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TESIS DOCTORAL

Policy evaluation: micro-analysis applied for the Spanish case

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D. Desiderio Romero Jordán , Profesor Titular de Universidad de la Universidad Rey Juan Carlos, Dña. María Arrazola Vacas, Profesora Contratada Doctora de la Universidad Rey Juan Carlos, y D. José de Hevia Payá, Profesor Titular de la Universidad Rey Juan Carlos, en cumplimiento de lo dispuesto en la normativa que regula el Tercer Ciclo de estudios universitarios de la Universidad Rey Juan Carlos, emiten un informe favorable autorizando la lectura y defensa de la Tesis Doctoral "Policy evaluation: micro-analysis applied for the Spanish case", realizada por la doctoranda Dña. Sofía de los Ángeles Galán Pérez.

La tesis doctoral analiza un tema de gran relevancia para la economía española, está perfectamente estructurada, conceptual y formalmente, posee numerosos elementos de originalidad e innovación, y en ella se emplea de manera adecuada y rigurosa la metodología científica del Análisis Económico Aplicado.

En definitiva, y en nuestra opinión, la tesis doctoral cumple tanto en cuanto a aspectos formales como de contenido, con todos los requisitos exigibles para poder ser defendida con éxito ante un tribunal de profesores doctores especialistas del área y permitir el acceso de Dña. Sofía de los Ángeles Galán Pérez al Grado de Doctora.

Para que conste y surta los efectos oportunos firmamos este informe en Madrid a 28 de Febrero de 2017.

Fdo. Desiderio Romero Fdo. María Arrazola Fdo. José de Hevia

A mis abuelos, mis padres,
mi hermana y Álvaro

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Resumen

Antecedentes

Desde el año 2000, en Europa y en España en particular, se han vivido dos fases económicas con importantes efectos sobre el mercado laboral. Por una parte, se vivió una época de expansión económica que duró hasta el año 2008, sólo interrumpida por una pequeña recesión en el año 2004. Pero por otra parte, esta época fue seguida de una de las peores crisis económicas experimentadas a nivel mundial produciéndose una gran destrucción de empleo en todos los países europeos.

Durante este periodo de diecisiete años con dos fases económicas bien distinguidas, se han reavivado debates sobre distintos asuntos en el contexto de la Unión Europea (UE). Por una parte en la época de expansión económica y de bonanza en los mercados laborales europeos, han resurgido las discusiones sobre el salario mínimo (SM). Por ejemplo, Irlanda implementó el salario mínimo a partir del año 2000, Reino Unido lo reintrodujo en 1999, después de la retirada en la década de los ochenta, y en Alemania, donde el salario mínimo se fija a través de la negociación colectiva, hubo un fuerte debate sobre la conveniencia de instaurarlo para todos los sectores productivos. Detrás de esta discusión, siempre se encuentra el aumento del número de perceptores de bajos salarios y la necesidad social de mejorar las condiciones de los trabajadores: España no fue ajena a estas tendencias. El gobierno elegido en el año 2004 se propuso incrementar significativamente el Salario Mínimo Interprofesional (SMI) para recuperar la pérdida de poder adquisitivo que habían tenido en los años anteriores sus perceptores a fin de conseguir que éste llegara a representar el 60% del salario medio. Para ello el gobierno adoptó dos medidas. Una fue crear un indicador diferenciado para la fijación de rentas sociales, denominado Indicador Público de Renta de Efectos Múltiples (IPREM), de manera que los incrementos del SMI no tuvieran incidencia sobre las cuentas públicas. La otra medida adoptada consistió en aprobar aumentos del SMI por encima de la evolución del Índice de Precios al Consumo (IPC) hasta conseguir el objetivo cuantitativo fijado.

Por otra parte, durante la época de recesión económica se reavivaron desde las instituciones europeas distintos debates sobre los problemas de los mercados laborales. Por un lado, entre los años 2010 a 2013, se volvió a discutir sobre la rigidez de estos mercados laborales. Más recientemente, el foco de atención se ha puesto en el impacto y las consecuencias a largo plazo que la crisis ha tenido, y sigue teniendo, sobre los jóvenes.

Debido a los cambios experimentados en los últimos años, el mercado laboral español es un excelente ejemplo de estudio para ambas situaciones. En este contexto, esta tesis centra su primer capítulo en el estudio del impacto de las subidas del salario mínimo en la probabilidad de perder el empleo de aquellos trabajadores que están cobrando un salario cercano al salario mínimo. Los datos administrativos individuales proporcionados por la Seguridad Social ofrecen una excelente oportunidad para analizar cuestiones como las implicaciones macroeconómicas de las fluctuaciones en la composición del mercado laboral español o el impacto a largo plazo del desempleo juvenil. Sobre estos dos temas se centran el segundo y el tercer capítulo de esta tesis. Concretamente, en el capítulo dos se estudia el efecto de la composición del mercado laboral español sobre la evolución de los salarios mientras que en el capítulo tres se analiza el efecto a largo plazo del desempleo en los años de juventud y al principio de la carrera laboral.

