decide (in which no bank nor any other financial institution will be 'saved' by public institutions for being 'system relevant or too big to fail'). In such a free market, in which central banks are completely abolished, money would be issued by private enterprises/ private financial institutions, and these currencies would compete in the market for user acceptance. Competition would favor those currencies with the highest stability in value. We consider Hayek's approach as interesting, who suggested that institutions would tend to rely on an extensive basket of commodities to form the ideal monetary base. Moreover, markets would converge on only a limited number of monetary standards, as only the most stable currencies would gain sufficient market acceptance. Unlike in a long-term mandatory full-banking system (i.e. based on the 100% reserve gold standard), banks could still earn revenue from lending against demand deposits, which would also be beneficial for the depositors as no additional charges/ fees would be necessary for the services associated with checking accounts.

5.2.3 Islamic Banking

Islamic banking is banking or financing activity which complies with sharia (Islamic law) and its practical application through the development of Islamic economics. Islamic banking/finance generally includes the concepts of 'Mudarabah' (profit sharing and loss bearing), 'Wadiah' (safekeeping), as well as 'Musharaka' (joint venture), Sharia prohibits riba, or usury, defined as interest paid on loans of money (Kameel & Larbani, 2006, 2009). By 2009, there were already over 300 banks and 250 mutual funds around the world complying with Islamic principles.

Ahamed Kameel (2006), former Professor of Economics and Management at the International Islamic University Malaysia stated that fractional reserve banking (FRB) has implications for the ownership structure of assets in the economy that violates the Islamic principles of ownership.

In line with the Malaysian economist Moussa Larbani, Kameel believed that money creation through fractional reserve banking is "the creation of purchasing power out of nothing which brings about unjust ownership transfers of assets, from the economy to the bank effectively paid for by the whole economy through inflation. This transfer of ownership is not based on human effort by taking on legitimate risks and is done neither with the knowledge nor the consent of the initial owners. This violates the ownership principles in Islam and is tantamount to theft. It also has the elements of riba." Their corresponding conclusion is that Islamic governments must not create fiat money since this is equivalent to taking assets of the people forcefully without compensation (Kameel & Larbani, 2009). Both even declare that Shariah scholars shall render a fatwa on both the fiat money and the fractional reserve system, as Islamic financing must not "be founded upon a money system that is fundamentally equivalent to theft and riba".

Despite these declarations, current real-life Islamic banking is certainly based on the fractional reserve system. It has also been criticized for failing to develop profit and loss sharing or more ethical modes of investment promised by early promoters. Instead, current Islamic banking is often regarded as actually selling banking products which "comply with the formal requirements of Islamic law" but use "ruses and subterfuges to conceal interest" and entail "higher costs, bigger risks" than conventional banks. Critic Feisal Khan (2013) argues that in many ways Islamic finance has not lived up to its defining characteristics. A "true" or strict Islamic banking and finance

system of profit and loss sharing is rarely used. Profit-loss sharing was planned to be the primary mode of finance replacing interest-based loans, but in reality, long-term financing with profit-and-loss-sharing mechanisms is, both by most banks as well as several customers, considered to be riskier and costlier than the long term or medium-term lending of the conventional banks (Yousef, 2004) - and has consequently significantly declined.

5.2.4 Ethical Banking

So-called 'ethical banks' are banks concerned with the social and environmental impacts of their investments and loans. The ethical banking sector includes: ethical investment, socially responsible investment, and corporate social responsibility, and is also often linked to the 'fair trade movement', 'ethical consumerism', and 'social enterprise' (Jennings, 2013). The ethical banking sector has not yet developed official comprehensive codes and regulations which must be adhered to in order to be certified as an "ethical bank". Thus, it currently appears difficult to create a concrete definition of what distinguishes ethical banks from conventional banks, also due to the fact that ethical banks are regulated by the same authorities as traditional banks and have to abide by the same public rules. Environment protection is generally seen as a key focus for ethical banks, for which banks operating in this field are often referred to as sustainable or green banks. At the current stage, 'ethical banking' can be seen as a 'high-end' label in the banking sector, mainly targeting upper-middle class private customers. Whether they will truly be able to significantly increase their market share, and how exactly they might be able to shape the banking sector, is not yet clear. So far, most European ethical banks, such as the German Ethikbank and the Italian Banca Etica, have rather focused on providing 'easier credit' to small start-ups and 'green technology' projects, while neither having criticized the FIAT money system, nor the recent ultra-loose monetary policies and low key interest rates caused by central banks (Jennings, 2013). To summarize on the recently presented two banking concepts, we consider Islamic banking as well as the idea of 'ethical banking' as interesting alternatives for consumers to achieve a lower dependence on the established major western banks such as 'Deutsche Bank'. Both, Islamic and

'ethical' banks have developed business concepts which could be recommended to different customer target groups. However, we do not expect that the individual banks behind these concepts will be able to significantly change the banking sector, leading to an end of the recently seen boom-and-bust-cycles caused by the combination of fiat money, fractional reserve banking and constant public interventionism. We argue that neither Islamic banking nor the currently known concepts of "ethical banking" explained herein, meet the standards defined by Hayek (1976) to establish a solid alternative to the seen Keynesian expansive monetary policies and cannot be seen as a significant step towards a true 'denationalization of money'.

5.2.5 Blockchain and Crypto Currencies

The concepts of blockchains and crypto currencies have gained significant relevance and awareness throughout recent years. Max Gulker (2017) defines the blockchain as a database which is distributed to all users without a centrally managed hub, storing unalterable digital records. The currently most famous of all crypto currencies is the virtual unit 'Bitcoin', a digital currency generated by decentralized, internet-based computers rather than a central authority. Transactions through the digital currency Bitcoin are confirmed, or validated, by a decentralized consensus system that uses a blockchain (Hosp, 2018). Gulker (2017) and Polleit (2017) argue that 'Bitcoin' and its blockchain technology could potentially become an alternative to the government monopoly on issuing currency. Blockchain technology could enable such a private currency to arise without a government or a semi-private central banking entity. Thorsten Polleit (2017) states that "the evolution of the blockchain largely circumvents many of the obstacles governments put in the way of a free market in money. But where it will lead is impossible to predict with certainty." However, the general current blockchain concept - or its potentially optimized successor technologies - are seen to have great potential to increase economic freedom in many areas (Polleit, 2017). There are significant differences between the individual concepts and purposes of the different platforms and crypto currencies, such as Bitcoin (BTC), Litecoin (LTC), IOTA (MIOTA), Cardano (ADA); Solana (SOL) and Ethereum (ETH) (Hosp, 2018).

Bitcoin was released as an open-source software with the idea of a decentralised digital currency. Bitcoin currency can be generated by computers and the transactions are done directly between the interested market participants, without any banks acting as the middle-man. The system behind Bitcoin is decentralized, using a distributed peer-to-peer database as well as an open source protocol (Spitznagel, 2017). Cardano can be seen as a public blockchain platform which facilitates peer-to-peer transactions with its internal cryptocurrency 'Ada'. Ethereum is a decentralized, open-source blockchain, and 'Ether' (with the currency code 'ETH') is the cryptocurrency generated by the Ethereum protocol.

IOTA, on the other hand, is an open-source distributed ledger and cryptocurrency, created for the emerging machine-to-machine economy of the growing so called 'Internet of Things' (IoT) sector. IOTA goes beyond the blockchain concept offering a block-less distributed ledger termed the 'Tangle'. This technology allows IOTA to offer zero-fee transactions and no fixed limit on transactions per second (T. Mittal, 2017). However, at the current stages the investment into crypto currencies can be rather seen as a speculative investment into new technology concept. Thus, based on the findings of Hosp (2018) and Spitznagel, (2017), we argue that currently Bitcoin and the other mentioned crypto coins should be considered software infrastructure innovation tools, not yet competing currencies. Moreover, as argued by Polleit (2017) and Spitznagel (2017), these virtual currencies are not backed by gold, silver or any other physical commodity. However, just like in the case of fiat money, it is trust which can turn a digital currency, into a value and therefore into an acceptable medium of exchange (Hosp, 2018). Consequently, the price of crypto currencies is only expected to sustainably increase if significant numbers of vendors and firms start accept these currencies as a mode of payment. We conclude that the fact that the request for crypto currencies, operating inside virtual communities, has significantly increased within the past decade, is an indication that a growing number of market participants consider 'money' as an individual property of economic agents, not of the state nor of central banks. Crypto currencies such as Bitcoin provide an impulse towards monetary freedom and a return to classical liberal principles (Hosp, 2018). Lee & Martin (2017) argue that a wider adoption and acceptance of cryptocurrencies as a payment option will naturally increases their worth. However, in line with Spitznagel (2017), we argue that in today's world, dominated by constant public interventionism,

very powerful central banks and Keynesian expansive monetary policies, it is unlikely that from a short- or mid-term perspective, crypto currencies can gain the role of widely-accepted 'currencies'. Therefore, crypto currencies such as Bitcoins can currently only be regarded as assets, or equities, not as currencies. However, the recent development in regard to crypto currencies must be seen as a positive evolution. Accordingly, we conclude that decentralized finance (DeFi) as a financial system which operates without the need for traditional, centralized intermediaries, should be seen as a promising alternative to the current government-issued fiat money system. Thus, time will tell if a better, more transparent and stable world economy can be created based on decentralized new concepts such as the blockchain (Spitznagel, 2017).

5.3 Proposed Short-Term Approach: Ordoliberalism 'with an Austrian Twist'

We consider the ultimate transition of the banking system towards a truly sustainable, free-market structure as the necessary long-term process, for which different phases will be necessary. However, before our desired truly free market can be achieved, it will be necessary to minimize the harm, unsustainable economic policies can do to our economy. The US-American economist Thomas Sowell (2015, p.7) stated that *"life does not ask what we want. It presents us with options."* In a 1962 speech, the former paramount leader of the People's Republic of China, Deng Xiaoping, stated: *"It doesn't matter whether it is a yellow cat or a black cat; as long as it catches mice, it is a good cat"* (in Chinese: 不管黄猫黑猫, 只要捉住老鼠就是好猫). We consider Xiaoping's supposedly pragmatic approach as oversimplified, but we do understand that in the first place, realizable "Realpolitik" ("practical policies") will be needed until, at a later stage, an order could be achieved similar to the original concepts of Hayek, Mises and Kirzner. Thus, in the first place, it will be necessary to stop the current Keynesian interventionism, by steering monetary and fiscal policies towards a more liberal and sustainable approach. Le Bon (1897) who

investigated on crowd psychology, argued that there are several characteristics of crowd psychology, which include impulsiveness, irritability, and the exaggeration of sentiments. Hannah Arendt (1951, p. 474) said that totalitarian rule can best be established and maintained with people that are not able to distinguish between fact and fiction, those neither being able to think independently, nor to properly use reasoning. Le Bon assumed that *“the masses have never thirsted after truth. Whoever can supply them with illusions is easily their master; whoever attempts to destroy their illusions is always their victim”* (Le Bon, 1897, p. 105). Fernando Pessoa once said *“não há nenhuma ideia inteligente que possa ganhar aceitação geral sem ser misturada antes com um pouco de estupidez”* (Pessoa, 1999, p. 104), which means that there is no truly smart idea which can gain general acceptance without being mixed-up with a certain degree of stupidity beforehand. Therefore, from a short-term perspective we need to consider which politico-economic system could realistically be achieved, which would do less economic and ethical harm than the currently seen Keynesianism.

First of all, we need to assure that monetary policy makers intend to minimize malinvestment and the loss of capital by pursuing a more restrictive monetary policy, in particular once artificial stock booms begin. As a first step, it could be seen as a significant advancement if EU member states would base their general economic policies (particularly their fiscal policies) on the concepts of Walter Eucken’s (1949, 1950, 1952) Ordoliberalism, while embracing the arguments of Bagus (2014) and Hülsmann (2008b) on deflation as well as Polanyi’s (1940, 1948) concept of the spontaneous order. We argue that Ludwig Erhard, who in his role as Minister of Economic Affairs led West Germany’s post-war economic reforms, based several of his economic policies on Eucken’s (1949) Ordoliberalism. We conclude that from all economic concepts which have been implemented in any EU member state since the 20th century, Erhard’s policies can be considered as ‘the least harmful ones’ to the ideas of competition and private property. Consequently, whereas the ideas of Mises (1922, 1929, 1940), Hayek (1944, 1973, 1976), and Huerta de Soto (1998, 2005, 2009a) must certainly be considered as more consistent and coherent, we argue that from all politico-economic theories which have actually significantly shaped government policies, Ordoliberalism must be considered as ‘the lesser evil’. We are aware that, when it comes to *“Realpolitik”* (German term for ‘practical politics’), the line between necessary pragmatism on

the one hand, and inconsistent, incoherent sycophancy on the other hand, may be hard to specify. Accordingly, we must remember the verse *"tu ne cede malis sed contra audentior ito"* (English translation: *'Do not give in to evil, but proceed ever more boldly against it'*) stated by Publius Vergilius Maro (known as 'Virgil') in his 'The Aeneid, Book VI' (Maro, 1872). We agree that a precise, coherent and unambiguous theoretical approach is required to thoroughly change the politico-economic system within the EU countries and to end the disastrous expansionary monetary policies of the ECB. However, as we do not expect that the ideas of Mises (1940), Hayek (1976) and Huerta de Soto (1998) will gain sufficient support in the short run to thoroughly 'change the system' from a truly 'Austrian School perspective', we need to consider which path could be taken to initiate a successful transition towards a truly free market. And, compared to those schools of thought which have shaped Europe's monetary and fiscal policies throughout the past decades - namely Keynesianism, New Keynesian economics, and Socialist economics - the ideas of Eucken (1949) should be seen as a short-term door-opener for those of Austrian School economists. We argue that this transition, although difficult and possibly lengthy, will lead to more sustainable monetary policies, while minimizing public interventionism and ultimately leading to a truly free market. However, as indicated, from a long-term perspective, the policies proposed by Eucken cannot be seen as sufficient to fully stop the harmful boom-and-bust-cycles. Thus, we must also refer to those concepts which we consider as more appropriate from a long-term perspective, referring to the ideas of Mises (1940), Hayek (1976) and Huerta de Soto (1998).

5.3.1 Walter Eucken's Ordoliberalism

Ordoliberalism significantly shaped the economic model of western Germany throughout the 2nd half of the 20th century. Nevertheless, on a global level Ordoliberalism has received significantly less attention and even in the Federal Republic of Germany, since the late 1960s, the academic focus on Keynesianism as well as Chicago School/ monetarist theories gained more relevance in

business schools and university lecture halls (Vanberg, 2011). However, with the beginning of the Global Financial Crisis of 2008 the term ‘Ordoliberalism’ has experienced a certain revival, in order to define ‘a 3rd way’, a new economic model which could possibly ‘control the (financial) markets’ while still protecting freedom and competition. This interest in Ordoliberalism is closely related to the relationship between liberalism, the state’s responsibilities, and economic regulations (Böhmler, 1998; Molina Cano, 2001). It supports a market order with a regulatory framework created by the state to ensure economic competition while protecting citizens from an excessive power concentration (Eucken, 1948; White, 2010). We intend to detect similarities and differences not only between the theory of Ordoliberalism and the ‘social market economy’, but also between Ordoliberalism and the Austrian school of economics. Ordoliberalism combines legal, political, philosophic and economic aspects and its general concept was essentially developed by economists of the ‘Freiburg School of Economics’, such as Walter Eucken, Franz Boehm, Leonhard Miksch and Hans Grossmann-Doerth (Molina Cano, 2001; Reimers, 2020a). Even if it was initially rooted in classic liberalism it was then further developed to define a ‘3rd way’ between centralized interventions states on the one hand, and the concept of complete ‘laissez-faire liberalism’ on the other hand (Böhmler, 1998; Molina Cano, 2001). The state should shape the general order of an economy, but it should not directly steer the actual economic processes (Vanberg, 2011). Consequently, in the preface of the first volume of the ORDO yearbook, Eucken (1948) stated: *“The State planning the general order? Yes! But the State planning and steering the economic process? No!”*

Right after World War II, Eucken's theories significantly influenced economic reforms in western Germany, as Eucken was already a member of the advisory council to Ludwig Erhard, then economic director of the American-British zone of occupation, helping to reshape and rebuild the German economic system (Oliver, 1960). Eucken also attended the founding conference of the liberal ‘Mont Pèlerin Society’ of which he was elected one of the vice-presidents (Hartwell, 1995). His own thinking ‘in orders/ structures’ is explicitly based on the legal thinking in political constitutions, and it is no coincidence that Eucken worked closely with the jurists Franz Böhm and Hans Großmann-Doerth (Molina Cano, 2001; White, 2010). In his thinking on philosophical and methodological problems, Eucken was related to Husserl. His theory of the economic order

('Ordnungstheorie') is interdisciplinary. Several of the modern directions in economics, such as property rights theory, evolutionary economics and new institutional economics, can be integrated in his methodological approach. Eucken's concept of Ordoliberalism intends to limit the economic centralization of power by individuals, companies and associations (Vanberg, 2011; Reimers, 2020a). This should be achieved with a legal and institutional framework, which defends private property, while highlighting the enforcement of private contracts, liability, free entry to markets, and monetary stabilization (Eucken, 1949). In Eucken's (1949, 1950, 1952) concept, the state should provide a well-functioning competitive order in which private agents can act without frequent discretionary influence from the state. From the perspective of the 'Freiburg school', the market, if protected by a 'market order' which assures competition, is generally a non-discriminatory, privilege-free and therefore good, ethical and just order.

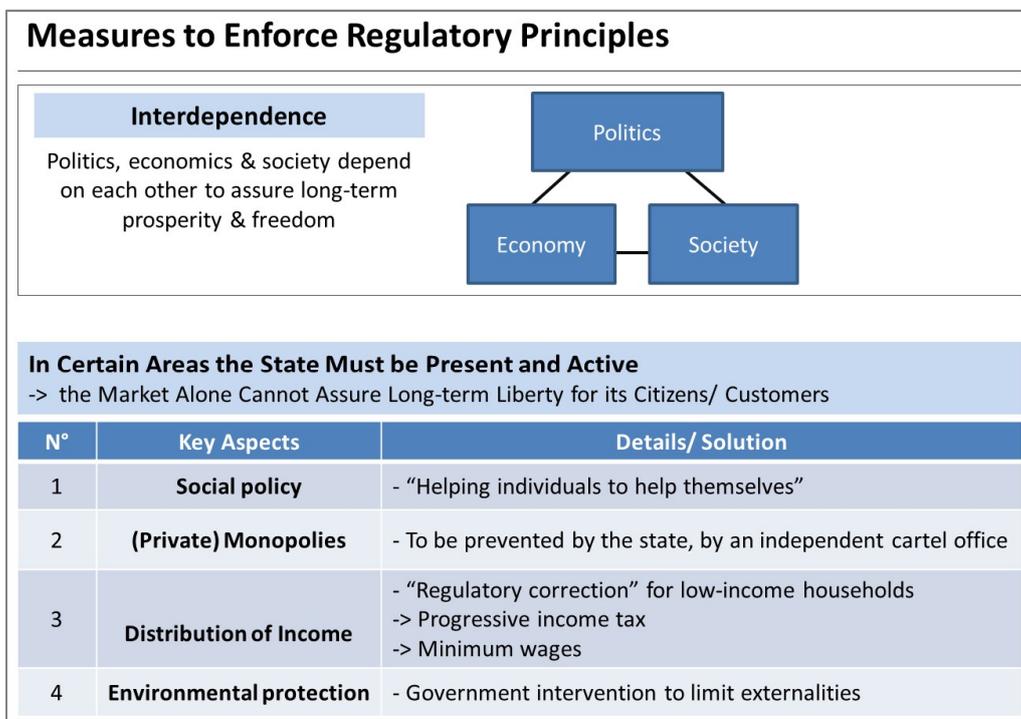
From the point of view of the ordo-liberals, the free market economy can promote material well-being in the best possible way, but a completely free market economy could also ultimately abolish itself by centralizing economic power (private monopolies), price fixing, antitrust etc. which would then destroy free competition (Eucken, 1952). Ordoliberalism argues that a completely free market without any public control could lead to private monopolies in the long run, making true competition impossible. To avoid this, there would be a need for an institution which sets the framework under which the competition can run smoothly (Molina Cano, 2001). And that institution would need to be the state. For example, a cartel office would be crucial to make it impossible for one single company (or for oligopolies via price fixing) to fully dominate the market (Eucken, 1949). Ordoliberalism wants an intermediate path, a 'third way' - an economic order that positions itself between socialism and pure free-market capitalism (Molina Cano, 2001). The ordo-liberals certainly do recognize that the state can become a problem with exaggerated interventions into economic affairs (Zmirak, 2002). Ordoliberals such as Eucken (1949) confirm that the state can undermine competition, that it can be hijacked by particular interests and that it can lead to an abuse of power. Ordo-liberals were also concerned with the threat of the state becoming the real threat to competition, freedom, peace and prosperity. Their order was meant to ensure economic competition, while also protecting citizens from excessive power concentration (Eucken, 1949, 1952). While Ordoliberalism strongly rejects a complete absence of state intervention in the

economy, it is also opposed to constant, discretionary interventionist measures (Zmirak, 2002). Thus, the interventionist fiscal policies seen in many countries in the period from 2008-2010, the bail-out programs for banks and other ‘too big to fail’ corporates would certainly not part of a truly ordoliberal agenda.

In Eucken’s concept (1949, 1952), the state should shape the general order of an economy, but should not steer directly the actual economic processes. An order (German: ‘Ordnung’) as a politically set framework is seen as the basis for functioning competition. Thus, Eucken defended a functional order to unite & optimize political & economic freedom. As Ordoliberalism was developed between many different great minds, including lawyers, sociologists, and political scientists, it is an interdisciplinary theory which also looks at socioeconomic and legal aspects.

The following chart defines the interdependence between politics, society and the economy, and shows from an ordoliberal point of view, in which areas the state must be present.

Chart N° 71: Ordoliberalism and its Regulatory Principles

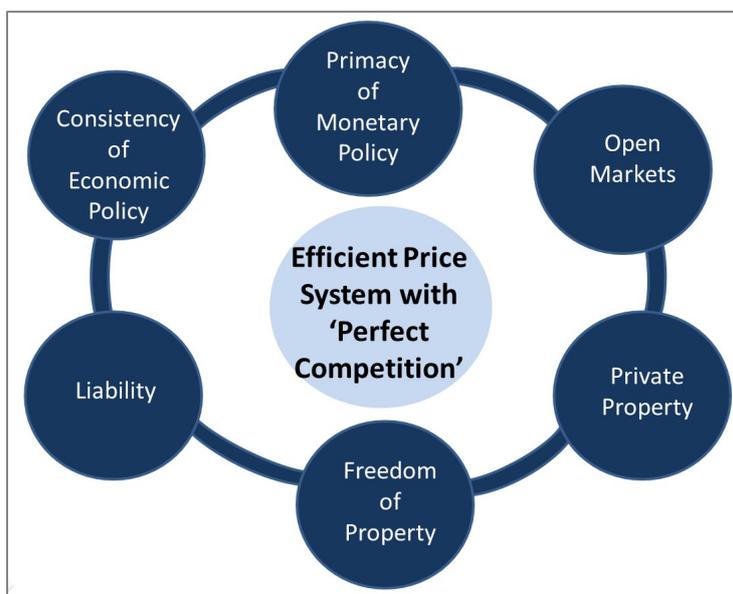


Own elaboration, based on Eucken (1949, 1950) and Vanberg (2011)

In this aspect, the ordo-liberals consider the state as crucial to protect the free market system. Such control would ultimately assure a functioning market economy, by protecting citizens/consumers from the supposedly destructive forces of the free market. For further clarification, we can detect the basic principles of Ordoliberalism & for a functioning competitive order (Molina Cano, 2001).

From an ordoliberal perspective, the following aspects are needed to achieve a proper economic (price) system with “perfect competition”.

Chart N° 72: Ordoliberalism’s ‘Perfect Price System and Perfect Competition’



Own elaboration, based on Eucken (1949, 1950) and Vanberg (2011)

The Freiburg School is often subsumed under the generalized term of “(German) neo-liberalism”, and even academic papers do not always properly distinguish between Müller-Armack’s ‘social market economy’, and the original concepts of neo-liberalism as well as Ordoliberalism. However, there exist clear relevant differences between these terms and concepts. As we learned, Ordoliberals separate themselves from classical liberals, as they promote a relevant role for the state with respect to the set-up of the market framework. The term ‘neoliberalism’ was originally

coined in 1938, at the Colloque Walter Lippmann, by Alexander Rüstow. The term “neo-liberalism” was meant benevolently as an alternative to “classic liberalism”, as this “new” form of liberalism was seen as capable to avoid inefficient concentration of power by public institutions as well as by private corporates (Zmirak, 2002). The colloquium defined the concept of neoliberalism as appreciating ‘the priority of the price mechanism, free enterprise, the system of competition, and a strong and impartial state’ (Reimers, 2020a). Due to this connected history, Ordoliberalism is often referred to as “German neo-liberalism”, which has led to confusion and “mix ups” of terms and ideas in the politico-economic discourse (Molina Cano, 2001). Müller-Armack’s (1947) concept of the social market economy was in some aspects more interventionist and outcome-oriented than the original concept of Ordoliberalism. The ordoliberals of the Freiburg School advocated a strictly procedural and rule-oriented liberalism. In a simplifying way, one may say that the difference between the ordo-liberalism of the Freiburg School and Müller-Armack’s concept of the social market economy can be seen in the room given to the political system to steer the economy and society via interventionist policies (Vanberg, 2011). Moreover, Müller-Armack’s (1947) social market economy can be defined as a rather ‘pragmatic’, result-oriented political-tool which can be adjusted to political, economic or social changes. This would distinguish it from Ordoliberalism which can be rather seen as a general theory, which moreover considers competition in itself to be ethical, since a functioning competitive market is seen as ‘ethical’ without any additional constant socio-political beneficence (Eucken, 1948; Molina Cano, 2001; Vanberg, 2011).

5.3.2 Ordoliberalism as a ‘Door-opener’ to an Austrian School Economic Order?

There have been quite different interpretations of what liberalism is actually all about. These differences have been visible at several of the meetings held by the Mont Pèlerin Society, the interdisciplinary group of liberal scholars which F.A. Hayek had first brought together in 1947 at Mount Pèlerin in Switzerland. Since the founding session of the Mont Pèlerin Society in 1947, it

had been shaped by three major schools of thought: the Austrian School, ordo-liberalism and the so-called Chicago School. Mises and Hayek represented the Austrian School, while Walter Eucken and Wilhelm Röpke represented ordo-liberalism, and ultimately George Stigler, Frank Knight and Milton Friedman were the main representatives of the Chicago School (Bagus, 2016). Already in 1949, an argument erupted between von Mises and Walter Eucken about the question of monopolies, whether private monopolies are a threat to economies and if so, how to deal with this threat. Constant conflicts of opinion occurred within the Mont Pèlerin Society, initially mainly due to disputes between Eucken and von Mises who represented two distinctively different perspectives on liberalism, competition and the role of economic policy (Böhmler, 1998; Hartwell, 1995). While von Mises (1940) favoured a more radical concept of the free 'unhampered market', Eucken (1949, 1950) also supported competition, but defending the concept of the market as 'a constitutional order'. Already in 1950, von Mises clearly expressed his doubts whether a cooperation with the ordo-liberals in the Mont Pèlerin Society could be of any use, accusing ordo-liberals of justifying several cases of state interventions. Mises saw all government interferences in the economic process critically as he considered economic policies as "*coercion... crucial acts of intervention... and authoritarian decrees and prohibitions*" (Mises, 1985, p. 76). Also Hayek criticized government policies that seek to shape the economic process by means of general rules which he considers as undesirable or even harmful (Hayek, 1944). Thus, in regard to specific aspects, particularly on free-market monopolies, controversies occurred and remained between Eucken and Röpke on the one side, and Mises and Hayek on the other side (Zmirak, 2002). Eucken (1948) and Röpke (1971) insisted that the market order is a rule-based order, as a market without any framework of rules and institutions would be a threat to competition and therefore a threat to consumers (Röpke, 1971; Vanberg, 2011).

Both, Eucken (1949, 1952) and Hayek (1939, 1941) participated equally in the later stages of the 'socialist calculation debates' in the 1930s and 1940s. Hereby Eucken (1952) also strongly questioned the functionality of any centrally administrated economy. His first argument was the impossibility of economic accounting in a centralized system. As a second point, Eucken (1950, 1952) dealt directly with the question of power and criticized any form of extreme concentration of economic power, both in public institutions as well as in private companies.

In line with Hayek, most ordoliberalists also criticized Keynes' famous quote "*in the long run we are all dead*". Both ordoliberalists as well as Austrian school economists consider Keynes' theory of economics as the main reason for the massive economic challenges and inflation seen in the 1970s. Also in regard to the importance of free prices, the positions of Eucken (1952) and Hayek (1936, 1944, 1990) were very similar: Both indicated the importance of free pricing, as price signals are the only means to enable the economic decision makers to communicate ('tacit' and/or 'dispersed') knowledge between each other, helping to solve the economic calculation problem. Both, Hayek (1931, 1939, 1941, 1944) and Eucken (1950, 1952) saw the price system as a crucial mechanism to communicate information, as it can assure on a daily basis what centralized systems fail to do: it registers every choice made by the market participants, transmitting potential scarcity of products, and consequently coordinating the price matrix. Moreover, economic profits must be seen as the reward for removing maladjustments from an economy.

Eucken's ordoliberalism was criticized as constructivist by many Austrian School economists, as he criticized any concentration of power, also emphasizing on eventual threats caused by the monopoly position of private companies (Bagus, 2016; Polleit, 2018). Thus, the Austrians' accusation of Ordoliberalists to be constructivists relates to the thesis that Eucken himself can be considered a constructivist rationalist. We partially agree with this accusation, as Eucken pretends to be able to design the principles of a 'fair and efficient economic order'. Eucken stated that "... *a house is to be built, and its ground plan is to be designed*" (Eucken, 1952, p. 250) which can be translated with 'when a house shall be built, its layout must be defined'. And from Eucken's perspective it is the state that needs to define this basic layout of a society and its market economy. Thus, for Eucken (1949, 1952) the economic order must be defined and controlled by the state, at least in its basic outlines, since he regards the concentration of private power as a serious danger which needs to be limited. A common criticism by both, Eucken (1952) and Hayek (1944), towards Keynes was related to Keynes' (1936) capital theory. Eucken's approach to capital theory was partially rooted in the corresponding tradition of the Austrian School economist Böhm-Bawerk. Eucken (1950, 1952) also focused on the concrete proportion and sequence of capital goods in the market process, as well as on the importance of relative prices, similar to Hayek's (1941, 1944)

business cycle theory. Moreover, both Hayek and Eucken criticized Keynes' (1936) mechanistic focus on aggregates and empiricism, which would not properly consider the individual behavior and subjective preferences of economic agents.

For Eucken (1949, 1950) the protection of the economic process by public entities is central, since for him the intensity of competition is defined by the structure of the market. We argue that such an understanding of the economic process must be viewed, at least partially, as static and interventionist. For Eucken, interventions by the state are justified if it serves to maintain or maximize the competition between different providers. For him, individual freedom has its limits where it endangers the general order (Molina Cano, 2001). Eucken (1950, 1952) links the two categories of "complete competition" and "competition of services" (in German: "*Leistungswettbewerb*"), which both need to be protected and maximized. In this concept, "competition of services" denotes the type of competition in which the satisfaction of customer requirements, instead of the elimination of competitors, is the defined goal for a healthy economy. Eucken argued that the economic order does not only consist of the market forms which surround the trade of goods and services within the economic process, but also of the monetary systems. Thus, Eucken is willing to assign a relevant role to the state, which he considers as legitimate and necessary to maintain and maximize competition. Consequently, Eucken also used the same argument to justify the central bank's banknote privilege. He said: „*doch auch diese Machtbildung erfolgt zu dem Zweck, die Wettbewerbsordnung zu ermöglichen...*“ (Eucken, 1952, p. 291), which can be translated to English by 'this concentration of power is necessary in order to make the competitive order possible'. We can say that Eucken assigns to the state a much more relevant and diverse role than Austrian School economists such as Hayek or Mises would have ever done. Particularly in the area of monopoly supervision, Eucken's ideas must be viewed as clearly interventionist.

Hayek's (1944, 1979, 1990) concept is much more dynamic, while generally showing criticism towards any state interventionism in the economic process. Instead of concentrating on the

theoretical construct of a "long-term equilibrium", Hayek (1944, 1979) considered competition as a dynamic process of temporary adjustments by individual subjects participating in the market process. For Hayek (1944, 1979) potential dangers which could hinder economic processes and the catallactic order of knowledge sharing, are almost entirely due to state interference. Thus, parts of Ordoliberalism collide with Hayek's concept of cultural evolution. In Hayek's (1979, 1990) concept, the rules of a liberal order must not be consciously created, but must develop naturally and freely in a long-term process without a central plan. Thus, Hayek's evolutionary concept is accused by Ordoliberals of ignoring the dangers that would arise if the state failed in defining and controlling the framework of economic activities.

We argue that an economic order based on Eucken's positions would be a major improvement compared to the Keynesian interventionist policies which have controlled most European welfare state economies throughout the 21st century. However, our politico-economic ideas are certainly more similar to those of Hayek (1944, 1948, 1979, 1990) and his understanding of the market process. In line with Hayek (1944, 1979) we believe in the endogenous power-eroding character of a dynamic competitive process.