Objetivos

El objetivo del primer capítulo[1] es estudiar las implicaciones microeconómicas que las subidas continuadas del salario mínimo podrían tener en las probabilidades individuales de perder el empleo. En España, existe un salario mínimo por debajo del cual no es posible celebrar contratos de trabajo con el objetivo principal de contribuir a la equidad social. Desde un punto de vista estrictamente económico, sin embargo, la literatura teórica enfatiza que el salario mínimo puede tener también un efecto adverso sobre el empleo de determinados colectivos de trabajadores, en particular de aquellos con un nivel de productividad inferior al salario mínimo fijado por las autoridades. En términos empíricos, los estudios disponibles no son plenamente concluyentes sobre la magnitud y significatividad de este posible impacto. Por una parte, algunos trabajos no encuentran que las subidas de salario mínimo generen un efecto significativamente negativo sobre el empleo. Otros estudios, por el contrario, sí lo hacen. Para el caso español, los trabajos disponibles muestran, en general, la existencia de efectos negativos en relación con los trabajadores más jóvenes, mientras que los resultados tienden a no ser significativos para el resto de colectivos. En este contexto, los aumentos que se aplicaron al salario mínimo en España entre 2004 y 2010 proporcionan un interesante caso de estudio para profundizar en el análisis empírico de esta cuestión. La información de la Muestra Continua de Vidas Laborales (MCVL), que se utiliza en esta tesis, resulta especialmente útil para captar este efecto, dado que proporciona información individual detallada del historial laboral de los trabajadores.

[1] El análisis realizado en el primer capítulo fue publicado en 2015 en la revista económica The BE Journal of Economic Analysis & Policy, 15(1), 299-328; junto con Puente, S.

El segundo capítulo de esta tesis centra su interés en el debate surgido durante los años 2012 y 2013 sobre la reforma del mercado laboral. En esos años, el Fondo Monetario Internacional (FMI) y la Comisión Europea (CE) alertaban a España sobre la necesidad de realizar con urgencia una nueva regulación laboral que abaratase el despido, simplificara la negociación colectiva y produjera una significativa moderación salarial. El motivo era que aunque se habían hecho reformas laborales en los años previos de 2010 y 2011, las estadísticas laborales disponibles seguían mostrando subidas continuadas en los salarios laborales españoles, mientras la realidad era que se estaban imponiendo recortes salariales a funcionarios y congelaciones de los salarios a los trabajadores de empresas privadas. Este hecho podría haber sido provocado porque el comportamiento cíclico de nivel agregado de los salarios en el mercado de trabajo español es reducido, encontrándose, además, que este comportamiento es aún más bajo en las épocas de recesión.

En un mercado de trabajo como el español, caracterizado por elevados flujos de entrada y salida, la evolución salarial agregada puede verse afectada de manera relevante por los cambios que se producen en la composición del empleo. Este efecto puede haber sido especialmente importante en un período como el transcurrido desde 2008, en el que la intensa destrucción de empleo observada ha estado concentrada en los colectivos de trabajadores con menor nivel de formación y experiencia profesional, que, en promedio, cobran unos salarios inferiores al salario medio de la economía. Por ello, es importante aislar las variaciones mecánicas que este fenómeno haya podido producir en los salarios, para identificar correctamente la respuesta de estos a la evolución coyuntural.

Desde el año 2008 los cambios en la composición del empleo han sido muy intensos y, en general, han estado sesgados hacia una pérdida importante del peso relativo de aquellos grupos de trabajadores con menores niveles salariales. Por ejemplo, los trabajadores más jóvenes redujeron su participación en el empleo total en casi 9 puntos porcentuales (pp) entre 2008 y 2012, y los trabajadores extranjeros en casi 2 pp en el mismo período. De la misma forma, la caída del empleo ha sido especialmente intensa entre el colectivo de trabajadores con menor nivel educativo, que ha disminuido su peso desde el 14,8 % observado en 2008 hasta el 10,2 % en 2012. Finalmente, en términos de la experiencia laboral, la participación de los trabajadores con menos antigüedad en la empresa se redujo con intensidad, reflejando el mayor impacto de la crisis sobre los contratos temporales. En concreto, los trabajadores con más de tres años de experiencia pasaron de representar un 61,7 % del empleo en 2008 a un 73 % en 2012. En las estadísticas salariales a escala agregada, que son las disponibles habitualmente para el análisis económico, cambios tan pronunciados en la composición del empleo pueden generar efectos estadísticos relativamente significativos que es necesario tener en cuenta a la hora de hacer un diagnóstico preciso sobre la evolución de los costes laborales y su relación con la situación cíclica. No obstante, la estimación

de estos efectos requiere disponer de información desagregada sobre el salario percibido por cada trabajador, junto con las características personales y del puesto de trabajo que ocupa. Esta tesis presenta una estimación de dichos efectos composición en el sector privado de la economía utilizando los datos de la MCVL, que proporciona dicha información hasta el año 2012 para una muestra representativa de los trabajadores afiliados a la Seguridad Social.

Por último, en el capítulo tres se estudia el impacto que genera el haber padecido desempleo juvenil sobre los episodios de desempleo cuando se llega a la edad adulta. El desempleo juvenil en España representa un grave problema del mercado laboral, sin olvidar que el ciclo económico de recesión incidió en mayor medida en este colectivo. No obstante, el mercado laboral español experimenta con mayor crudeza que otros países los efectos negativos de la adversa coyuntura económica, especialmente en la población juvenil, que presenta altas tasas de desempleo, afecta a todos los niveles de educación, es persistente en el tiempo, tiende a producir paro de larga duración y genera un mayor riesgo de exclusión social. Además, existen un conjunto de debilidades estructurales que influyen directamente en el paro juvenil, tales como (i) alta tasa de abandono escolar temprano, que dobla los valores de la UE-27; (ii) una marcada polaridad del mercado de trabajo juvenil, que se caracteriza por un porcentaje más elevado respecto a otros países europeos de jóvenes con un nivel de formación bajo y que tienen una tasa de paro que duplica la media europea y un porcentaje más elevado respecto a otros países europeos de jóvenes altamente cualificados que están subempleados o padecen una tasa de paro muy superior a la media de la zona euro. A su vez, la alta incidencia de la temporalidad y del trabajo a tiempo parcial no deseado hacen que en España más de tres cuartas partes de los jóvenes empleados trabajan, de forma temporal, parcial, o ambas, sin desear dichas modalidades de contrato.