Nowadays, to generally compare 'the Austrian school concept' with Ordoliberalism is rather challenging, as there clearly are different branches within the Austrian school, ranging from Hayek's (1948, 1976, 1990) 'institutional evolution' to von Mises (1929, 1940) and ultimately including the anarcho-capitalist 'natural order' of Rothbard (1970). For simplification, we will herein compare Ordoliberalism to the praxeologic Misesian-Rothbardian definition.

Table N°18: Ordoliberalism vs Austrian School Economics

N°	Ordoliberals versus the 'Praxeologic Misesian-Rothbardian' Austrian School
1	No general adoption of the concept of Praxeology in the Ordoliberal theory.
2	No fundamental rejection of empiric analyses to predict certain future developments
3	Main difference to Austrian School: Free markets are not always self-healing
4	Too much centralized/ bundled power (even of private entities) is likely to threaten freedom
5	-> (also private) cartels as a long-term threat to citizens/ consumers
6	-> defending a money control via an independent monopoly office – under the rule of law
7	Free markets are good, but fragile: State may intervene to preserve competition
8	Monetary policies: Eucken defended 'stable monetary policies' with a central bank
9	Monetary policy concept of Eucken more similar to M. Friedman than to von Mises/ Rothbard

Own elaboration, based on: Mises (1940, 1957), Rothbard (1962), Eucken (1949, 1950)

In regard to the threat caused by too much statism, parallels can be seen between ordoliberals and the Austrian school economists like F.A. Hayek (1990). It was Hayek's conviction that people are not as good at creating and designing as they often think they are, saying that it is "*...the curious task of economics to demonstrate to men how little they really know about what they imagine they can design*" (Hayek, 1990, p. 76). Hayek said that there is no effective way to combine and detect the astronomical quantity of information needed to direct economic resources of specific applications properly. He said that there was not one person, not one computer or government that could contain all of the relevant knowledge necessary to detect all scarcity ratios of all goods and services within a certain economy. Therefore, governments will never be able to define new business models, niches, necessities and inventions as quickly and properly as the free market does. In this aspect, the Austrian Hayek and the ordoliberals Eucken and Franz Böhm had almost identical views, both emphasizing on that no centralized politico-economic system can be as efficient as the market economy (Zmirak, 2002).

Despite these similarities, there have been fundamental differences between ordoliberalism and Austrian school economists, particularly with those Austrians following the ideas of Rothbard (Bagus, 2016). However, some significant differences can also be found between Eucken and Hayek. The author of this thesis argues that their most crucial disagreement was on monetary policy and the consequent potential risks and benefits of an abolition of central banks, as Hayek favoured a complete 'denationalization of money' with freely competing private moneys.

Before Eucken defined his 'ordo theory' (*'Ordnungstheorie'*), he had published the *'Kritische Betrachtungen zum deutschen Geldproblem'* on Germany's monetary policies throughout the hyper-inflation in the early 20th century (Eucken, 1923, 1949). In this document, and while still being in favor of re-introducing the gold standard, Eucken (1923) stated that the origin of the mentioned inflation could be found in Germany's monetary policies of that time. However, one year later, Eucken (1924) argued in the publication *'Das internationale Währungsproblem'* that there were many practical reasons for which a return to the gold standard would not be recommendable.

In the years that followed, Eucken (1949, 1952) moved further and further away from the idea of the traditional gold standard. Eucken (1952) then called for a state institutionalized monetary framework that should guarantee a stable economic process. This should be achieved within the framework of a commodity reserve currency (*'Waren-Reserve-Währung'*). Instead of purely focusing on gold, the commodity reserve currency would be based on a broad shopping basket, for which a central agency would buy and sell certificates at a fixed price. Eucken argued that through this process, the money creation by central banks could be limited by clear rules, reducing the risk of public interventionism and expansive monetary policies to a minimum. Eucken (1952) called for a clear restriction of the central banks' power, with the aim to avoid a cumulative inflation or deflation processes. In regard to foreign trade and external monetary policy, the state and the central bank should work towards the stabilization of exchange rates, which would also be facilitated by the introduction of the commodity reserve currency. However, the creation of money should remain in the hands of the state, while the operations of the private market players (the private banks) should be limited to the lending/ credit business. Eucken justified the central bank's monopoly on money creation, considering it as compatible with his aim to maximize competition

within the economic order. Eucken justified his approach by stating that a proper commodity reserve currency would significantly reduce the state's ability to directly influence the evolution of the money supply.

Also Hayek (1932) began his career as a supporter of the gold standard. But similar to Eucken, also Hayek (1939) soon feared significant challenges in implementing the gold standard, for which Hayek then considered the gold standard to be the 'second best' alternative. At a later stage, and, just like Eucken, Hayek supported the definition of a commodity reserve currency, which, however, was not considered in the Bretton Woods agreements. Nevertheless, Hayek continued to defend the introduction of a commodity reserve currency, while criticizing the fundamental dangers of inflation and the negative effects of any state power on monetary policy. The negative impact of public institutions on monetary policies would even be intensified by an increasing welfare state. According to Hayek (1939, 1941, 1944), the combination of a central bank which controls the monetary policies and a growing welfare state which requires increasing public spending, must lead to a misallocation of resources, market distortions and minimized economic freedom. In the 1970s, Hayek's perspective changed, as he realized that central banks are generally incapable to assure a long-term inflation-free monetary policy (Hayek, 1976, 1979). Thus, Hayek concluded that central banks must generally not get the privilege to a monopoly over monetary policies. Hayek properly stated that government money "*has the defects of all monopolies: one must use their product even if it is unsatisfactory, and, above all, it prevents the discovery of better methods of satisfying a need for which a monopolist has no incentive.*" (Hayek, 1976, p. 27)

Therefore, Hayek called for a denationalization (privatization) of money, arguing that central banks must lose their monopoly on money creation, enabling competition between the state and various private money providers in the sense of free banking. Hayek (1976, 1979) argued that the free competition of currencies would automatically regulate itself, by assuring that only currencies with a stable value could gain the consumers' confidence. Thus, only good currencies, which are not prone to inflation, would be competitive, while in the medium and long term, market participants would detect and avoid all unstable currencies.

Hayek's (1976) proposal called for privately issued, competing currencies and the abolition of the current FIAT money system. Eucken did not question the existence of central banks, and there is no reference indicating that he supported the idea to privatize money. However, we must also consider the historic context, as Eucken already died in 1950, whereas Hayek finalized his fascinating pamphlet 'The Denationalisation of Money' not before 1976. Thus, Hayek thoroughly developed his theory on monetary policy at a time Eucken had already deceased.

5.3.3 *Quis custodiet ipsos custodes?* (Who will watch the watchmen?)

In his book '1984', George Orwell stated: "*We know that no one ever seizes power with the intention of relinquishing it. Power is not a means; it is an end.*" (Orwell, 1949, p. 263)

Criticising the ordoliberalists' concept, already in 1929 von Mises argued in his essay "Criticism of Interventionism" that there "is no such compromise, no Third Way". Mises said that it was impossible to create an economic order that could combine and bundle the desirable qualities of socialism and the good qualities of capitalism – while at the same time avoiding their individual undesirable aspects. Mises considered the idea of such compromise as not feasible, ultimately calling ordo-liberalism "interventionism". Mises also argued that such interventionism would initiate an intervention spiral, in which initially the state makes certain interventions with the intention of limiting itself to them. But these interventions will soon lead to unpredictable consequences, which in turn require new, originally unintended interventions. These new interventions will continue, and if the limits of state intervention are not clearly fixed in a clear and sustainable way, at least in principle, if the state keeps intervening in the private sector's sphere in an unpredictable manner, the possibility of long-term calculation and sound management ceases. Criticising any interventionist approach, Bagus (2016) and Polleit (2018) both argue that it can be empirically proven that all states (also those which have historically been shaped by the

ideas of ordo-liberalism, social market economy or even the 'Chicago School') become larger and more powerful over time.

Polleit argues that ordo-liberals think that they could 'domesticate the state' - by imposing constitutional rules on it, assigning it clearly defined tasks and thus making it efficient, transparent and useful for good causes. However, this laudable aim seems unrealistic from a long-term perspective. Based on the findings of Rothbard (1970), and in line with Hoppe (2008) and Huerta de Soto (2005), Polleit (2018) states that, once established and given a certain legal power, the growth of public institutions and public interventionism will always naturally occur at the expense of civil and entrepreneurial freedoms. This is not at all an unfortunate coincidence – instead it is natural. Similarly, Hoppe (2006) argued that even a minimal state will sooner or later become a more and more interventionist coercive state. Especially small and well-organized interest groups effectively influence state legislation and regulation in their favour. Polleit (2018) and Hoppe (2006) say that in a social market economy, there are no fundamental barriers that could effectively put a stop to the state's interventionism. Due to the resulting corrupt system, everything and everyone would be politicized. As a result, all those who want to gain advantages through the state would go into the political business. Then, politics and major corporates will ultimately become one, and the resulting corrupt system would be based on bribing, in-transparency and lobbyism. Hoppe says that what the advocates of ordo-liberalism and the social market economy are promising – which is that the state 'protects and preserves the freedom of citizens and businesses, while securing prosperity' - is simply impossible. Hülsmann (1998), Huerta de Soto (2005), Hoppe (2006) and Polleit (2017, 2018) share Mises' view that any interventionist ideas are doomed to failure. Generally, interventionism in all its forms, including the social market economy, could never offer a coherent alternative. Thus, based on Mises (1940) and Rothbard (1970), the four mentioned economists claim that from an economic point of view, only a truly free market economy is a decent, permanently feasible economic and social order.

We argue that Eucken's concept would be an improvement versus the Keynesian approach which has shaped the monetary politics of the European Central Bank and the US Federal Reserve throughout the past years (Reimers, 2020a). Eucken's (1949, 1952) concept, even if not fully coherent, seems to provide a moral, legal and political framework which could minimize public coercion while improving individual liberties. Thus, at least from a short-term perspective, we conclude that his thoughts must be seen as a valuable first step to minimize the recent increase of public interventionism and Keynesian expansive monetary policies. However, in line with Hayek (1976) and Polleit (2018), the author of this thesis considers the overall concept of Eucken, particularly in regard to monetary policies, as partially contradictory and ultimately insufficient (Reimers, 2020a). It seems surprising that Eucken, who cared so much about the optimization of a competing market, did neither consider the abolition of central banks, nor the (consequent) denationalization of money. In line with Mises (1948), Hayek (1941, 1944) and Polleit (2018), we still consider Eucken's approach on monetary policies as insufficient and inconsistent. The long-term goal in regard to monetary policies must clearly be the abolition of all central banks. Throughout the past decades, and as seen during the subprime crisis in 2008, all major central banks in the Western world have proven to intensify market distortions (Huerta de Soto, 2009b).

Thus, we conclude that from a truly competition-oriented perspective, Hayek's (1944, 1976, 1979, 1990) ideas in general, but particularly on monetary policies, are clearly more ambitious, but also more coherent and rigorous than those of Eucken. From an anarcho-capitalist point of view, however, one could criticize that Hayek did not request a complete abolition of the state, as in his concept, the state would need to guarantee the legal framework for monetary arrangements (Reimers, 2019). Within these rules, all market participants would be allowed to develop the individual currencies which they consider as most suitable, while not questioning the general necessity of the state as such. Thus, even if the ordoliberal concept appears to be partially inconsistent and insufficient, we argue that an ordoliberal economic order would be a significant improvement versus the Keynesian expansive monetary and interventionist fiscal policies seen throughout the past decades. Even more importantly, we conclude that truly Austrian School ideas are likely to expand more easily in an ordoliberal politico-economic order, than within today's western social-democratic welfare states, in which 'social justice' and the 'fair redistribution of

wealth' have been considered as more relevant than economic freedom and entrepreneurial creativity. We do not expect that the abolition of all central banks and the 'de-nationalization' of money can be seen as realistic short-term goals. However, we claim that the expansive monetary policies of the recent decades could at least be minimized, if economists, journalists and politicians were willing to recognize the potential benefits of a more sustainable approach – including the benefits of market-driven deflation, compared to unsustainable inflationary policies (Reimers, 2019). Thus, in the following chapter we will analyse deflation as a potential alternative to the neo-classic myth of 'a need for inflation'.

5.4 Deflation: A Useful Alternative!?

Often 'the need for inflation' is simply justified by the 'necessity' to avoid deflation which itself is often considered to have destructive effects for any economy. By neo-classical economists, deflation is often compared to '*quicksand*' as it is argued that a deflationary downward spiral is extremely difficult to stop, as it quickly drags an economy into a long-term crisis. First of all, we need to understand what "deflation" really means. Most neo-classical economists consider deflation simply as "a general decrease in prices", whereas economists like Philipp Bagus (2014) and Jörg Guido Hülsmann (2008b) distinguish between a decrease of prices, called 'price deflation', and a reduction in money supply called 'monetary deflation'. While Keynes, Friedman and von Mises generally failed to see most of the beneficial effects of deflation, more recent economists dedicated more profound analyses to this topic.

As quoted by J.G. Hülsmann (2008b), price deflation can be caused by economic growth with increased production and higher supply of services and goods, often linked to technological advancements and lower production costs. Moreover, an increase of money demand within a free market with commodity money system would lead to deflation as the 'money's' purchasing power increases. This can, for example, be related to a (perceived) quality increase of the specific money or purely to speculation. In a rather interventionist system with fiat money, such deflation could also be achieved by decree or coercively, for example through confiscatory means (Bagus, 2014). Apart from looking at historic scenarios, we want to see which effects a potential upcoming deflation could have for the economy - and the automotive industry in particular.

It is often argued that falling prices hurt companies as deflation will lead to a decrease in sales, lower company turnovers and profits, consequently leading to a lay-off of employees. A similar argument, but from a consumer perspective, is that the pure expectation of falling prices will depress consumer demand and the economy in general.

In particular regarding certain final consumer products such as food products or motor fuel, this argumentation is seen as invalid, as there simply is a constant need for these goods and services which cannot be delayed for a significant amount of time.

Even in regard to high-technology products, the customer expectation of falling prices, caused by the constant, technologic advancements and introductions of improved new models, have not stopped these consumers from spending significant amounts on computers, mobile phones and similar goods. In this case, the universal law of time preference has certainly helped to assure strong sales, as most customers avoid to use a potentially outdated product. However, this aspect might not be equally relevant for other goods or sectors, in particular for high-priced goods which are on average only bought a very few times throughout a consumer's life time, such as real estate and automobiles.

In our research we have been looking at the automotive industry, which starts its manufacturing process at the early stages of production (as shown in the Hayekian Triangle), for which significant investments into capital goods are needed (Huerta de Soto, 1998; Garrison, 2001). In the European Union, the average holding period of vehicles by their first owner is approximately 6-7 years. Therefore, consumers may delay planned vehicle purchases by several years due to turbulent economic times, as seen during the financial crisis (the so-called 'real-estate bubble') in Spain in the period from 2008-2010. Moreover, we argue that at least in our current fiat money system, deflation will lead investors to rather invest in consumer goods/ the 'later stages of production, rather than into capital goods and the 'early stages of production'. Moreover, it is argued that the positive long-term effects of deflation could only be seen in a truly free market without fiat money, where it will ultimately help to restructure the economy. In particular the automotive market, with its current production over-capacities, could become more sustainable by the possible elimination of non-competitive, highly-indebted companies, leaving market space and resources to the more competitive and sustainable manufacturers.

Manufacturers need to initiate the purchasing process of commodities/ parts used for their vehicle production several years before the vehicle is fully produced and finally sold to the consumer. We may assume a total time frame of 3 years (in our example from 2020 to 2023) between the purchase of commodities and parts from suppliers up to the actual sale of the produced vehicle to the final customer. In case of a constant annual deflation of 2%, a commodity bought for 100€/kg in 2020, would only cost 94.1€/kg in 2023, when the vehicle is actually sold to the consumer. This alone does not need to be a crucial aspect for an OEM competitive position,

assuming that all competitors are equally affected. First of all, the produced vehicle will be 'a completely new good' whose 'value' cannot be directly linked to the individual costs of the separate commodities used to produce it. Secondly, all manufacturers always attempt to pass occurring costs to the customer and will even try to keep the vehicle sales price stable. By including additional features, e.g. new safety or technology features, new colours or accessories, vehicles can constantly be 're-launched' and 'personalized' making them more immune against deflation than it is the case for less sophisticated products. In this case, automotive OEMs' revenues might even increase relatively to the costs, if prices of the purchased commodities/ parts fall more significantly than prices of the OEMs' end products (vehicles). If all automotive OEMs are equally affected by these external factors, no manufacturer will have any competitive advantage or disadvantage. As stated by Rothbard (1963, p. 17): "*what matters for business is not the general behavior of prices, but the price differentials between selling prices and costs.*"

However, the major automotive OEMs do not only buy their parts/ commodities from many different suppliers which are located in different countries and currency zones. More importantly, even though most OEMs operate on a global level, they have significantly different market shares in the individual markets and currency zones. Thus, in a fiat money system, automotive OEMs mainly operating in markets with a long-term deflation will be affected differently to those OEMs mostly selling in markets with a low, stable inflation. If deflation is caused by technological progress and/ or a general increase of productivity, a corresponding reduction of production costs can make these markets more attractive as a manufacturing base. However, for the actual distribution of produced vehicles, we argue that long-term deflation may lead OEMs to pull volumes out of such deflation markets, shifting these units into markets with a (from a monetarist perspective) "stable" inflation. In other words, if an OEM purchases its commodities and parts in country A with an annual inflation rate of +2% and can choose between investing into a local distribution network to either sell these units in market B with an annual inflation rate of +2% or in market C with an annual deflation of 2% - we argue that (*ceteris paribus*) the OEM will rather choose country B. Consequently, in the current fiat money system split between individual 'fiat currency zones', deflation would cause a differential advantage between the individual global automotive manufacturers.