El desempleo juvenil a largo plazo tiene un efecto negativo sobre el crecimiento económico y la productividad. Desde un punto de vista macroeconómico, existe un riesgo de pérdida de talento y habilidades, ya que una gran cantidad de graduados universitarios tienen grandes dificultades para encontrar un trabajo y poner sus conocimientos y capacidades en la producción de innovación y contribuir al crecimiento económico. Además, el hecho de que una gran parte de la mano de obra joven esté desempleada no sólo conduce a la reducción de la productividad y del producto interno bruto, sino que también aumenta los costes económicos para el Estado. Desde el punto de vista microeconómico, el desempleo prolongado a una edad temprana puede tener efectos nocivos más amplios en la carrera. El FMI explica en "Scarred Generation" cómo el desempleo prolongado para los jóvenes puede causar la erosión de las habilidades y tener un impacto negativo en el nivel de logro profesional de un individuo. El comienzo de su carrera es también un momento crucial para establecer conexiones, por lo que un período de desempleo temprano puede dañar la capacidad de un joven para construir y mantener redes valiosas. Incluso puede haber efectos psicológicos del

desempleo juvenil. De hecho, puede crear una desconfianza de los sistemas socioeconómicos y políticos y dañar el nivel general de felicidad de un individuo.

Metodología

La metodología utilizada en esta tesis varía según el capítulo. En el primer capítulo, un elemento relevante a la hora de explicar el diferente impacto del SMI por grupos de trabajadores es la evolución de la productividad a lo largo del ciclo vital del trabajador, ya que en principio los incrementos de la productividad serán distintos por edades y por tanto, afectarán de forma diferente a las probabilidades de pérdida de empleo. Como se muestra en el capítulo primero de esta tesis, los incrementos salariales son superiores en los grupos de edad intermedios, mientras que, tanto los trabajadores más jóvenes como los de más edad obtuvieron incrementos salariales más reducidos. En la medida que esta evolución de los salarios refleje el comportamiento de la productividad, cabe pensar que estos dos últimos colectivos podrían verse más afectados por posibles subidas del SMI, dado que difícilmente podrían generar las ganancias de productividad necesarias para compensar la subida del SMI. Para tomar en consideración este efecto y, en general, el resto de las características personales que pueden afectar a la probabilidad de perder el empleo, se ha estimado un modelo *logit* (1) sobre dicha probabilidad que incluye como variables explicativas (recogidas en el vector $x_{i,t}$) , entre otras, la edad, la nacionalidad, el tamaño de la familia, el tipo de contrato, la antigüedad en la empresa y el salario individual (variable $wage_{it}$). En este modelo, la variable que recoge el impacto de las subidas del salario mínimo es la brecha negativa (recogida en la variable $wagegap$ entre el salario actual del trabajador y el salario mínimo vigente el año siguiente. Finalmente, $g_{i,t}$ es un conjunto de variables dicotómicas, que incluye, mes, año y la interacción del mes y año para controlar por factores macroeconómicos y efectos estacionales.

$$\Pr[d_{i,t} = 1] = \Lambda\{\beta' x_{i,t} + \theta wagegap_{i,t} + \alpha wage_{i,t} + \Phi' g_{i,t} + \epsilon_{i,t}\} \qquad (1)$$

Este modelo que incluye características del individuo permite estimar si el incremento del salario mínimo hace que los trabajadores con un menor nivel de cualificación tengan una mayor probabilidad para perder el empleo.

La metodología usada en el segundo capítulo es bastante distinta de la anterior. En este capítulo, se estima la evolución salarial, controlando por los cambios en la composición del empleo. Este análisis e realiza a partir de la especificación de un modelo econométrico que permite estimar la relación entre los salarios, aproximados por las bases de cotización registradas en la MCVL, y un

conjunto de características de los trabajadores. En particular, para cada año t se estima el siguiente modelo:

$$W_{it} = \beta_t * X_{it} + \varepsilon_{it}$$

Donde *i* representa el individuo, W_{it} el logaritmo del salario real y $\beta_t * X_{it}$ representa la parte del salario que puede ser explicada por las características individuales del trabajador. En particular, en X_{it} se incluyen el sexo de los trabajadores, la edad, el grupo de cotización y la experiencia en la empresa. En este análisis, se ha optado por estimar el impacto de las características individuales sobre el salario de forma flexible, por lo que se han utilizado variables artificiales que cubren todas las posibles combinaciones entre los distintos grupos de edad, sexo, experiencia y cualificación. De esta manera se tiene en cuenta no solo el efecto directo que, por ejemplo, la experiencia tiene sobre el salario, sino además el hecho de que ese efecto puede ser diferente dependiendo de, por ejemplo, el nivel de cualificación. Esta relación estimada entre el salario y las características de los trabajadores se utiliza a continuación para predecir los salarios que los individuos habrían tenido en t + 1 si esa relación funcional se hubiese mantenido constante:

$$\hat{W}_{it+1} = \beta_{it} * X_{it+1}$$

Es decir, $\hat{W}_{it+1}$ recogería el nivel salarial que se habría observado en t + 1 dadas las características de los trabajadores empleados en ese año y siempre que la retribución de estas características se hubiera mantenido constante e igual a la estimada en t. El impacto de los efectos composición sobre la evolución salarial agregada se puede estimar mediante la diferencia entre $\hat{W}_{it+1}$y W_{it} ya que en ambos casos se utiliza la misma forma funcional, pero las características individuales observadas son distintas. Por su parte, la diferencia entre los salarios observados en t + 1 W_{it+1} y el nivel salarial estimado $\hat{W}_{it+1}$ puede interpretarse como la variación salarial una vez descontados los efectos composición, ya que en ambos casos las características individuales son las mismas, pero no así los rendimientos vinculados a cada característica. Por tanto, esta especificación permite separar tres efectos: (i) cambios en la composición de las características, (ii) cambios en la remuneración de esas características y (iii) cambios en términos reales de los salarios, por lo que permite ver cómo afecta los cambios en la composición en el mercado laboral en la evolución sobre la evolución de los salarios.

Por último, el capítulo tres utiliza, nuevamente, la información individual proporcionada por la MCVL para comparar la probabilidad de empleabilidad de aquellas personas que han sufrido episodios de desempleo antes de los 30 años con aquellos que no los han sufrido. No obstante, una comparativa directa sería errónea debido a que incluso en ausencia de episodios de desempleo antes de los 30 años, hay trabajadores que presentan mayores probabilidades de experimentar episodios

de desempleo debido sus características. En este capítulo, se define el desempleo juvenil como los días no trabajados acumulados entre los 18 y los 30 años. A su vez, para identificar posibles no linealidades entre el desempleo juvenil y posteriores episodios de desempleo, se agrupa en el desempleo acumulado antes de los 30 en 5 categorías: 0 meses, de 1 a 6 meses (U_{30_6}), de 7 a 12 meses ($U_{30_{12}}$), de 12 a 24 meses ($U_{30_{24}}$), de 24 a 36 meses ($U_{30_{36}}$) y más de 36 meses ($U_{30_{+36}}$). El grupo sobre el que se compara es aquellos individuos que no han sufrido episodios de desempleo. El modelo estimado es una regresión utilizando Mínimos Cuadrados Ordinarios (MCO) donde U_{x_i} Es el porcentaje de tiempo en el desempleo antes de los 30 años.

$$U_{x_i} = \beta_1 U_{30_6} + \beta_2 U_{30_{12}} + \beta_3 U_{30_{24}} + \beta_4 U_{30_{36}} + \beta_5 U_{30_{+36}} + \alpha x_i + \varepsilon_i$$

El vector x_i incluye un conjunto de características individuales como el género, nacionalidad, categoría ocupacional en la Seguridad Social, tipo de contratos y miembros dependientes en la familia (miembros menores de 6 años y mayores de 65 años). Esta especificación nos permite separar el efecto dependiendo del tiempo transcurrido en el desempleo antes de los 30 años, ya que, el efecto esperado no es el mismo para aquellos individuos que pasan menos de 6 meses que para aquellos que pasan más de dos años.

En el capítulo se estima por separado un modelo para aquellos trabajadores con un menor nivel de cualificación y otro para aquellos trabajadores con un mayor nivel de cualificación.

Resultados

En el primer capítulo, el resultado que se encuentra es que las subidas del SMI tienen un impacto positivo y significativo sobre la probabilidad de perder el empleo en el grupo afectado, excepto para los trabajadores de edades intermedias, entre 25 y 32 años. Este efecto es mayor en los más jóvenes y, sobre todo, entre los mayores de 45 años. El análisis por sexos viene a confirmar estos resultados, encontrándose que el efecto en el grupo de edad de entre 33 y 45 años se debe exclusivamente al grupo de las mujeres. Los resultados sugieren que la traslación de las subidas del SMI a los salarios de convenio ha podido aumentar la probabilidad individual de perder el empleo para este colectivo más amplio de trabajadores pero, en todo caso, dicho efecto sería de menor importancia cuantitativa que el efecto directo asociado a la subida del SMI. En resumen, a pesar de que el colectivo potencialmente afectado por los aumentos del SMI es reducido, su impacto sobre la probabilidad de perder el empleo es significativo, especialmente para algunos grupos de trabajadores, como los jóvenes, en línea con lo encontrado en trabajos previos y entre los trabajadores mayores de 45 años y las mujeres de mediana edad. No puede descartarse, además, un

efecto agregado de mayor cuantía en la medida en que las subidas del SMI se acaben trasladando al resto de la distribución salarial vía la negociación colectiva.

Los resultados encontrados en el capítulo dos demuestran que durante la crisis de los años noventa y en la crisis que se inició en 2008, los cambios en la composición del empleo han sido elevados, habiéndose observado un aumento del peso relativo de los trabajadores con mayor formación y experiencia, que, en promedio, perciben salarios más elevados. Estos cambios en la composición del empleo han desempeñado un papel destacado en la evolución de los salarios a escala agregada y podrían explicar, según la metodología utilizada, una parte del incremento de los salarios reales que se observó en las fases iniciales de la crisis del año 2008, aunque el incremento salarial neto de estos efectos fue aún positivo, a pesar del intenso deterioro sufrido por el empleo. A su vez, el proceso de moderación salarial que comenzó en 2010 podría ser algo más intenso de lo que indican las estadísticas agregadas sobre costes laborales.

Por último, los resultados encontrados en el último capítulo confirman que los episodios de desempleo experimentados antes de los 30 años tienen impacto negativo en la evolución laboral del individuo 5 años después e incluso 10 años después, aunque los efectos disminuyen. Es decir, aquellos trabajadores que pasaron más de 6 meses desempleados antes de los 30 años sufren con mayor probabilidad otra experiencia de desempleo durante su vida laboral. No obstante, hay una serie de características observables que aumentan la probabilidad de experimentar otro episodio de desempleo. Por ejemplo, el efecto para las mujeres es 10% superior alto que para los hombres. Otros factores, como la nacionalidad, el nivel educativo, los miembros dependientes en la familia (aquellos menores de 6 años o mayores de 65 años) o el tipo de contrato, también tienen un impacto en la probabilidad de estar desempleado a partir de los 30 años.