On the other hand, by shifting volume initially planned for market C into market B, the general vehicle supply in market C would decrease, possibly leading to a price stabilization in market C. Moreover, as Bagus (2014) argues, if consumers abstain from consumption for a longer period of time, the decreasing sales prices will urge manufacturers to optimize their processes, becoming more alert for market niches, while also mainly increasing efficiency by reducing unnecessary costs. This will urge OEMs to replace workers with machines in order to increase efficiency. This would lead to investments into the capital sector, creating employment in the capital goods sector. Consequently, companies are expected to focus even more on optimizing efficiency and competitiveness in times of deflation. However, the relative cost increase of raising a credit in times of deflation is an entrepreneurial challenge for this hypothesis which we will analyse at a later stage of this chapter.

Hülsmann (2008b) confirms that deflation will increase real savings, as people are likely to reduce consumption in certain sectors, expecting a further decrease of prices. As we learned by the Hayekian Triangle and capital-based macroeconomics, real savings are essential for a future sustainable economic growth. Thus, the increase of savings will ultimately lead to sustainable growth (Cochran, 2015).

Paul Krugman (2008) raises another aspect against deflation, mentioning the current 'stickiness' of labour costs in most industrialized countries, in particular in Western Europe. He continues that in an 'ideal world', based on a free market scenario, labour conditions and salaries of the employees could be regularly updated and adjusted, based on the company's operational result, inflationary compensations or salary adaptations due to deflation (Krugman, 2008).

However, in today's heavily regulated labour markets with significant government interventions and other powerful institutions such as unions and workers councils, salaries appear to be relatively sticky downwards. Thus, in particular in the automotive industry in which a significant number of workers is 'organized', being 'protected' by labour unions, salaries of employees with permanent contracts appear to be extremely sticky, showing a downward nominal wage rigidity.

Consequently, Krugman (2008) argues that renegotiating existing (permanent) contracts, with the aim of reducing previously agreed salaries, seems to be very challenging. Therefore, current rigid labour markets on the one hand, and the structure of most employment contracts on the other hand, appear to be a real challenge for corporates in times of long-term deflation, as most labour costs cannot be quickly harmonized and equalized with a potentially decreasing company turnover, caused by deflation.

Other costs which, at least from a short-term perspective, are even more fixed than employee salaries are debts. Creditors will receive payments with a higher purchasing power of money, while relative cost of a debt will increase for debtors during deflation. From a general economic perspective, the losses of the debtor are balanced by the profit of the creditors. This will lead to a re-distribution, but the general production potential of the economy will not be hampered. Thus, such redistribution will not have an impact on the overall economy (Hülsmann, 2008b). However, during deflation the relative debt burden of debtors will increase, if seen in relation to the expected negative evolution of the turnover. Both Keynesians (Keynes, 2012) and Monetarists (Friedman, 1969) argue that such increase of the relative debt burden will stop companies from investing into future projects as it will become more difficult to repay the debts (Krugman, 2008). As stated by Krugman (2008) and Irving Fisher (1933), the debtors are expected to be forced to cut their spending once their debt burden rises, while creditors are not likely to increase their spending by the same amount. Thus, deflation would exert a depressing effect on spending by raising debt burdens, leading to a vicious circle as rising real debt will lead to even less spending in the future, causing further deflation. This would have negative long-term effects on the economy as necessary investments e.g. into research or the purchase of new capital goods would possibly be postponed by companies which are speculating on a new inflation at a later stage.

As shown by the Capital Based Macroeconomics Theory (Garrison, 2001), *malinvestment* caused by artificially low interest rates creates long term challenges not only to the individual investing company, but to the overall economy. Such investments are unsustainable and would not have happened without the artificial credit expansion (Huerta de Soto, 1998). Similarly, a relative increase of the debt burden caused by deflation can be seen as a 'filter' which assures that the

amount of unsustainable investments will be minimized (Bagus, 2014; Hülsmann, 2008b). We conclude that, even if the increase of the relative debt burden and a possible decrease in profit due to reduced sales volumes might lead to the bankruptcy of some automotive OEMs, this is not expected to have a negative long-term impact on the overall economy. It is likely to be the least competitive OEMs with unsustainable structures, to suffer in times of deflation.

As indicated, bankruptcies of uncompetitive companies play an important and positive role in a functioning free market, as they shift the control of resources and factors of production to those competitors which are most capable of using them to satisfy consumer needs (Rothbard, 1962; Kirzner, 1963). Overall, there will not be a change in the economy's productive capacity in the long term. Bagus (2014) and Rothbard (1962) agree that a natural deflation process can have a positive impact on an economy, helping to restructure it in order to become more efficient and sustainable. Not surprisingly, mainly those market participants that expect to make significant (disproportionate) losses in times of deflation are the ones that most strongly defend a constant inflation – even if it is caused by an unsustainable growth of the money supply. Generally speaking, it is mainly banking institutions, governments and highly indebted companies which benefit from inflation - also due to the previously explained Cantillon Effect (Cantillon, 1755). Bagus (2014) insists that price deflation is not a general economic problem, as falling prices only lead to redistribution. For the automotive industry, a long-term price deflation would cause several challenges but could help to restructure the sector, to become more efficient. If the long-term deflation within a certain market is related to a productivity increase and a corresponding reduction in production costs, then the market's competitiveness as a manufacturing location is (*ceteris paribus*) likely to increase. However, we had already indicated our position that, in regard to further investments into local sales and distribution networks, exporting companies are likely to focus on markets with (from a monetarist perspective) moderate inflation.

We argue that the recent production overcapacities in the automotive sector mainly exist because several uncompetitive, highly-indebted OEMs have artificially been kept alive by (government subsidies and) ultra-loose monetary policies. We indicated different forms of monetary and fiscal policies which kept automotive OEMs such as General Motors and Chrysler alive. Within the first

decade of the twentyfirst century, the reduction of the rate of interest by the US Federal Reserve, scrappage campaigns as well as bailouts for both mentioned OEMs significantly distorted the US-American automotive industry. Such interventions prevented the market from naturally adjusting to the actual market demand. We argue that without the discussed public interventions, the General Motors corporation would have failed, while its competitive business areas would have been taken-over by other companies. Also in several European countries, similar public interventions had protected local OEMs such as Groupe PSA (Peugeot Société Anonyme) in France, Fiat S.p.A. in Italy as well as Seat S.A. in Spain. These interventions hampered the needed market adjustment process. We argue that in a truly free market, resources would be allocated in a much more efficient way. Thus, customer demand is best taken care of when governments do not interfere in the market process.

After the elimination of non-competitive companies, it would be possible for sound competitors to fill the created gap. Thus, falling prices in a free market, potentially caused by economic growth, do not cause a threat to the general economy (Hülsmann, 2008b). It should be pointed out that in a truly free market, price deflation would be a natural process during economic growth caused by more efficient production processes with technological advancements (Bagus, 2014). Rothbard (1962, 1963) stated that the only economically truly harmful deflation is compulsory monetary contraction by the government. The global economy has seen a significant increase in productivity throughout the past decades, not only in developing countries but also in Western economies. Only the constant increase of money supply within the fiat money system has prevented the natural occurrence of a price deflationary period throughout the past decades.

5.5 Proposed Mid-Term Solutions on Monetary Policies

Central banks such as the ECB and the Federal Reserve need to pursue a much 'stricter' monetary policy to avoid artificial booms caused by credit expansion and maturity mismatching. Alonso, Bagus and Rallo (2012) suggest that central banks should only buy securities of very high quality, restricting the range of acceptable collateral to short-term high-quality assets. In line with Huerta de Soto (1998), Hülsmann (2008) and Garrison (2001), we conclude that an exaggerated expansion of credits and money supply must be avoided as this will prevent credit contractions, and shall keep banks from believing that they can continuously expand credit, while not being responsible for their own debts and mismanagement.

Moreover, we propose that central banks should only lend to the banking system at a penalty interest rate (never at extremely low interest rates), or may alternative buy assets only at penalty prices. By applying these penalties, central banks would disincentive maturity mismatching and credit expansions. Such 'pragmatic approaches' on how to optimize monetary policies within the current monetary system, by (temporarily) accepting the government's current monopoly on money production and the existence of central banks, may appear as an unsatisfying compromise, as a 'monetarism with an Austrian twist'. However, economic policies which minimize ultra-loose monetary policies and credit expansions, and which are based on solid fiscal policies to minimize public interventions must be seen as a significant improvement versus the Keynesian monetary and fiscal policies seen in Europe throughout the past decades.

In line with Huerta de Soto (1998), we argue that central banks must become more independent from governments and other public institutions, focusing on a qualitative improvement of their actions, not creating "moral hazards", and not rescuing uncompetitive companies (with the taxpayers' money) for being considered as "too big to fail". Thus, there must not be any further bail-out programs - neither for banks nor for other companies or financial institutions. We agree with Huerta de Soto (2009b), Ikenson (2001), Salerno (2015) and McMaken (2018) that defining certain corporates, such as banks and automotive OEMs, as being 'too big to fail', in order to then

justify government interventions to protect them with the official aim ‘to protect jobs’, must be entirely stopped.

Annually, the Financial Stability Board (FSB) releases a list of “global systemically important” financial companies, Citigroup, JP Morgan Chase, Bank of America, BNP Paribas, Deutsche Bank, HSBC, Barclays, Credit Suisse and Goldman Sachs. One may assume that under the current structure, all of these corporates could count on public support in a new financial crisis. But as stated, during the 2007-2010 financial crisis, also several industrial corporations including automotive manufacturers were saved by governments. For the future, the free market should decide on any company’s relevance, competitiveness and ‘right to exist’ within the market. It cannot be justified, neither economically nor morally, that major corporates only survived thanks to bailout programs and other public supports, as this ultimately led to the situation that unprofitable and uncompetitive companies were able to ‘socialize their losses’

The crucial impact of the rate of interest, the heterogeneity of capital and the existence of the different stages of production as well as a general rejection of any ‘too big to fail bailouts’ must carefully be considered for the definition of a realistic, but better future monetary policy concept.

5.6 Long-Term Target: Towards the Denationalization of Money via a Spontaneous Order

Ultimately, the legal privileges of central banks and monetary authorities should be abolished. In line with Hayek (1976), we argue that there is no rationale for preventing consumers from using the monies and money substitutes which they consider as best. Hayek (1944, 1948, 1976, 1990) made several crucial contributions to economics and social thought. However, if one specific concept had to be identified which had a significant impact, not only on Austrian school

economists and libertarian philosophers, but also on mainstream academia, one would probably have to name the 'spontaneous order'. (Sandefur, 2009) It is usually Hayek who is associated with the 'revival' of the term 'spontaneous order', for giving it its name and for thoroughly developing its conceptual structure (Bladel, 2006). It was Hayek's study of the Scottish Enlightenment philosophers and other liberal and Austrian-school thinkers, including Carl Menger, and von Mises, as well as the context of the socialist calculation debate, which led him to further investigate on the topic. Hayek warned in his 'The Road to Serfdom' (1944) of the threat of tyranny resulting from government control of economic decision-making through central planning. Hayek points out that the 'moral' institutions of free market capitalism, such as private property and contracts, represent the natural result of a proper evolutionary process. Hayek states that humanity, without central planning and without any conscious central designing, naturally and gradually moved towards capitalism since it represents the most efficient order (1991).

Moreover, Hayek said that the market process is mainly a process in which participants discover relevant information. The economy is seen as a mechanism which generates and distributes knowledge, characterizing economics as the study on the utilization of knowledge in society. Thus, the economic problem of society is not a problem of how to allocate given resources, but a problem of utilization of knowledge which is not given to anyone in its totality. Consequently, Hayek's spontaneous order is a concept of unplanned social order, generated unconsciously by goal-oriented individual action, stating that these self-organizing social phenomena are transmitting more relevant information than any centrally steered, conscious design. A minimized intervention of government must be assured, as otherwise not only individual liberties, but also cultural evolution are threatened, since freedom, liberalism and cultural evolution are closely connected (Reimers, 2019). Hayek states that spontaneous order promotes cooperation, enabling individuals to coordinate their actions e.g. via market prices, and cultural rules. His crucial point is that civilization as such depends on "the extended order of human cooperation". The importance of the extended order is stated by Hayek when he argues that "*...our civilization depends, not only for its origin but also for its preservation, on what can be precisely described only as the extended order of human cooperation, an order more commonly, if somewhat misleadingly, known as capitalism*" (Hayek, 1990, p. 6). The extended order of human cooperation

plays a central role in Hayek's beliefs, which need to be understood and respected, to maximize prosperity and freedom of mankind. Hayek defines the "extended order" as a society based on a voluntary exchange within a free market, with limited government, property rights, and the Rule of Law. The extended order can be seen as a species of the "spontaneous order" process, being the result of human action but not of human design.

Like morality, law, language and biological organisms, also monetary institutions result from spontaneous order. Financial institutions can be seen as some of the most abstract institutions of an advanced civilisation, on which trade heavily depends, the moment barter is replaced by indirect exchange mediated by money. Under government control, the current monetary system has become more complex and more artificial, not being driven by true offer and demand.

As Hayek argued, the spontaneous order is a dynamic discovery process, in which people can experiment with new social mores, or new laws, just as they might with new technologies. Consequently, all major aspects which have shaped most civilizations throughout decades or centuries were caused by the spontaneous order process (Hayek, 1990). Based on this concept, the existence of central banks and their influence on interest rate and money supply can only be harmful - and the central banks' complete elimination must therefore be a logic step. We agree with Hayek (1976, 1990) and conclude that the entire privatisation of the current (monopolistic) state-issued money must be the ultimate targeted. Such privatisation will ensure that the money supply is under the control of business enterprises which will only make constant, long-term profits when providing a stable, trustworthy and therefore competitive currency in the market place.

6 Conclusions on our Research Objectives

„Sapere aude! - Habe den Mut, dich deines eigenen Verstandes zu bedienen!“

(English: “Dare to think. Have the courage to use your own mind!”)

Kant, I. (1784, p. 483)

Throughout Chapter 4 of this thesis, we evaluated the impact of expansive monetary policies and different forms of public interventions on the automotive market in the period from 2001 to 2018. We looked particularly at the impact of an excessive growth in bank credit, as well as of public interventions such as company bail-outs, scrappage campaigns, and public incentives for alternative fuel vehicles (AFVs). Accordingly, we used political and economic theory on monetary and fiscal policies, paying particular attention to the Austrian Business Cycle Theory and its differences versus the concepts of Keynesians and monetarists.

We want to summarize our findings to respond to our main research question of this thesis: *‘How did monetary and fiscal policies influence the sales evolution of automotive OEMs in the USA and Europe within the years 2001 to 2018, analyzing the impact of credit expansions caused by central banks as well as by evaluating the impact of fiscal policies such as scrappage campaigns and public incentives for alternative fuel vehicles?’*

In Chapter 5, we then evaluated potential alternatives to the rather expansive monetary policies and interventionist fiscal policies used in most western countries throughout the past decades.

6.1 Review of our Research Targets & Used Methodology

In Chapter 1 of this thesis, we had defined 5 main research objectives, on which a thorough analysis was done throughout Chapter 4. These five research objectives were:

Table N° 19: Review of Research Objectives

N°	Research Objectives
1	Definition of the impact of expansive monetary policies on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.
2	Analysis of the impact of artificially low interest rates (below the ‘natural rate of interest’) on the automotive sales evolution in Europe and the USA in the period from 2001 to 2008.
3	Evaluation of the impact of so-called ‘scrappage campaigns’ on the automotive sales evolution in Europe and the USA in the period from 2009 to 2012.
4	Evaluation of the impact and effectiveness of public incentives for AFVs on the vehicle sales evolution in Europe in the period from 2010 to 2018.
5	Critical evaluation of the sustainability and market competitiveness of the AFV technology without public incentives.

(Author’s own design)

The aim of this thesis is to enrich economic theory with new findings on the discussed research objectives. We argue that, this thesis is unique in providing a comprehensive elaboration on the impact of expansive monetary policies and public interventionism on the automotive industry from an Austrian School approach. Accordingly, we feel confident to say that this thesis fills a research gap, as we have not found any further publications which provide such in-depth analysis of the main research questions from an Austrian School perspective. Consequently, no other academic research provides such a comprehensive illustration of historic data on the automotive industry in line with a theoretical framework based on praxeology, methodological dualism and deduction (Mises, 1940, 1957). Thus, this thesis should also provide decision makers within the automotive

sector with a detailed analysis of our main research question from an Austrian School perspective, enabling them to learn from previous mistakes to properly prepare for the future.