Además en relación a posibles extensiones de este último capítulo, hay otros factores que pueden influenciar la probabilidad de sufrir más episodios de desempleo como vivir en un mercado de trabajo local deprimido, procedentes de un entorno familiar desfavorecido y una gama de capacidades y comportamientos individuales normalmente no observados en los datos del mercado de trabajo.

Conclusiones

En resumen, esta tesis estudia diferentes ámbitos del mercado laboral español que han estado de máxima actualidad a nivel europeo en la última década estudiando el posible efecto microeconómico de todos ellos.

Primero, se estudia el impacto que tuvo la subida del SMI durante los años 2004 y 2010, encontrándose un impacto positivo y significativo sobre la probabilidad de perder el empleo en el grupo afectado, excepto para los trabajadores de edades intermedias, entre 25 y 32 años. Este efecto es mayor en los más jóvenes y, sobre todo, entre los mayores de 45 años. El efecto encontrado se centra en dos grupos poblacionales sensibles dadas sus características, pero el efecto encontrado en los mayores de 45 años es de mayor implicación económica debido a que es un grupo de trabajadores que dada su edad les será de gran dificultad encontrar un nuevo trabajo por lo que muchos de estos afectados acabarán siendo desempleados de larga duración.

Segundo, se analiza el papel desempeñado por los cambios en la composición del empleo en la evolución de los salarios a escala agregada, encontrándose que estos cambios podrían explicar, según la metodología utilizada, una parte del incremento de los salarios reales que se observó en las fases iniciales de la crisis del año 2008.

Por último, se estudia el impacto que genera el haber padecido desempleo juvenil sobre los episodios de desempleo cuando se llega a la edad adulta. Los resultados encontrados en este capítulo confirman que los episodios de desempleo experimentados antes de los 30 años tienen impacto negativo en la evolución laboral del individuo 5 años después e incluso 10 años después.

Abstract

Since 2000, it has been experienced different phases in the labour market developments evolution. On the one hand, there was an economic expansion that lasted until 2008, only interrupted by a small recession in 2004. On the other hand, this was followed by one of the worst economic crises in the worldwide with incredible employment destruction in all the European countries.

During this seventeen-year period with two different economic phases, discussions on different aspects of the labour market have been revived in the context of the European Union. On the one hand, during the economic expansion and boom in European labour markets, discussions about the minimum wage were again in the agenda of the majority European countries. For instance, Ireland implemented the minimum wage from the year 2000, the United Kingdom reintroduced it in 1999 (after the withdrawal in the 1980s) and Germany, where the minimum wage is fixed through collective bargaining, there was a strong debate on the appropriateness of establishing it for all productive sectors. Behind these debates, there is always the increase in the number of low wage earners and the social need to improve the conditions of workers. In this context, Spain was not unrelated to these trends. The government elected in 2004 proposed a significant increase in the Minimum Inter-professional Salary to recover the loss of purchasing power that had in the previous years. The objective was to get the minimum wage represent 60% of the average salary. To this end, the government adopted two measures. One was to create a differentiated indicator for the establishment of social incomes in order that the increases in the minimum wage had no impact on public accounts and the other measure adopted was to approve increases in the minimum wage above the evolution of the CPI to reach the quantified target set (60% of the average salary).

On the other hand, different debates about the problems of the European labour markets were revitalised from the European institutions in the period of economic recession. For instance, labour market rigidities were again discussed from 2010 to 2013 and the great impact and long-term consequences of the crisis on young people was another important topic on the agenda in recent years.

The Spanish labour market is a perfect case of study for both situations due to the changes experienced in the last years. Therefore, this thesis focuses its first chapter on the study of the impact of minimum wage increases on the probability of losing the employment of those workers who are receiving wages close to the minimum wage in the Spanish case. Similarly, the evolution on the Spanish labour market and the individual administrative data provided by the Social Security make the Spanish case a perfect country to study the macroeconomic implications of fluctuations in

the composition of the Spanish labour market or the long-term impact of youth unemployment. The second and third chapters focus on these two topics. In chapter two of this thesis, I study the effects of the composition of the Spanish labour market on the evolution of wages and the long-term effect of youth unemployment is analysed in chapter three.

The purpose of the first chapter is to analyse the microeconomic implications that sustained increases in the minimum wage could have on individual probabilities of losing employment.
In Spain, there is a mandatory minimum wage is widespread among developed countries, the main aim being to enhance social equity. From a strictly economic standpoint, however, the theoretical literature emphasises that a minimum wage can also have an adverse impact on employment for certain groups of workers, especially those whose productivity level is below the minimum wage set by the authorities. In empirical terms, the studies available are not fully conclusive on the size and significance of this possible impact. Some studies find that increases in the minimum wage do not have a significantly adverse effect on employment, whereas others find that they do. For the case of Spain, in general the available studies show that there are adverse effects on younger workers, while for all other workers the findings are generally negligible. In this setting, the increases in the minimum wage seen in Spain between 2004 and 2010 provide an interesting case study for a more in-depth empirical analysis of this issue. The data contained in the Social Security Administrative Labour Records (Muestra Continua de Vidas Laborales, which are the data used in this thesis, are particularly useful for this purpose, as they provide detailed individual information on workers' employment histories. The result is that increases in the national minimum wage have a positive and significant impact on the probability of workers in the group affected losing their employment, except for workers in the intermediate (25-32) age group. This effect is more pronounced for younger workers and especially for workers over 45. The analysis by gender confirms these findings, showing that the effect in the 33-45 age group is due exclusively to female workers. Accordingly, the findings suggest that increases in the national minimum wage passed through to collective bargained wages may have raised the individual probability of employment loss for this broader group of workers, but this effect would, in any case, be lower in quantitative terms than the direct effect associated with increases in the national minimum wage. To sum up, even though only a small group of workers is potentially affected by increases in the national minimum wage, the impact on the likelihood of their losing their employment is significant, especially for certain groups, such as younger workers, in keeping with the findings of previous studies, and workers over 45 and female workers in the intermediate age groups. Moreover, a larger overall effect cannot be ruled out, to the extent that increases in the national minimum wage are ultimately passed through to the rest of the wage distribution through the collective bargaining process.