Moreover, no academic paper found provides such a detailed analysis of the impact of monetary and fiscal policies on the automotive industry, by openly applying a specific ethical theory. Accordingly, this study is based on the ethical concept of the non-aggression principle (Rand, 1964) and the benefits of human cooperation in a free society (Mises, 1912, 1940, 1957; Hayek, 1939, 1944), which clearly differentiates it from purely empiric market research (generally based on cross-sectional time-series analysis and triangulation) and the concepts provided by mainstream economics.

In this Chapter we want to summarize our findings, linking them precisely to the mentioned research objectives. Useful literature included recent academic papers as well as classical writings on economic theory, and economic policy, focusing on selected schools of economic thought, such as the Austrian School economics, Keynesian economics and the so-called Chicago school. Moreover, we used specific technical literature on the automotive industry, including automotive market analyses, AFV sales reports and related case studies, while also considering economic theory on negative externalities, public incentives and public finance.

6.1.1 Methodology & Empirical Illustrations

As well-explained in Chapter 3, our methodological approach is based on methodological dualism, Praxeology, and deduction (Mises, 1940, 1957; Rothbard, 1957; Hoppe, 1983, 1995). We used Praxeology, the science of human action, for our methodology and theoretical approach which is based on the axiom that human beings exist and act (Mises, 1940, 1957). Based on the findings of Mises (1940, 1957), we distinguished between theory and history, using deduction to obtain

propositions which are true *a priori*. In line with a proper use of methodological dualism (Hoppe, 1983, 1995), we used empiric data only to illustrate the validity of our theory in regard to the analyzed topic and specific period of time. We were able to prove that the causes and symptoms of the financial crisis in the first decade of the 21st century can perfectly be illustrated by the Austrian Business Cycle Theory, as defined by Mises (1912, 1934, 1940), Hayek (1931, 1939, 1941), Huerta de Soto (1998) and Garrison (2001). The used empiric data illustrated how expansive monetary policies caused the corresponding boom-and-bust cycle. Moreover, based on the findings of Ikenson (2011), McMaken (2018), Salerno (2015) and Schnabl (2011, 2015), we demonstrated that both, the European as well as the US-American automotive industry were heavily affected by the economic crisis. Moreover, we argue that automotive OEMs themselves intensified the seen economic crisis, due to endogenous factors, such as in-house principal-agent problems, and other reasons for mismanagement and *malinvestments*. Thus, automotive OEMs were not only the ‘mised victims’ of public interventionism and expansive monetary policies, but often, their own mismanagement led to a misallocation of resources with harmful effects on the entire economy. Quantitative research with historic data can only takes a ‘snapshot’ of a phenomenon, considering and illustrating variables at a specific moment in time with a specific sample. Accordingly, our shown empiric analyses were only used to illustrate our findings, while our key research objectives were directly linked to the mentioned praxeologic *a priori* presumptions.

6.1.2 Analyzed Propositions for a *Priori* Truths

The following propositions were defined as *a priori* truths:

1. Fiat money, being typically created through bank circulation credit, causes economically detrimental effects on the economy, causing capital consumption and *malinvestment*.

2. A decrease in the market interest rate 'below the natural interest rate'⁶ caused by expansive monetary policies of central banks stimulates entrepreneurs to misallocate resources, leading to market distortions and an unsustainable boom.
3. Fiscal policies distort the free market process (e.g. by implementing public incentives for some market players while hampering others), and will lead to unsustainable misallocations, ultimately lowering people's average standard of living, hampering free entrepreneurship and free consumer choice.

We defined our key research objectives according to the above-mentioned *a priori* presumptions. On the following pages we will properly indicate our findings on the mentioned key research objectives, and by doing so we validate the indicated *a priori* truths.

6.2 Findings on Expansive Monetary Policies

Our first key research objective was to define the impact of expansive monetary policies on the automotive sector in Europe and the USA in the period from 2001 to 2008.

In Chapter 4 we initially explained the general effects of monetary policies on the economy, comparing the different business cycle concepts of Keynesianism, Monetarism and the Austrian school of economics. To do so, we evaluated the monetarist concepts of Milton Friedman (1953, 1961, 1962, 1969), as well as Keynes' (1923, 1936, 2012) ideas on monetary policies, business cycles and fiscal stimulus packages, including his equilibrium & circular flow-framework. However, based on the stated findings of Mises (1912, 1934), Hayek (1932, 1939, 1941), Huerta de Soto (1998) and Hülsmann (1998, 2008), specific attention was paid to the Austrian Business Cycle

⁶ Based on Garrison (2001), we define the 'natural rate of interest' as the rate which reflects the time preferences of market participants, to allocate resources among the temporally defined stages of production and therefore being consistent with a natural growth

Theory (ABCT) and its 'outgrow' the capital-based macroeconomics with its analysis of the production possibilities frontier, the loanable-funds market, the structure of production and the stage specific labor market analysis (Garrison, 2001). All major economists of the Austrian School of economics, such as Hayek (1932, 1940), Mises (1912, 1940), Rothbard (1962), Huerta de Soto (1998, 2005) and Hülsmann (1998) have proven that the combination of a fiat money system and public interventionism into the economic process is inefficient, causing misallocations of resources and consequently distortions in the economy. Based on these findings, we consider the Fiat money system as unsustainable, amoral and in some aspects potentially illegal. Mises (1934) stated that fractional-reserve banking is the root cause of business cycles. We support his conclusion that a fiat currency system with uncovered money titles reduces the interest rate in the credit market below its natural level, that is, below the level it would have reached in the absence of public interventionism. We conclude that the ABCT, which considers the different stages of production, is significantly more precise and pragmatic than the well-known neo-classical business-cycle concepts of Keynes (1923, 1936) and Friedman (1953, 1961, 1969) which ignore the heterogeneous and multi-specific structure of capital. Accordingly, based on Huerta de Soto (1998, 2009b) and Garrison (2001), we elaborated on the temporal pattern of heterogeneous capital goods and the different stages of production which can act very differently to the injection of new monetary units by central banks. This knowledge is particularly relevant to evaluate the evolution of the automotive industry, which requires the production of capital goods, depending on the earliest stages of production such as the transformation of iron ore to iron to then produce steel. We indicated that during the financial crisis at the beginning of the 21st century, also the automotive industry particularly suffered from the long-term effects of market distortions caused by ultra-loose monetary policies and artificial credit expansions (Salerno, 2015).

Based on the findings of Huerta de Soto (1998) and Garrison (2001) that expansive monetary policies and artificially low interest rates must inevitably lead to harmful market distortions, we referred to the causes and effects of the financial crisis/ 'subprime' crisis in the USA and Europe. Based on Bagus *et al.* (2012), Huerta de Soto (2009b), Ravier (2011) and Thornton (2009), we

argue that the credit expansion which led to the global financial crisis, visible in the period from 2008-2010, can be seen as a *prime example* of malinvestment. As explained by Bagus *et al.* (2012) and Huerta de Soto (2009b), the ECB played a central role in maintaining interest rates at an extremely low level, while causing an artificially high money supply within the European Monetary Union (EMU), further intensifying the worldwide credit bubble which had been initiated by the US-American FED. In 2001, the US Federal Reserve significantly expanded its M2 money supply while simultaneously cutting the federal-funds rate, from 6.25% at the beginning of 2001 to 1% in 2005. Two business areas which had been most significantly impacted by this unsustainable growth were the housing sector and the automotive industry, which consequently suffered from the following economic bust phase, in which certain OEMs such as General Motors had to file for bankruptcy, also requesting public bailouts (Ikenson, 2011; Salerno, 2015). Accordingly, we illustrated how low interest rates stimulate investments in the early stages of production, e.g. construction works/ housing and the automotive industry and how these policies tend to cause boom-and-bust cycles (Garrison, 2001). Particularly the US-American and the Spanish economy and their automotive industries were heavily affected by the mentioned crisis. Until 2004, requested loans for vehicle purchases significantly increased due to the significant reduction of the market's rate of interest. Simultaneously, minimized borrowing costs allowed automotive dealers to increase their vehicle sales, as buyers were willing to purchase vehicles via financing schemes (McMaken, 2018). The automotive sales boom at the beginning of the 21st century throughout the years of expansive monetary policies was soon followed by a dramatic reduction of automotive sales during the subprime crisis. The USA's recession caused by this financial crisis made auto sales plummet to levels not seen since 1994. To be more precise, in 2009, the annual automotive sales in the US market decreased to 9.5 million units, coming from a peak of 16.5 million in 2006. Simultaneously, the corresponding lack of credit available to potential car buyers during the peak of the crisis hampered car sales even more (Ramseyer *et al.*, 2011). However, quickly after the peak of the subprime crisis, the US Federal Reserve's focused on quantitative easing schemes, prolonging the era of cheap debt. Consequently, due to new expansionary monetary policies and particularly due to fiscal stimulus packages, automotive sales recovered again at a speed which would have been rather unlikely without mentioned

interventionism (Ikenson, 2011; McMaken, 2018; Salerno, 2015). We must also not ignore the number of consumers which were not able to pay their loans throughout the crisis of 2008-2009. Particularly consumers which had purchased their vehicles between 2005 to 2007, using financing schemes with running periods of 3-4 years (or more) often had difficulties in paying their loans when being professionally affected by the economic crisis (McMaken, 2018). Correspondingly, we could confirm two key hypotheses raised in Chapter 1 of this thesis: On the one hand, we confirmed the theoretical findings of Hayek (1941), Huerta de Soto (1998) and Alonso Neira *et al.* (2013), that expansionary monetary policies, such as an increase in money supply and unsustainable credit expansions, led to a distortion of the market process. Moreover, we confirmed that expansionary monetary policies in combination with an increase of credit supply (which is not backed by previous savings), led to an unnatural growth of the automotive market in the period from 2001 to 2007. Our findings fully support our first proposition for an *a priori* truth, which is: *'Fiat money, being typically created through bank circulation credit, causes economically detrimental effects on the economy, causing capital consumption and malinvestment.'*

However, two other aspects must also be highlighted: First of all, we need to highlight the impact of a devaluated currency on the price competitiveness of those goods produced within the corresponding currency territory. To understand the impact of expansive monetary policies on the price competitiveness of different models, we also evaluated data by the World Economic Forum (2011) on the vehicle sales evolution in different markets, such as the USA, Japan and the countries of the Euro currency zone (Schnabl *et al.*, 2016). In Japan, the central bank's expansive monetary policy optimized the competitiveness of local automotive OEMs such as Toyota, which produce a significant amount of vehicles in their Japanese factories in order to then export these units. The corresponding monetary inflation led to an increased competitiveness of Japanese vehicles abroad, since the (manipulated) exchange rates facilitated the Japanese export business. In 2011, Japanese automobile exports amounted to USD 150 billion, while imports only reached USD 17 billion. Accordingly, Schnabl (2016) argued that Japanese automotive OEMs would have been less competitive, if the Japanese monetary policy had been more restrictive throughout the past decades. Also in the USA, the expansive monetary policies by the US Fed led to a devaluation of the US-Dollar, helping to protect automotive producers within the US

market, giving them an artificial competitive advantage. The 'Euro-zone' is divided between export-oriented markets such as Germany, and other countries which are depending on imports, often without relevant local automotive production. German ambassadors of the Euro-currency argue that vehicles 'made in Germany' have seen a significant increase in competitiveness since the introduction of the Euro currency. The Euro, in combination with a generally expansive monetary policy of the ECB, optimized the international price competitiveness of goods produced in Germany. Simultaneously, Schnabl *et al.* (2016) argued that the ultra-loose monetary policy of the ECB has helped to export vehicles produced in the Euro-Zone to markets outside that monetary union due to the caused depreciation of currency. However, similar expansive monetary policies have been implemented by most central banks worldwide, for which a general monetary inflation was seen in most major markets.

Secondly, we also want to refer to the internal entrepreneurial mistakes made on OEM level, for which neither governments nor central banks can be blamed. Accordingly, although Lind *et al.* (2012) explained that the financial crisis had major effects on the automotive industry, in fact, the industry had already faced profitability problems before 2008. Thus, already before the start of the economic crisis, several automotive OEMs such as General Motors and Ford had suffered from internal structural and financial problems, often caused by harmful internal management decisions (Ikenson, 2011; McMaken, 2018; Salerno, 2015). In 2007, General Motors and Chrysler had made significant losses, with General Motors alone losing almost \$40 billion in 2007 (Cole *et al.*, 2008; Ramseyer *et al.*, 2011). Thus, we concluded that the mentioned automakers' problems had built up over years, as particularly GM and Chrysler had already been in weak financial condition and with limited competitiveness versus most of their foreign challenger brands before 2008. However, we also need to conclude that the economic crisis of 2008, caused by monetary and fiscal policies, led to 'the final bust' within the automotive sector, the so-called '*straw that broke the camel's back*'.

6.3 Findings on the Impact of Interest Rates

Our second research objective was to detect the impact of artificially low interest rates (below the so-called 'natural rate of interest') on automotive sales in Europe and the USA in the period from 2001 to 2008.

Based on our findings in Chapter 4, we conclude that Keynesianism has been the by far most influential economic school of thought throughout the past decades. Thus, it has shaped the monetary and fiscal policies that led to the boom-and-bust cycles seen throughout the past decades. Keynes (1936) argued that economic bubbles mainly exist because of psychological instabilities within the economy, not because of coercive public interventions and corresponding misallocations of resources. Thus, Keynesianism supports countercyclical policies of the government, to provide monetary and fiscal incentives to the market in order to stabilize the business cycle (Keynes, 1936; Garrison, 2001).

Hayek (1944, 1990) explored how the theories of Keynes (1923, 1936) are amoral, criticizing Keynes for being opportunistic and short-sighted and for Keynes' famous quote that the "*long run is a misleading guide to current affairs. In the long run we are all dead*" (Keynes, 1923, p.80). Contrary to Keynes, the Austrian School economists Huerta de Soto (2009b) and Hülsmann (2008) argue that in recent boom-and-bust cycles, the artificial economic boom before the corresponding bust has been the actual problem. Throughout this period of (artificial) economic growth, resources are being misallocated and ultimately, due to the unsustainable allocation of resources, this bubble must come to an end.

Based on Hayek (1931, 1941), we showed that credit expansion caused by an increase in money supply, leads to an artificial growth of the early stages of production (e.g. the automotive industry), which to a high degree needs to be seen as mal-investment. The ABC theory argues that, if central banks make loans or purchase government bonds from banks, this action causes an injection of bank reserves into the economy. Banks then have excess reserves which they can loan, but the excess of loanable funds also urges the banks to either reduce the charged interest rate or the credit quality requirements of borrowers, or both. This leads to increased borrowing

and investing, particularly in those sectors where the return on investment is expected after a rather long period of time. When central banks drive the market rate of interest below the natural rate of interest, market participants rather refrain from saving assets, as the interest income from savings is likely to be lower than the expected benefits from investing. Based on analyses by Nicolás Cachanosky and Peter Lewin, the EVA (economic value added) framework and financial concepts like 'duration to business cycles' helped to indicate that monetary policies change the relative present value of investment projects (Cachanosky & Lewin, 2016). Cross Correlations based on James P. Keeler was used to illustrate former correlations between money supply, interest rates and the stages of productions (Keeler, 2001), and based on Luther & Cohen (2015) a structural vector auto regression (VAR) is used to estimate changes in the structure of production. We presented these empiric results to illustrate the validity of our theory for the analyzed period in regard to a strong correlation between money supply, interest rates and the stages of productions. In line with Huerta de Soto (2009b) and Alonso Neira *et al.* (2011), we conclude that the analysed boom-and-bust cycle was caused by expansionary monetary policies of the central banks involved, which further distorted the market by lowering the market rate of interest below the natural rate of interest. This additional credit flow stimulated investments into projects which had previously seemed unprofitable, creating unsustainable *malinvestments* (Alonso Neira *et al.*, 2013).