The second chapter of this thesis focuses on the debate that emerged during the years 2012 and 2013. In these years, the International Monetary Fund and the European Commission warned Spain about the need to urgently carry out a new labour reform that would reduce dismissal, simplify the collective bargaining and produce significant wage moderation. The reason was that although labour reforms had been made in 2010 and 2011, the available labour statistics at national and European levels continued showing increases in Spanish labour wages. In the meanwhile, the reality was that wage cuts were being imposed on civil servants and freezes of the wages to the workers of private companies. This may have been due to the fact that the cyclical behaviour of the aggregate level of wages in the Spanish labour market is small, and that this behaviour is even lower in times of recession.

In the Spanish labour market, characterised by high labour market inflows and outflows, aggregate wage behaviour may be significantly affected by changes in the composition of employment. This effect may have been particularly important in the period dating from 2008, in which the marked job destruction has been concentrated in lower skilled and in less experienced workers whose average wage is below the Spanish average. It is therefore important to isolate the mechanical changes which this phenomenon may have caused in wages, in order to determine accurately how wages have responded to economic developments.

The changes in the composition of employment since 2008 have been extremely sharp and generally skewed towards a significant loss in the relative weight of lower-paid workers. For instance, the share of younger workers in total employment fell by nearly 9 percentage points (pp) between 2008 and 2012, and that of foreign workers dropped by nearly 2 pp in the same period. Similarly, the fall in employment was particularly pronounced in workers with a lower educational level, the proportion of which dropped from 14.8% in 2008 to 10.2% in 2012. Finally, in terms of work experience, the share of workers with fewer years of service in the firm decreased sharply, reflecting the greater impact of the crisis on temporary jobs. Specifically, the share of workers with more than three years of experience expressed as a percentage of total employment increased from 61.7% in 2008 to 73% in 2012. In aggregate wage statistics (those normally used for economic analysis), such large changes in the composition of employment may give rise to relatively significant statistical effects which have to be taken into account when attempting to make a precise diagnosis on the behaviour of labour costs and their relationship with the cyclical situation. However, estimating these effects requires disaggregated information on the wage received by each worker, as well as the characteristics of the incumbent and of the job held. This thesis estimates these composition effects in the private sector of the economy using data from the Social Security Administrative Labour Records, which provides such information up to 2012 for a representative sample of social security records.

The conclusion of this chapter is that in the last few years the changes in the composition of employment have been marked and the relative weight of more highly trained and experienced workers who, on average, receive higher wages, has increased. These changes in the composition of employment have played a notable role in aggregate wage behaviour and may, depending on the methodology used, explain a part of the increase in real wages early in the crisis, although the net increase in wages from these effects was still positive, despite the sharp deterioration in employment. The process of wage moderation initiated in 2010 may be somewhat sharper than is indicated by the aggregate statistics on labour costs.

Finally, chapter three analyses the long-term impact of youth unemployment. Youth unemployment is an important structural problem in the Spanish labour market. In addition to that, the Spanish labour market experiences more sharply than other countries the negative effects of the adverse economic situation, especially youth population, which presents high unemployment rates persistent over time. The long- term unemployment tends to produce an increased risk of social exclusion. In addition, there are a number of structural weaknesses that directly affect youth unemployment, such as (i) high early-school-leaving rate, which doubles EU-27 values; (ii) a marked polarity in the youth labour market, which is characterized by a higher percentage of young people with a low level of education. With respect to other European countries, highly qualified Spanish young people are underemployed or suffer unemployment rate well above the euro area average. At the same time, the high incidence of temporary employment and unwanted part-time work mean that more than three quarters of young employees work temporarily or partially, or both, without wishing to do so in Spain.

The long-term youth unemployment has a negative effect on economic growth and productivity. From a macroeconomic point of view, there is a risk of loss of talent and skills since a great amount of university graduates are unable to find a job and to put their knowledge and capabilities into producing innovation and contributing to economic growth. Moreover, having a large share of the young workforce unemployed, not only leads to reduced productivity and gross domestic product but also increases the economic costs for the state, since there is more money to be paid on social benefits and less money coming in from taxes. From a microeconomic point of view, prolonged unemployment at a young age can have broader harmful effects on one's career. The International Monetary Fund explains in "Scarred Generation" notes how prolonged joblessness for young people can cause skills erosion and negatively impact an individual's level of occupational attainment. The beginning of one's career is also a crucial time to establish connections, so a spell of unemployment early on can harm a young person's ability to build and maintain valuable networks. There can even be psychological effects from youth unemployment. It can create a

distrust of socioeconomic and political systems and harm an individual's overall level of happiness.

The data suggest that individuals who spent more than 6 months unemployed before 30 suffer another unemployment experience during their adult labour life. There are a number of observable characteristics which increase the probability of experiencing another unemployment episode. However, more than half of the inter-temporal correlation in unemployment experience cannot be explained by these factors. So, those hit by youth unemployment, from any background, carry persistent effects from their past until at least age 40. The magnitude is that conditional on background characteristics, an extra six months' youth unemployment (pre-30) leads to an extra 10% of time spent in unemployment over the age of 30 years old. The effect for women is 10% higher than for men workers. Other factors such as nationality, occupational category, family member below 6 or over 65 years old or type of contract also have an impact on the probability to be unemployed over the age of 30 years old.