In modern economies production, processes are often rather complex and lengthy in terms of time, incorporating a range of interrelated stages (Rothbard, 1962). Garrison (2001) followed-up on the findings of Hayek (1932, 1941), using Hayek's model of a structure of production which extends from earlier stages to later stages, with different specific types of capital for these different stages. The price system, as well as profit and loss accounting, guide the production activities through time, allowing the economic actors to focus on those investments which seem economically viable (Hayek, 1931; Kirzner, 1963; Boettke, 2001). Huerta de Soto (1998, 2009b) explains that the production process of a car requires different stages of investment, ranging from the most remote (mining iron ore) to the most immediate (the car dealership). As the entire process of producing a car takes several years, consisting of a multitude of productive stages, we may use the industry sector analyzed in this thesis as a perfect example: This process starts by

defining the general concept of the vehicle (the stage furthest from final consumption), leading to the definition of its design, as well as the selection and ordering of the corresponding materials from automotive suppliers (Huerta de Soto, 1998). In further phases, the actual production of all parts, accessories and of the engine starts, leading to the actual production and assembling of the final vehicle. Late stages include the final steps, the distribution, and ultimately putting the final item out for sale. Thus, the production of each vehicle requires a sophisticated process of production which takes several years, and numerous stages (Huerta de Soto, 2006). Blackman and Holland (2006) described these stages even in further detail, arguing that in the automotive industry, the supply chain process starts with gaining and refining the required raw materials, such as oil and iron ore, followed by refined raw materials and primary manufacturing such as plastics, rubber, steel and metal. In the third phase, goods produced by component manufacturers are shown, such as metal components, as well as electronics. At a later stage, the actual car assembly is then done on car manufacturer level. The values of all producer goods at the stages of production derive from the value consumers place on the final consumer good. Several production plans align goods at these different stages of production into a capital structure which ultimately leads to the production of the final good (Garrison, 2001; Boettke, 2012). In the recession of 2001, the Federal Reserve had notably increased the M2 money supply, while simultaneously cutting the federal-funds rate, from 6.25% at the beginning of 2001 to only 1.75% at the end of the same year (Shostak, 2003). Within the period from 2003 to 2005, the rate was kept at a historic low of only 1%, resulting in a negative real interest rate, as the nominal interest rate was lower than the inflation (Ferrara, 2011). Thus, the expansionary monetary policies and particularly the artificially low interest rates implemented by the US Fed had stimulated investment activities in the early stages (Huerta de Soto, 2009b).

Thus, we can fully support the claim of our second *a priori* truth: *'A decrease in the market interest rate (below the natural interest rate) caused by expansive monetary policies of central banks stimulates entrepreneurs to misallocate resources, leading to market distortions and an unsustainable boom.'*

6.4 Findings on Fiscal Policies, such as Scrappage Campaigns

Throughout Chapter 4, we identified how monetary and fiscal policies generally influenced the sales evolution of automotive OEMs in the USA and Europe within the years 2001 to 2018.

The third out of five main research objectives was to evaluate the impact of so-called 'scrappage campaigns' on the automotive sales evolution in Europe and the USA in the period from 2009 to 2012.

Keynesianism has shaped monetary and fiscal policies in most western countries throughout the past decades. And from a Keynesian perspective, the consumption function is an essential component of successful economic policies. Keynes assumed that a collapse of investment activities is the main cause of economic downturns. Consequently, Keynes supported countercyclical fiscal and monetary policies and ultimately asked for a "comprehensive socialization of investment" (Keynes, 1923, 1936). Keynes urged to 'proactively stimulate the economy', initiating centrally steered projects, led by central banks and/ or governments, including deficit spending, and other fiscal and monetary stimulations (Keynes, 1936; Garrison, 2001). The Keynesian concept provided the academic and moral justification for the ultra-loose monetary policies and governmental interventions we have seen in the past decades (Huerta de Soto, 2009b, 2009c). Thus, it is crucial to understand his theoretical background to perceive the origins of the recent financial crisis. We examined the impact of fiscal measures implemented by several western national governments after the outbreak of the financial crisis at the beginning of the 21st century. Public interventions include fiscal policies aimed at either increasing or reducing the market potential of certain goods, services or entire business sectors (Mises, 1949; Rothbard, 1970). Thus, a main research objective was to evaluate the impact of so-called 'scrappage campaigns' on the automotive sales evolution in Europe and the USA in the period from 2009 to 2012. The financial crisis of 2007-2009 had led to a significant drop in global vehicle sales, for which governments of several countries implemented different public incentives, such as the mentioned vehicle scrappage programs, to revitalize the automotive sector (Köhler *et al.*, 2015). Public support for OEMs by providing public incentives or even by offering public bailout packages, differed between the individual countries, but the official purpose of these public interventions has

generally been to ‘stabilize the economy while protecting workers’ (Ikenson, 2011; McMaken, 2018; Salerno, 2015). From a Keynesian perspective, the discussed scrappage programs were required to avoid a liquidity trap in times of economic depression. Accordingly, we analyzed fiscal stimulus packages such as the scrappage campaigns, implemented in the peak of the financial crisis to avoid a wave of bankruptcies and lay-offs in the automotive sector (Ikenson, 2011; McMaken, 2018; Salerno, 2015). For this topic, we thoroughly analysed literature on economic freedom and public interventionism, ideally with a direct connection to the automotive industry and the mentioned time period. Mian and Sufi (2012) concluded that explained scrappage programs were only able to pull purchases forward – at a high additional cost, and without leading to any additional sales. The positive effect during the scrappage campaign was directly reversed in the following months when significantly fewer cars were sold. Moreover, particularly in the USA, the monetary inflation which was necessary to finance the scrappage scheme raised the general price level.

We can conclude that the incentivized anticipation of vehicle purchases by consumers led to an unsustainable market distortion. Moreover, these substitution effects were only analysed within the car industry itself, without considering any potential effects on other industries. Thus, even if scrappage programs provoked a relevant rise in the purchase of new vehicles, such rise in consumption is likely to occur with a simultaneous reduction in the consumption of other types of goods (Jiménez *et al.*, 2011).

Based on Mises (1951), Rothbard (1970), Huerta de Soto (2009a, 2009b), Ikenson (2011), McMaken (2018), Salerno (2015) and Schnabl (2011, 2015), we argue that any form of protectionism, including subsidies and public incentives, distorts the market process, ultimately leading to a misallocation of resources. The free market creates the optimum social conditions for all market participants, operating to the benefits of all economic agents (Mises, 1940; Nozick, 1974; Rand, 1964). Kirzner (1963, 1973) emphasizes on the entrepreneur’s role in reallocating resources which had been misallocated, for which a free market itself would tend to correct misallocations of resources. It is a key role of the corporate capitalist to cover his entrepreneurial function by guiding the processes of production towards the desires of consumers (Krause, 2004; Garrison, 2001). A free market would assure that all resources are best allocated to satisfy the

wishes of consumers (Huerta de Soto, 2005; Benegas Lynch, 2011). However, we must acknowledge that at the beginning of the 21st century, the politico-economic systems in the USA and Europe can by no means be considered as truly 'capitalist'. Thus, entrepreneurial concepts and processes which could apply in a truly free market, may not be appropriate in today's politico-economic system which is shaped by expansionary monetary policies and interventionist fiscal policies. With regard to subsidies, we fully agree with Hazlitt (1946) and Rothbard (1970) that these interventions lead to a harmful market distortion. In line with Huerta de Soto (2006, 2009a), Hülsmann (1998) and Rothbard (1962), we argue that subsidies artificially extend the life of uncompetitive companies while distorting the market by not satisfying the actual consumer wants. As we learned from M. Polanyi (1948) and Hayek (1944, 1979, 1990), no public institution can effectively bundle all the relevant information available on the market place to 'steer' the market more efficiently than what could be achieved within a spontaneous order (Reimers, 2020b). We argue that less public interventionism would also allow the automotive sector to develop more freely, assuring that the most competitive OEMs would prevail and grow, while *malinvestments* could be minimized. We conclude that, even if the automotive industry had initially suffered if no fiscal stimulus packages (no scrappage campaigns) would have been implemented, the market would have naturally recovered once the natural customer demand was given. As Huerta de Soto (2009a, p. 233) properly stated, "*the market is very agile and quick to detect errors, spontaneously setting in motion the necessary investment processes to meet the unavoidable restructuring as soon as possible and with minimal costs*". Thus, following the theoretical concepts of Mises (1940), Hayek (1939, 1944, 1990), and Huerta de Soto (2005, 2009a), we argue that governments should have denied to 'protect' any specific company or business sector, as the target in any efficient economy must be to allow the free market processes to shift resources to marginally more productive activities.

We also showed that several OEMs, such as Toyota and Volkswagen, easily survived the economic crisis without any individual supports such as bailouts by their local governments, while other automotive OEMs such as General Motors and Chrysler would possibly not have survived the financial crisis without the significant interventions by the US government in the period from 2008-2010 (McMaken, 2018). Consequently, the discussed interventions were counterproductive

for the long-term sustainability of the automotive industry, in which the most competitive producers should provide their goods to attracted consumers, without depending on subsidies, bailouts and other fiscal policies paid for by the taxpayers (Ikenson, 2011).

Thus, we conclude that a company's competitiveness should ultimately depend on entrepreneurial creativity, on its management's ability to adapt to market changes, while constantly trying to detect market niches (Kirzner, 1963, 1973; Huerta de Soto, 2009a). The achievements of FCA's former CEO Sergio Marchionne (Berta, 2011) and Tesla's CEO Elon Musk (Vange, 2015) can be seen as adequate examples of how innovation and efficient processes can significantly improve a company's competitiveness. Thus, it is important to consider the corresponding concepts on market changes and entrepreneurial creativity developed by Schumpeter (1934) and Israel Kirzner (1973), as well as on dynamic efficiency (Huerta de Soto, 2009a) and '*contrepneurship*' (Taghizadegan, 2016). Nevertheless, it is also true that the short-term thinking of many managers in the automotive industry as well as of several principal shareholders which control such automotive OEM stock corporations, has often led to unsustainable short-term decisions. In line with Sala i Martin (2013), Alonso Neira *et al.* (2013), and Salerno (2015), we argue that the politically motivated concept of constantly helping major corporates to socialize their losses in economic crisis through fiscal and monetary policies is immoral and economically inefficient and must therefore come to an end. Accordingly, our findings also support the claim of our third proposition for an *a priori* truth, which stated: '*Fiscal policies distort the free market process (e.g. by implementing public incentives for some market players while hampering others), and will lead to unsustainable misallocations, ultimately lowering people's average standard of living, hampering free entrepreneurship and free consumer choice*'.

Consequently, we concluded that politically-motivated fiscal policies after the credit crunch tried to save those automotive OEMs whose internal corporate challenges had already existed before the financial crisis. Thus, these internal corporate challenges had only been intensified by the financial crisis. Ironically, the financial crisis itself had precisely been caused by the unsustainable increase of money supply and artificial credit expansions caused by the Federal Reserve's ultra-loose monetary policy. In line with Ikenson (2011) and Salerno (2015) we are convinced that the

actions taken distorted the market signals, not being based on economic feasibility but on political activism and opportunism. During the crisis, governments and central banks should have avoided micro-engineering, 'favoritism' and the selective rescue of some large companies, and instead should have opted for entrepreneurial freedom and competition in a truly free market. Even if the expansionary monetary policies of central banks and the fiscal stimulus packages of local governments were effective in stopping the mass destruction of jobs in the short term, we argue that the market distortions generated are likely to create an even more significant problem for the future. Government interventionism does not rescue the economy, as it only protects those goods and services which consumers do not request, draining resources away from truly sustainable and natural growth (Mises, 1940; Rothbard, 1962; Huerta de Soto, 2005; Bagus *et al.*, 2014; Benegas Lynch, 2011, 2016).

6.5 Findings on Public Incentives & Sales Evolution of AFVs

In the final part of Chapter 4, we evaluated the effects of public incentives for alternative fuel vehicles (AFVs) on automotive sales in selected European countries such as Norway, the Netherlands, Germany, and Spain between the years 2010-2018.

Our corresponding key research objective was: '*the evaluation of the impact and effectiveness of public incentives for AFVs on the vehicle sales evolution in Europe in the period from 2010 to 2018*'.

The author elaborated on his most relevant findings in his academic paper '*The Subsidized Green Revolution: The Impact of Public Incentives on the Automotive Industry to Promote Alternative Fuel Vehicles (AFVs) in the Period from 2010 to 2018*', which was published in a special issue of the peer-reviewed, open access journal *Energies* (Reimers, 2021).

First of all, we want to emphasize that the impact of negative externalities caused by automobiles must certainly be taken seriously. The damage/costs which third parties may suffer (for example

by NOx & CO2 emissions) as a result of an economic transaction between the (automotive) producer and a (final) consumer must not be ignored. However, as of now, the exact impact and costs of these negative externalities cannot be precisely quantified.

Throughout the past decade, several fiscal incentives have been launched by governments in Europe, Asia, North America and other regions to minimize the total cost of ownership (TCO) of alternative fuel vehicles with the aim to increase their competitiveness and market share (Brand *et al.*, 2013; Diamond, 2009). We explained why we used the term 'AFVs', including Hybrid vehicles (H-EVs) in this category, as particularly in the period from 2010 to 2015, H-EVs were also notably promoted by public entities. Thus, Hybrid vehicles (H-EVs) could be seen as the 'stepping stone' for alternative fuel concepts, which paved the way for Plug-in Hybrid Electric (PH-EVs) vehicles and Battery-Electric-Vehicles (B-EVs). However, public support for H-EVs has been significantly reduced (or fully stopped) in most markets, concentrating public incentives on 'Plug-in electric vehicles', abbreviated by 'PEVs'. A 'PEV' is any vehicle that can be recharged via an external source of electricity, for which the abbreviation 'PEV' can be seen as an umbrella term for electrified vehicles, which includes all-electric, or battery electric vehicles (B-EVs), as well as plug-in hybrid vehicles (PH-EVs). Accordingly, whereas Hybrid vehicles ('H-EVs') are herein considered as AFVs, they do not belong to the group of 'PEVs'.

Thus, since the early 21st century, public entities on EU-, national and municipal level have tried to promote AFV technologies via different fiscal and legal supports (Brand *et al.*, 2013; Diamond, 2009; Gass *et al.*, 2013; Lane & Potter, 2007; Mock & Yang, 2014; Tran *et al.*, 2013). In several European markets, public subsidies and tax exemptions for PEVs have been quite substantial within recent years (Axsen *et al.*, 2015; Carlucci *et al.*, 2018; Dudenhöffer, 2016).

Governments have promoted this market growth through a combination of financial incentives such as tax exemptions and direct subsidies as well as other incentives including free parking, but also by supporting the set-up of charging infrastructure (Gass *et al.*, 2013; Mock & Yang, 2014; Lutsey N., 2015b).

Thus, several empirical studies on the sales evolution of AFVs were considered, comparing the sales results with the corresponding individual public incentive models of each analyzed market.

These incentives have clearly increased the awareness of AFVs. However, by 2018, only in comparably smaller Nordic countries like Norway, Netherlands, Iceland, and Sweden has a significant PEV sales growth occurred. In the Netherlands and Norway, sales volumes of AFVs have constantly been growing as simultaneously public incentives have compensated a significant portion of the AFVs' total vehicle cost (Kok, 2015; Mock *et al.*, 2014). However, by 2018 and on a European average across all markets, Europe was still in the adoption phase of AFVs. AFVs still face relevant barriers to adoption, barriers which are common to most new technologies, such as the lack of knowledge by potential adopters, a low consumer risk tolerance (Jaffe and Stavins, 1994; Stoneman & Diederer, 1994), as well as high initial production costs (Epple, 1995). According to Axsen the main constraint to the commercialization of B-EVs has been the limited energy storage (Rezvani *et al.*, 2015).

Apart from the above-mentioned topics, two other main challenges considered by potential customers of B-EVs and FC-EVs are the status of the (public) recharging network as well as the actual recharging time for these vehicles (Axsen *et al.*, 2015; Harrison *et al.*, 2017). Therefore, a stronger growth of B-EV & FC-EV sales will also require an optimized re-charging infrastructure. Another crucial aspect which limited the success of PEVs, has been the uncertainty about the vehicles' total cost of ownership (TCO) as the future residual values for these new technology vehicles can hardly be predicted. Public incentives for PEVs have differed significantly between the individual EU countries. By the end of 2017, we could roughly divide the European markets into three groups: The first group consists of Norway only, with PEV incentives ranging between 39-67% of the net price for B-EVs and 17-23% for PH-EVs. In the second group we could find markets such as the Netherlands, Sweden, France and UK with calculated incentives of 10-40% of the net B-EV price. And the third group consisted of countries such as Poland and Italy where incentives did not even reach 10% of the net B-EV prices (Drossinos *et al.*, 2017). It must be stated that in the absence of public incentives, PEVs have not been cost-competitive in any European market - despite the notable recent growth rate in PEVs sales. However, our analysis clearly indicated that PEV sales grew most in those markets with the highest public incentives (Norway and Netherlands), whereas PEVs sales in markets with low corresponding public incentives, such as Italy and Poland, have been almost irrelevant.

We agree with Bagus (2014), Benegas Lynch (2014), Boettke (2012), Huerta de Soto (2009b), and Ravier (2018), claiming that in today's real-world economies, we can detect several public interventions which hamper entrepreneurial freedom and competition, while distorting the proper allocation of resources. We argue that the currently seen incentives for AFVs must certainly be considered as one of these (harmful) interventions. Based on Mises (1934), Hayek (1931, 1941) and Huerta de Soto (2005), we highlighted the importance of free prices, crucial to properly allocate resources, as any governmental interventions on pricing via taxes and subsidies lead to a hampering market distortion. Menger defined the Austrian marginal utility theory, detecting that price determines cost and not vice versa (Hayek, 1941).