Regarding possible extensions of this preliminary study, there is an additional possible reason why unemployment falls disproportionately on the same individuals both as youths and prime age adults because the persistence of unemployment can differ among areas or regions.

In summary, this thesis examines different areas of the Spanish labour market that have been very topical at European level in the last decade and analyses the possible microeconomic effect of all of them.

CAPÍTULO 1 - CHAPTER 1: MINIMUM WAGES: DO THEY REALLY HURT YOUNG PEOPLE?[2]

Abstract

This paper uses a significant increase in the minimum wage in Spain between 2004 and 2010 as a case study to analyze the effects on the individual probability of losing employment, using a large panel of social security records. We show that this individual approach is important, as the possible effects for different types of individuals may differ from other estimates in the literature, based on aggregate or firm-level data, hence complementing them. Our main finding is that older people experienced the largest increase in the probability of losing their job, when compared with other age groups, including young people. The intuition is simple: among the affected (low-productivity) workers, young people are expected to increase their productivity more than older ones, who are in the flat part of their life-cycle productivity curve. Consequently, an employer facing a uniform increase in the minimum wage may find it profitable to retain young employees and to fire older ones.

[2] Published in The BE Journal of Economic Analysis & Policy, 15(1), 299-328 with Puente, S.

Resumen

Este artículo estima los efectos de la intensa subida del salario mínimo que se produjo en España entre los años 2004 y 2010 sobre la probabilidad individual de perder el empleo, utilizando datos de registros de la Seguridad Social. El principal resultado es que el mayor incremento en la probabilidad de perder el empleo se produjo entre los trabajadores de mayor edad, incluso cuando se los compara con los más jóvenes. La intuición de este resultado es sencilla: entre los trabajadores (de baja productividad) afectados, es de esperar que los más jóvenes experimenten incrementos de productividad superiores a los de los más mayores, que están ya en la parte plana de su ciclo vital de productividad. En consecuencia, un empleador que se enfrente a un incremento uniforme del salario mínimo puede encontrar ventajoso retener a los trabajadores jóvenes y despedir a los mayores.

1. Introduction

The impact of a rise in the minimum wage on employment has been extensively studied in the literature. Basic economic theory states that in a perfectly competitive economy an increase in the minimum wage expels less productive workers from the labour market, and the magnitude of this employment reduction depends on the wage rise required to reach the new minimum wage. However, expectations about future productivity could also play an important role (especially for young workers). Moreover, if the assumption of a perfectly competitive economy is not satisfied, employment destruction among less productive workers could be less intense.

There are several studies on the effects of minimum wages on employment, particularly for the United States and the United Kingdom. In their seminal papers, Card and Krueger (1994, 1995 and 2000) found no negative effects on firm-level employment in the US fast food industry. Other papers confirmed partially these findings, for example Machin and Manning (1997), Portugal and Cardoso (2006) or Dube et al. (2010). On the other hand, there are also papers that find the opposite effect, for example Burkhauser et al. (2000), Neumark and Wascher (2000), Sabia (2009) or Mulligan (2011). Some of these works end up with opposite conclusions despite using very close methodologies in some cases. Hence, the impact of minimum wages on levels of employment is still a controversial issue.

Specifically for the Spanish case, several studies have tried to analyse the impact of minimum wages increases on the labour market, mainly for younger workers. Dolado et al. (1996) find negative effects for workers between 16 and 18 years old, but positive ones for workers over the age of 18. Dolado and Felgueroso (1997), Dolado, Felgueroso and Jimeno (1997) and Blazquez, Llorente and Moral (2009) find no effect at all, and Cebrian et al. (2010) find a negative effect on employment. Most of these papers explore this issue using aggregate data (Labour Force Survey, Employment Situation Survey, Wage Structure Survey or similar), finding effects mainly for young workers. From an aggregate point of view this is certainly sensible, because this group has low levels of experience and productivity, so that they earn lower wages, and their weight in the set of people affected by the minimum wage is consequently high. But when the effect on the individual probability of losing one's job is analysed, this is not necessarily true. Indeed, the effect could be more intense for older workers, because the productivity of young people is expected to increase faster.

Most of the previous studies are focused on aggregate, firm-level, or establishment-level employment data. However, there is a bunch of reasons that can make compatible weak effects on

employment levels with strong individual effects on employment probabilities: Substitution of some workers by others, movement of workers across regions or firms, or data (regions or firms) with most of their workers not affected by the increase in the minimum wage. Consequently, it is important to look also for individual employment effects of minimum wages, independently of their possible aggregate effects on employment levels, and this is the purpose of this paper. In this respect, Stewart (2004) analyses the impact of the introduction of a minimum wage in the United Kingdom in April 1999 on the probability of continuing in employment. He uses a difference-in-differences estimator with three different individual micro datasets and he does not find any adverse effect on employment for any of them. However, this could be due to the short period of study because the minimum wage was introduced on 1 April 1999 in UK, and the time span analysed is March 1997 to March 2000 in the case of the Labour Force Survey, autumn 1994 to autumn 1999 in that of the British Household Panel Survey Data (BHPS), and 1994 to 1999 in the case of the New Earnings Survey Panel Data (NES), which is based on administrative records, like the one we use. In this latter case data refer to April of each year. This leaves only one month under the new minimum wage, which could be the reason for the absence of negative effects on employment found in Stewart (2004).