From Mises (1951), Hayek (1931, 1939) and Kirzner (1963, 1973) we learned that prices serve to communicate economic changes and scarcities. Thus, free pricing is crucial to enable the market participants to communicate with each other via price signals, helping to solve the economic calculation problem (Boettke, 2001). We agree with Hayek (1939, 1945) and Kirzner (1963, 1973) who explained that economic profits must be seen as the reward for removing maladjustments from an economy. Mises (1940), Rothbard (1962), Huerta de Soto (2005) and Benegas Lynch (2011) argued that in a truly free market, all prices must be determined exclusively by the law of supply and demand. Benegas Lynch (2014), Boettke (2012), Garrison (2001), and Huerta de Soto (2008) point out that in a competitive market, the entrepreneur knows that consumers are likely to be responsive to noticeable price changes. Consequently, as stated by Huerta de Soto (2005), Hoppe (1998) and Rothbard (1962), when, due to subsidies or other public interventions, the official price of a product is below its actual free-market price, an excessive demand can be stimulated for that good.

Thus, also a publically steered price control will always decrease the utility for at least one of the parties involved (Hoppe, 1995). Price controls distort the allocation of resources, while hampering the free selection of goods by the consumers (Huerta de Soto, 2005). Correspondingly, also any form of subsidies distorts the market, enabling the users of a subsidized good (e.g. AFVs) to benefit from them without having to pay the actual free market price. Thus, in line with Mises (1936), Huerta de Soto (2005), and Hazlitt (1946), we argue that state-driven market distortions are morally and economically wrong, as the production costs of the subsidized goods and services

are not only covered by those who actually benefit from the product, but instead by all economic agents/ tax payers. In an economic system led by subsidies and other interventions, goods tend to become a political instrument, as their price, quality and production quantity will be influenced by public authorities (Boettke, 2012). Therefore, their overall production and distribution process will ultimately be more expensive and less effective than in a free market.

On the other hand, Jenkin (2015) insists on the impact of economies of scale, which will help manufacturers to produce future AFVs at lower costs. Concrete indications for increasing AFV sales volumes would then reassure car manufacturers to invest into larger production facilities for AFVs, leading to lower per-unit-costs. Consequently, particularly for B-EVs, economies of scale will drive down total production costs of electric vehicles, enabling them to achieve much wider-scale adoption. Moreover, we conclude that the recent 'positive' public interventions to support AFV sales (e.g. via tax exemptions for AFVs) will soon be replaced by 'negative interventions' for ICE vehicles, such as further regulations, fees and taxes. In July 2021, the European Union proposed an effective ban on the sale of new ICE vehicles from 2035 onwards. Moreover, the EU Commission proposed its member states to approve a 55% cut in vehicle CO₂ emissions already by 2030 versus the corresponding 2021 emission levels. Accordingly, *IHS Markit* estimates that if the EU raised its CO₂ emission reduction targets to more than 50% by 2030, it would reduce ICE car sales to virtually zero by then (Carey & Steitz, 2021). Accordingly, if EU member states and the European Parliament followed the EU Commission's proposals, public entities could further intensify the transition towards PEVs, while being able to decrease their required public budgets to increase the PEV market share. However, we insist that any type of public interventionism into the market process must be seen as a harmful distortion, which leads to a misallocation of resources.

6.6 Findings on the Sustainability and Competitiveness of AFVs

Our fifth and final key research objective was to critically evaluate the sustainability and market competitiveness of the AFV technology without public incentives. The impact of the transport sector on climate change and energy-related greenhouse gas (GHG) emissions has become a major aspect of political discussion throughout the past years (Brand *et al.*, 2013; Axsen *et al.*, 2015; Hartmann, 2018; Sinn *et al.* 2019). Historically, several geo-strategic conflicts related to the access to and usage of different energy sources have caused political tensions between states and confederations of states (Axsen *et al.*, 2015; Hartmann, 2018; Brand *et al.*, 2013). Accordingly, several states intend to reduce their local vehicle-related petrol and diesel demand to decrease their dependence on crude oil-producing OPEC countries (Brand *et al.*, 2013). Vehicles run by fossil fuels are criticized for several negative externalities such noise, air pollution, and more specifically for the emission of nitrogen oxides (NO_x) and carbon dioxide (Brand *et al.*, 2013; Diamond, 2009; Gass *et al.*, 2013; Lane & Potter, 2007). Several studies indicate that there are crucial environmental, consumer fuel-saving, and macroeconomic benefits (Nealer, 2015) associated with alternative fuel vehicles which are said to exceed the costs of electric vehicle incentives (Greene *et al.*, 2014). In addition, the governments of several EU-member states have criticized the car-related petrol and diesel demand for having created a worrying dependence on foreign energy sources (Brand *et al.*, 2013). Thus, from a geostrategic perspective, it is often highlighted that the transition of the European automotive industry towards electrification may reduce the EU's dependency on imported fossil fuels. Also for these reasons, national and local governments across the globe started to adopt different measures to increase the use of alternative fuel vehicles (Axsen *et al.*, 2015). However, it cannot be ignored that the most crucial raw materials for battery production, such as lithium, copper, nickel, cobalt, graphite and manganese, need to be mined from the ground. Additionally, these scarce resources can overwhelmingly be found in countries located outside of the European Union. In the case of China, its domestic lack of certain battery raw materials is more than compensated by its mid-stream supply chain dominance. China controls the processing of several critical minerals, such as lithium, cobalt and graphite. For example, China controls the cobalt refining industry in the

“Democratic Republic of Congo” (which is the source of more than 60% of the global cobalt production), owning eight of the 14 largest Congolese cobalt mines (Moore, 2021). Moreover, China has been significantly faster than the EU and the USA in building up a “lithium-ion-battery-to-electric-vehicle supply chain” by quickly increasing its number of “battery megafactories” to produce lithium-ion battery cells. Thus, at least for the running decade of the 2020s, China will continue to control the vast majority of the global lithium-ion production capacities. In 2021, a total of 122 of such lithium-ion battery megafactories was already operating globally, with another 78 factories confirmed to be finalized by 2030. Of this total of 200 megafactories (said to be operating by 2030), only 11 are to be located in the USA, 21 within continental Europe, but 148 corresponding factories are to be located in China. This dominance could likely enable China to lead the 21st century automotive and energy storage industries (Todd, 2019).

However, the main focus of our research is dedicated to the impact of monetary and fiscal policies on the automotive industry, rather than in the evaluation of geostrategic energy policies. We foresee that in the decade of the 2020's, the sales evolution of passenger cars with PEV technologies will significantly increase, particularly in the case of B-EVs. Due to the mentioned economies of scale, the increasing range of available PEV models in the market, and the seen public incentives, sales of PH-EVs and B-EVs are expected to grow strongly within this decade. However, we argue that in a free market, innovative entrepreneurs and creative researchers could soon find alternative technologies which will be more environmentally sustainable and economically efficient than today's PEV technologies.

We evaluated the four main alternative fuel technologies which have been most successful in Europe throughout the past years, namely: Hybrid Electric (H-EVs) and Plug-in Hybrid Electric (PH-EVs) vehicles, as well as Battery-Electric-Vehicles (B-EVs) and their 'sub-category' of Fuel-Cell- Electric vehicles (FC-EVs). From the currently available AFV technologies, we consider the FC-EV concept to be the most sustainable option, using hydrogen as an emission-free, environmentally neutral fuel. Bicer & Dincer (2017) showed that B-EVs cause significantly higher toxicity values than FC-EVs, throughout their respective manufacturing and maintenance stages. In most countries, the power generation necessary to fuel 'green' B-EVs still depends on the use of fossil fuels (Sinn *et al.* 2019). We already indicated that B-EVs are still run by intricate lithium-

based batteries, containing toxic metals such as nickel, lead and copper, as well as toxic and flammable electrolytes (Carlucci *et al.*, 2018; Hartmann, 2018; Sinn *et al.* 2019). Despite the current technological challenges (such as high production costs, complicated hydrogen storage, high costs of the needed recharging infrastructure) Hydrogen driven vehicles could be more environmental-friendly with respect to global warming and ozone layer depletion potentials than B-EVs. In this context, we believe that both electrofuels (fuels manufactured using renewable electricity) as well as fuel-cell electric vehicles (FC-EVs) could be interesting alternatives to the current 'full-electric vehicle hype'. New technologies, such as the hydrogen-electric hybrid sports car 'RG Nathalie' are being developed. RG Nathalie is equipped with a 15 kW (20 hp) fuel cell, and runs on methanol to generate hydrogen, which can be seen as a truly inspiring new concept (Zoellter, 2020). Moreover, within 2022, BMW is about to launch its SUV model 'iX5 Hydrogen' and Hyperion Motors will launch its sports car 'Hyperion XP-1', both being based on a hydrogen fuel cell technology. Thus, due to the constant discoveries of entrepreneurs and researchers, and the corresponding technological progress, it is impossible to foresee which fuel technology will be most successful (in terms of market share) twenty or thirty years from now. Within this decade, the author also sees more potential for FC-EV technologies in the heavy-duty transport industry than for passenger cars. However, due to the recent focus of public entities on promoting B-EVs in the passenger car industry, investments by automotive OEMs on FC-EV technologies and other alternative concepts have been rather limited – particularly by most European and US-American automotive OEMs. Accordingly, we argue that the massive public incentives for B-EVs have hindered the development of more efficient, more sustainable technologies.

Moreover, as we learned from Mises (1940, 1951), Polanyi (1948), Hayek (1944, 1948, 1990), and Huerta de Soto (2005, 2009a), the market is in constant change, due to entrepreneurial creativity and innovation, as well as changing subjective preferences of the market participants. Thus, it is impossible to predict which fuel type will 'succeed' in the next decades, as completely new and more efficient engine technologies might soon be developed.

A main challenge for our analysis of automotive sales (by using time series data) was the definition of the concrete correlation between specific independent variables and the dependent variable, as several intervening, moderating and control variables have also significantly changed

throughout the analyzed period. For example, public incentives for AFVs might have developed in line with other relevant changes, such as an optimized PEV recharging network, the optimization of the vehicle driving range and a general increase in consumer consciousness of environmental issues.

It is expected that throughout the next decades, public incentives for PEVs can be reduced due to the ongoing optimization of these vehicle technologies, not only in regard to their production costs but also regarding their driving range, which will naturally increase their competitiveness (Lutsey N., 2015a). Automotive manufacturers have used these recent years of strong fiscal interventionism to optimize their AFV models with regard to crucial aspects such as product quality, reliability, driving range, and needed recharging times (Dudenhöffer, 2019). Consequently, due to the seen public subsidies and other public interventions as well as due to the expected future economies of scale, it might be the case that by the early 2030's, most PH-EV and B-EV models will be price competitive without any further governmental support (McKerracher *et al.* (2019).

However, based on the ideas of Mises (1940), Rothbard (1962, 1970) and Huerta de Soto (1998, 2005, 2009a), we showed that any form of public interventionism must lead to a harmful distortion of the market, and the misallocation of resources. We conclude that in a free market, once customer demand for AFVs has naturally increased, providers and consumers will find truly adequate, efficient and customer-friendly solutions by themselves, without public interventions. In line with Mises (1951), Hayek (1944, 1948, 1973, 1990), Elinor Ostrom (1990), Michael Polanyi (1948), and Huerta de Soto (2005), we claim that a key fallacy in statist thinking has been to assume that a conscious central planning by public entities would be more-efficient than any unplanned 'extended order'.

We understand Sowell's (2015) perspective that there are certain market imperfections which have led citizens to assume that government interventions would be 'necessary and beneficial'. However, Sowell also clearly and correctly indicated that the imperfections of the market must always be weighed against the imperfections of the government, as government interventions tend to make things worse. Based on Mises (1940), Hayek (1990), Garrison (2001), Huerta de Soto (2005, 2009a) and Hülsmann (2008), we argue that it is neither morally nor economically

appropriate to simply manipulate the market by implementing fiscal policies to increase the competitiveness of a specific product, even if therefore that product ultimately achieves price competitiveness caused by optimized economies of scale. The ends do not always justify the means (Peterson, 2017; Rand, 1964), even if (in our analysed scenario) long term price competitiveness of technologies can be achieved by initial short-term public interventionism to boost research and development investments into the corresponding new technology.

Based on Kirzner (1963), Hartmann (2018), Sinn *et al.* (2019), we indicated our concern that the implemented public incentives for AFVs are unsustainable, leading to market distortions which may cause a new, artificial market bubble. Thus, with the aim to 'connect the dots', we intended to indicate the similarities between the public interventions (credit expansions, bailouts, and scrappage programs) implemented in 2009-2010 to prevent the automotive industry from a further down-turn during the parallel subprime crisis, with the recent public incentives for AFVs. Accordingly, we argue that the interventionist policies in the first decade of the 21st century were just as unsustainable for the automotive industry as the current market distortions to promote alternative fuel vehicles.

6.7 Suggestions for a More Sustainable Approach to Monetary & Fiscal Policies

Based on Huerta de Soto (2008, 2009b), Hülsmann (2010), Ravier (2011), Bagus *et al.* (2012), and Alonso Neira (2013), we argue that national governments and other institutions, such as central banks, the US Congress and the European Union, are the actual originators of the recently seen economic crisis. Thus, the author of this thesis urges for significant changes in regard to both, monetary and fiscal policies. Even if this research cannot provide a detailed evaluation of all raised macroeconomic and monetary topics, it should be stated that there are sophisticated alternative models to the expansive monetary policies and public interventionism, seen in the EU and USA throughout the past decades. The most important step would be the abolition of the current monopolistic state-issued fiat money system, allowing competition between different

currencies, which may be simultaneously issued by states and private entities. Central banks must lose their monopoly on money creation, enabling competition between the state and private money providers. We analyzed the strengths and weaknesses of different alternative monetary systems, including full-reserve and high-reserve banking, free banking and Islamic banking. We also referred to blockchains and crypto currencies in which the author of this thesis, in line with Hosp (2018) and Polleit (2017), sees interesting approaches to potentially further reduce the influence of the traditional banking sector. From a short-term perspective, we insist that it would be a significant advancement if EU member states based their general economic policies (particularly their fiscal policies) on the concepts of Walter Eucken's (1949, 1950, 1952) Ordoliberalism. From all politico-economic theories which significantly shaped the government policies of certain EU-member states, Ordoliberalism should be seen as the politico-economic theory which has been 'the least harmful'. However, from a long-term perspective, the policies proposed by Eucken cannot be seen as sufficient to stop the harmful boom-and-bust-cycles. Thus, we argue that it is economists like von Mises (1912, 1940, 1957), Hayek (1944, 1976, 1979, 1990), Kirzner (1963, 1973), Huerta de Soto (1998, 2005, 2009a), Garrison (2001) and Hülsmann (2008) which, based on the ideas of the Austrian School of economics, offer the most suitable politico-economic concepts. We agree with Mises (1951), Hayek (1944, 1948, 1973, 1990), Michael Polanyi (1948), Boettke (2001), Huerta de Soto (2005) and Benegas Lynch (2011), that a centralized, planned economy cannot function effectively. Consequently, public interventionism must be significantly minimized, allowing the market participants to operate and cooperate in a free market order. Consequently, all forms of public interventions in the economic cycle, including bailouts, scrappage campaigns and other public incentives have led to a harmful distortion of the market process.

7 Summary and Outlook

This thesis aimed at enriching economic theory by providing a comprehensive research on the impact of expansive monetary policies and public interventionism on the automotive industry by applying an Austrian School theoretical approach. Accordingly, this thesis fills a relevant research gap, as we have not found other publications providing such in-depth analysis in our main research question from an Austrian School perspective. Thus, the used theoretical framework is based on praxeology and methodological dualism, while referring to the non-aggression principle as our ethical theory, which clearly differentiates it from purely empiric market research (generally based on cross-sectional time-series analysis and triangulation) of mainstream economics.

Throughout the past decades, the monetary policies of central banks such as the Federal Reserve and the ECB as well as the fiscal policies of the corresponding national governments aimed at an active and constant steering of the economy to assure economic growth, employment and political stability. Monetary instruments were actively used, with the official aim to prevent recessions. However, based on the ideas of von Mises and von Hayek, and of several other well-known economists, such as Garrison, Huerta de Soto, Schnabl, Bagus and Hülsmann, it is argued that precisely this form of interventionism was the main reason for the recent boom-and-bust cycle seen in the period from 2001-2009.

F.A. von Hayek had already properly stated that "*the curious task of economics is to demonstrate to men how little they really know about what they imagine they can design.*" (Hayek; 1990, p. 76). Hayek had defined as the 'fatal conceit' the illusion that "*man is able to shape the world around him according to his wishes*", as Hayek argued that central planning cannot properly anticipate market needs.

The central research question of this study is: How did monetary and fiscal policies influence the sales evolution of automotive OEMs in the USA and in Europe within the period from 2001 to 2018, analyzing the examples of credit expansions caused by central banks as well as by evaluating the impact of scrappage campaigns, company bailouts and other public

interventionism, such as public incentives for alternative fuel vehicles?' The research is based on both quantitative and qualitative analyses, while referring to economic theory, econometrics and specific macroeconomic case studies. Different tools of quantitative and qualitative research are used while Muligan's vector correlation model was used as an econometric methodology to interpret the relationship between real consumable output and the interest rate term spread, and a structural vector auto regression is used to estimate changes in the structure of production.

The neo-classical approach of many governments and central banks throughout the past decades, the abolition of the Gold Standard, the introduction of the so-called "fiat money system", the fractional reserve banking system in combination with interventionist 'too-big-to-fail' policies, as well as several expansive monetary policies have all played a relevant role in creating the recent economic busts seen in particular in the period from 2007-2009. Mentioned ultra-loose monetary policies, in combination with the current form of fractional-reserve banking within a fiat money system, must therefore be blamed for having created monetary and credit bubbles which led to expansive-recessive economic cycles, as seen during the recent financial crisis.

Previously, in the US-American recession of 2001 after the information technology bubble (the 'dot-com bubble'), the Federal Reserve had aggressively expanded the M2 money supply even further, while simultaneously cutting the federal-funds rate, which started in 2001 at 6.25% and ended in the same year at only 1.75%. Between 2003-2005, the rate was at a historic low of 1%, resulting in a negative real interest rate, as the nominal interest rate was lower than the inflation. Thus, credit expansion which led to the recent financial and economic crisis must be seen as a *'prime example of malinvestment'*.

Monetary and public incentives had an impact on the sales volumes and sales strategies of automotive OEMs. Consequently, there is a connection between fiscal interventionism, macroeconomic stability, the sales evolution of automotive OEMs, and specific industry related aspects such as the residual value evolution and a vehicle's total cost of ownership (TCOs).

The artificial expansion of credit without prior backing by real savings, led to unsustainable investment in the early, capital-intensive stages of the production process. In the recent financial crisis of 2007-2009, this process could best be seen in the housing market, in particular in the

USA and Spain. Mentioned financial crisis led to a general economic crisis affecting also other business sectors.

In regard to the automotive industry, it would not be objective to only blame monetary and fiscal policies for the seen crisis of several Western automotive OEMs such as General Motors, Chrysler and SEAT. One may argue that the constant overcapacities of mentioned OEM factories, even before the mentioned financial crisis, had given a signal that in several Western markets, vehicle supply had already been higher than its natural demand - and that several automotive brands should have previously started with significant internal structural changes to become competitive again. Thus, automotive OEMs themselves intensified the seen economic crisis, due to endogenous factors, such as in-house principal-agent problems, and other reasons for mismanagement and *malinvestments*. Accordingly, automotive OEMs were not only the 'mised victims' of public interventionism and expansive monetary policies, but often, their own mismanagement led to a misallocation of resources with harmful effects on the entire economy.

To be competitive in the US-American and the European automotive market, it has become increasingly crucial to offer the customer new and competitive products and services related to new fuel types, vehicle specifications, safety features, as well as leasing and financing products. As argued by I. Kirzner, Huerta de Soto and Taghizadegan, understanding the concept of dynamic efficiency and the importance of entrepreneurial creativity is crucial to properly steer any company. In the discussed period from 2000 to 2007, right before the appearance of the symptoms related to the subprime crisis, the Federal Reserve's monetary policies helped to cover several automotive OEMs' own in-house problems, by artificially stimulating consumption and investment (Salerno, 2015; Cole, 2008; McMaken, 2018). However, mentioned financial crisis, led to a significant market decrease within the automotive market, causing profit collapses and existence-threatening scenarios for mentioned corporations within a few months or even weeks.

As of 2008, the liquidity in short-term credit markets during the financial crisis hampered the supply of nonbank consumer credit, mainly in the USA but also in other parts such of the world (Alonso Neira *et al.*, 2011). The collapse of the asset-backed commercial paper market reduced the financing capacity of such nonbank lenders as captive leasing companies in the automotive

industry. The loss of financing capacity at nonbank institutions, such as the captive leasing arms of automotive OEMs, hampered the supply of credit, leading to the further collapse of companies like General Motors and Chrysler. In the period from 2007 to 2008, particularly in the USA, the short-term funding market significantly shrank, as money market funds and other buyers of short-term debt started to avoid it. At the beginning of 2009, the growing illiquidity in the asset-backed commercial paper market (abbreviated by 'ABCP market') further hindered nonbank intermediaries in securing new funding (Campbell *et al.* 2011), which coincides with the collapse of the General Motors Acceptance Corporation (GMAC).

The fiscal policies implemented between 2009-2010, such as government-funded scrappage programs in the USA, Spain, Germany and several other markets, simply tried to save precisely those automotive OEMs whose previous internal management failures had been suddenly exposed by the mentioned financial crisis.

We combined the findings of Huerta de Soto (2009b), of Alonso Neira *et al.* (2011), and Bagus *et al.* (2012) in regard to the subprime crisis of 2008-2009, with the corresponding specific market analyses of the automotive industry by Schnabl *et al.* (2016), Cole *et al.* (2008), Ikenson (2001), Ulbrich (2008), Dudenhöffer (2016) and McMaken (2018), to come to precise conclusions with regard to the impact of monetary and fiscal policies on the automotive industry. By doing so, we conclude that the fiscal policies implemented in the period from 2009 to 2010, such as government-funded scrappage programs in the USA, Spain, Germany and several other markets, artificially protected those automotive OEMs whose previous internal management failures had only been intensified by mentioned financial crisis. In other words, public interventionism helped primarily those companies whose financial difficulties had not begun with the subprime crisis, but which had previously suffered from years of mismanagement. And the financial crisis itself had been caused by the previous unsustainable increase of money supply and artificial credit expansions caused by the Federal Reserve's and ECB's monetary policies (Alonso Neira *et al.*, 2011; Huerta de Soto, 2009b; McMaken, 2018). In line with Huerta de Soto (2009b), and Salerno (2015), we agree that mentioned politically-motivated bailouts and other fiscal policies must clearly be seen as a harmful market distortion, leading to the misallocation of resources. As

properly stated by the US-American economist Thomas Sowell (1993), *“the first lesson of economics is scarcity: There is never enough of anything to fully satisfy all those who want it. The first lesson of politics is to disregard the first lesson of economics.”*

In line with Hülsmann (2008), Huerta de Soto (2009a), Kirzner (1973), and Sala i Martin (2003), we conclude that it is not only economically efficient, but also morally accurate, if the market consequently rewards companies which make better products at competitive prices. The ‘too big to fail’ concept which made governments save banks and automotive companies in order to “protect jobs and to help-out system-relevant corporates” must be entirely stopped. The current production overcapacities in the automotive sector mainly exist because several uncompetitive, highly-indebted OEMs have artificially been kept alive by government subsidies and ultra-loose monetary policies. We referred to the different forms of monetary and fiscal policies which had helped General Motors and Chrysler to survive within the first decade of the twentyfirst century. Expansive monetary policies including the reduction of the rate of interest by the US Federal Reserve, as well as scrappage campaigns and the discussed bailouts for both OEMs significantly distorted the US-American automotive industry and consequently the overall economy. The different mentioned forms of public protectionism prevented the market from naturally adjusting to the actual market demand. Particularly without the discussed public interventions, seen from 2008 to 2011, the existence of General Motors would have been threatened. Also in several European countries, similar interventions protected the corresponding local OEMs such as Groupe PSA (Peugeot Société Anonyme) in France, Fiat S.p.A. in Italy as well as Seat S.A. in Spain. These forms of protectionism hampered the needed market adjustment process, reducing the need to eliminate uncompetitive business process and production overcapacities. Meanwhile, with several new (mainly Chinese) competitors such as NIO Inc., Xiaopeng Motors (Xpeng), BYD Company Limited, Aiyas Ltd. and Great Wall Motors, as well as Zhejiang Geely Holding Group Co. Ltd and SAIC Motor Corporation Limited entering the European and US-American markets (Amblard, 2018), these overcapacities might become even more severe.

We conclude that without any form of government interventionism, the market would naturally readjust to the real demand situation.

We learned from Schnabl *et al.* (2016, 2017) that there are certainly several groups which significantly benefit from monetary inflation. As shown, monetary inflation does not affect all market participants equally as the new money does not enter the economy evenly (Hülsmann, 2008). Consequently, following the ideas of Hayek (1932, 1944, 1976), Rothbard (1962), Huerta de Soto (1998, 2009b) and Garrison (2001), it is argued that governmental institutions and banks benefit most from new money supply as they usually receive this money (monetary inflation) at an early stage, when general price increases (price inflation) are still not visible within the economy.

However, it must also be taken into consideration that expansionary monetary policies and a noticeable devaluation of the local currency provide a competitive advantage for export driven companies, which has already been the case for several automotive OEMs, such as Toyota in Japan. Consequently, not only in Japan, but also within the Euro currency zone, automotive OEMs strongly producing for export markets outside of their own currency zone, have benefitted from such currency devaluations, caused by an increase of money supply.

We consider the Austrian Business Cycle Theory (Mises, 1912, 1934, 1940; Hayek, 1932, 1939, 1941; Huerta de Soto, 1998; Garrison, 2001) as the most sophisticated and pragmatic of all analysed business cycle models, able to clearly distinguish sustainable from unsustainable economic booms, while properly dividing the structure of production into stages, analysing the stage-specific labour markets. Neither Keynes nor Friedman truly recognized the significance of the loanable funds market in the context of business cycles. We consider the business cycle concept of Keynes as incapable of neither properly interpreting past events, nor of providing a framework to prevent future economic busts. On the contrary, Keynesian monetary and fiscal policies have been the main reason for the subprime crisis in the first decade of the 21st century, which also significantly affected the automotive industry. The theoretical frameworks provided by monetarists such as Friedman (1957, 1962, 1969, 1987) as well as by ordoliberalists such as Eucken (1949, 1959, 1952) can be seen as a slight improvement versus today's Keynesian interventionism, but will not be sufficient to establish a truly free, sustainable market without market distortions by public entities. We appreciate the previously mentioned advancements by

Mises, Hayek, Huerta de Soto and Garrison in regard to the Austrian Business Cycle Theory, as well as Hayek's and Garrison's advancements regarding the Hayekian triangle model, but we agree with Hülsmann that mentioned concepts can still be further optimized. By the end of 2021, the economies of most industrialized countries might appear to be stable. However, this impression of economic stability has been caused by an apparently endless 'free liquidity' which has been based on the discussed expansionary monetaries policies of central banks, such as the Fed and the ECB. However, the author of this thesis argues that a new global economic crisis is very likely to occur within the current decade due to the following main reasons:

First of all, the intensified money creation by central banks has led to artificially high asset valuations. The stock market capitalization as well as real-estate prices have grown significantly faster in the USA and the EU than the markets' corresponding GDPs. This evolution is worrying, as it has been caused by interventionist policies and market distortions. Secondly, also the debt levels of the corresponding markets have increased considerably. For example, the current high total-debt levels of the USA could turn into a key cause for a future financial crisis. The recent public spendings during the Covid-19 crisis have limited the governments' fiscal resources, reducing their possibilities for future interventions.

In regard to the use of automobiles, negative externalities and the implementation of a Pigouvian tax (1920) such as the carbon tax (Friedman, 1979; Gale, 2013) were critically analysed. The neoclassical analysis of externalities is shaped by the impact of the equilibrium models of physics and by the quest for precise quantification and measurement, ultimately justifying the state's coercive role in limiting individual freedom by penalizing 'marginal social costs' of negative externalities. These negative externalities certainly include different forms of air pollution, and in the context of this thesis would primarily refer to the emission of nitrogen oxides (NOx) and carbon dioxide (CO₂). Contrary to Friedman's and Gale's approach, for Rothbard it is not the markets that have failed in minimizing pollution, but governments have failed in properly allocating property rights. Rothbard (1982) sees negative externalities as a property rights problem, which in our example ultimately leads to the question of 'who owns the air that vehicles pollute?' A similar concept of the 'common property system', further defined by Elinor Ostrom can be seen as a

relevant progress for the privatization of possible common resources such as forests or rivers and other resources with clearly defined boundaries.

However, it does not fully satisfy the need to properly trace the negative long-term effects of air pollution caused by thousands or millions of individual car owners, in particular in urban areas. In addition, even the latest electric vehicle technologies are also causing significant pollution, as confirmed by Louis Lambilliotte. Firstly, current PEVs are run on electricity which in most European countries and the United States is still mainly generated from the combustion of fossil fuels (Carlucci *et al.*, 2018; Sinn *et al.* 2019). Moreover, today's PEVs are run by intricate lithium-based batteries which are difficult to dispose of and harmful to the environment, as they contain toxic metals such as nickel, lead and copper, as well as toxic and flammable electrolytes (Carlucci *et al.*, 2018; Hartmann, 2018). Consequently, even if ICE technologies will be replaced by PEVs, we did not find any literature which could realistically explain how in a fully privatized legal system the victims of negative externalities of consumption will be able to receive an 'appropriate' compensation for health problems caused by toxic vehicle emissions.

In line with the defined research questions, the corresponding research has elaborated on how dependent the 'green technology/ alternative fuel vehicle' industry has been on public financial support. Correspondingly, we focused on the correlation of fiscal policies to promote alternative fuel vehicles (AFVs) with their corresponding sales evolution in Europe. It was shown that financial incentives provided through fiscal policies have been crucial for the market breakthrough of AFVs, which up until today would not be price competitive without public interventionism. It is argued that in most European markets, such as Germany, Italy, Spain and Poland, a truly significant market penetration will only be achieved once AFVs become fully price competitive.

Up until 2019, the market share of PEVs in most western automotive markets was significantly lower than what had previously been forecasted by most governments and several market analysts (McKinsey, 2009; IEA, 2020). In 2020, with the rapid global spread of the Covid-19 pandemic, a significant economic crisis hit most economies, also aggravating the situation within the automotive sector. In order to 'support' this sector, several governments implemented public incentive schemes, further incentivizing the purchase of PEVs. These intensified incentives were

a crucial reason for the increase of PEV sales in the years 2020 and 2021. However, we must acknowledge that the growing variety of available PEV models, the increasing driving range of electric vehicles, as well as their decreasing production costs due to economies of scale have also helped to make PEVs become more competitive.

It is impossible to exactly quantify the effects of fiscal incentives on the PEV sales evolution, as too many variables, including non-monetary aspects, cognitive and cultural factors, must also be considered. Mentioned public incentives for AFVs, and other forms of public interventionism have themselves often been the result of politico-economic decisions related to foreign affairs, energy independence, and economic crises. Based on the analysed historic data, and the theoretical concept of Mises, we consider attempts to provide concrete quantitative forecasts on the future vehicle sales evolution as unsound and unscientific.

It is very likely that the recent 'positive' public interventions to support AFV sales (e.g. tax exemptions for AFVs) will simply be replaced by 'negative interventions', such as further regulations and taxes on ICE vehicles. By doing so, public entities could further steer the transition towards the 'electric revolution' without needing significant public budgets for long-term public AFV incentives. This will further transform the automotive landscape, enabling new (and often Asian) mobility providers to conquer relevant market share in Europe. With the mentioned new competitors such as VinFast, Polestar, NIO Inc., Xiaopeng Motors (Xpeng) and Aiyas Ltd., as well as Lynk & Co, Great Wall Motors, 'SAIC Motor Corporation Limited' and Chongqing Sokon Industry Group entering the European and US-American markets with competitive PEV models, the global dominance of the traditional US-American and European automotive OEMs may ultimately come to an end.

New engine technologies, significantly more efficient than today's internal combustion engines (ICEs), can, should and will be developed. However, also without the recent significant public incentives for AFVs, new engine technologies would have emerged, with potentially more innovative propulsion systems than today's full-electric vehicles (B-EVs). The existing incentives to 'promote' AFVs have been an unsustainable market distortion which has caused a significant financial redistribution and bureaucracy, not being backed by the actual consumer demand. Thus,

the recent focus of European governments on promoting B-EV and PH-EV has made it more difficult to promote other alternative engine technologies which in the long-run could possibly be more sustainable, both from an economic as well as ecologic perspective. From an environmental perspective, for example certain FC-EV technology approaches could turn out be more sustainable than today's B-EVs and PH-EVs. However, within this decade, and also due to their current technological challenges (such as high production costs, complicated hydrogen storage, high costs of the needed recharging infrastructure), the author sees more potential for FC-EV technologies in the heavy-duty transport industry than for passenger cars. Moreover, due to the recent focus of public entities on promoting PEVs (particularly in the passenger car industry), most western automotive OEMs are not expected to primarily concentrate their investments on the further development of FC-EVs or other alternative engine technologies for passenger cars. Accordingly, we argue that the narrowed focus of public entities and their corresponding incentives and regulations have led to a reduced willingness of researchers and entrepreneurs to develop other, more effective vehicle fuel technologies.

Consequently, a truly free and efficient economy would give the individual market participants the freedom to discover for themselves the relevant range of business opportunities. Or to close with the words of Carl Menger: *“man himself is the beginning and the end of every economy.”*

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