The individual approach is also important when one wants to assess whether minimum wage effects are different or not across different groups of people. In this respect, some efforts have been made in the literature. For example, Neumark et al. (2004) estimate different effects for different points in the wage distribution, finding the sensible result that low-wage workers are the most strongly affected. Regarding differences by age, the literature is scarcer, probably due to the lack of observations for older workers affected by minimum wages. Neumark and Wascher (1992) obtain a slightly higher effect when the sample contains young adults (16-24) than when only teenagers are considered. However, papers that specifically study the possible different impact for all age groups, including people close to the end of their careers, are very difficult to find.

The Spanish case is particularly interesting to analyse. The government effected a significant increase in the single national minimum wage in mid-2004, of 6.6%. The motivation was the loss of purchasing power suffered by workers on account of the decrease in the real minimum wage between 1999 and 2004. The new minimum did not become obligatory until January 2005, when an additional rise made a total increase in just one year of 11.4%. It was the largest increase since 1990. Subsequently, the real minimum wage continued to rise until 2010, albeit at a slower pace. The change in the minimum wage in 2004-2005 affected all workers irrespective of their age, so we do not have an age group that was affected and another age group that was not. However, we can use the "differential impact" approach, because we expect a higher impact for low productivity workers, or workers with a low potential productivity, than for other workers. Our identification

strategy will be to use some sort of difference-in-differences estimator, comparing the affected group (people with salary in year t less than the real minimum wage in year t+1) with workers with the same low productivity, but in years when the minimum wage did not increase. For this purpose, we use individual data from Social Security Administrative Labour Records, which provide information on the entire labour history of individual workers. With this database we can estimate the effect of the increase of the minimum wage on the individual probability of remaining in employment for affected workers, defined as those whose wages would have to be raised to reach the new minimum. The fact that real minimum wages were decreasing before 2004 is very convenient, as we can compare an affected individual with a non-affected worker with similar characteristics, including wage. The huge amount of observations in our database allows us to properly estimate different effects by age, including people at the last stage of their working lives.

We find that the estimated impact on the probability of losing employment is positive and significantly different from zero for young and older workers, although the magnitude of this effect in the case of older workers is double that in the case of young workers. The negative impact on the probability of remaining in employment might be particularly harmful in the case of older workers because they may be definitively expelled from the labour market. In contrast, young workers have greater chances of finding another job sooner or later, because they are at the beginning of their careers, on the upward-sloping part of their productivity curve (which is not the case for older workers).

The next section sets out the historical developments in minimum wages in Spain. After that, we describe our database (Social Security Administrative Labour Records), discussing its advantages and disadvantages. Section 4 presents the methodology used in this paper and the three models we use to estimate the different possible transitions that may occur as a consequence of increases in the minimum wage. The results for the employment probabilities are then presented in Section 5 and, finally, the conclusions are set out in Section 6.

2. Historical developments in minimum wages in Spain

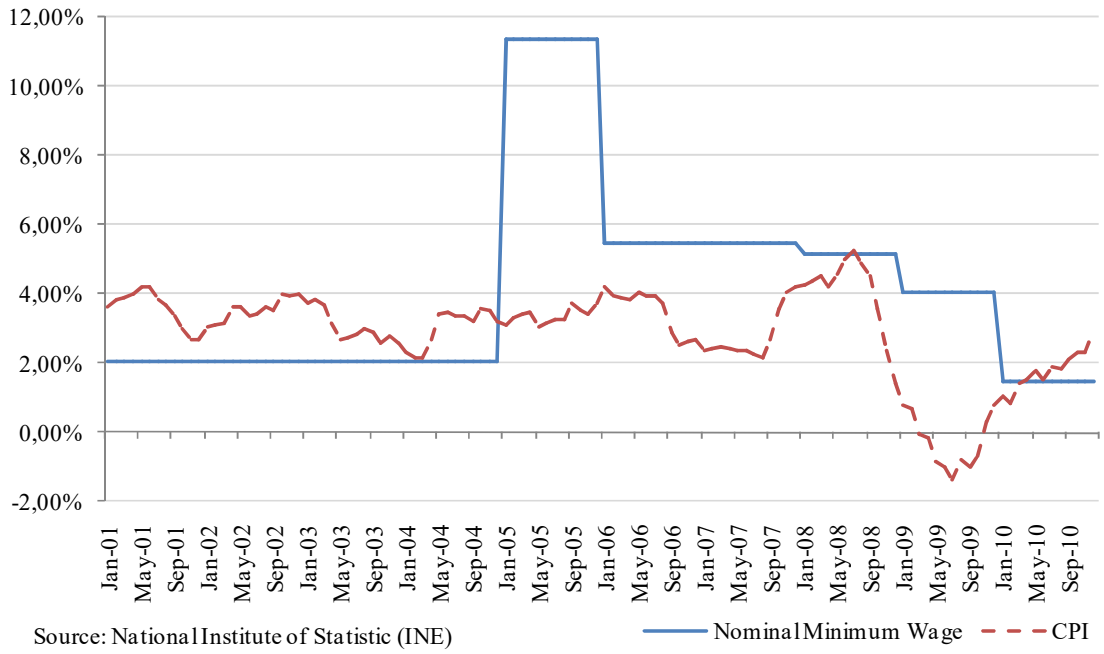
In Spain, a mandatory minimum wage was established for the first time in 1964, and regional differences disappeared in 1980. Between that year and 1990, Spain had three different minimum wages: one for workers less than 17 years old; another for 17 year old, and the other for workers over the age of 17. From 1990 to 1998 two minimum wages existed, one for workers aged 17 and under, and another for workers over the age of 17. However, since 1998, the minimum wage has been independent of age and has covered all workers irrespective of the sector they are in. The

government decides its level each year, usually in January, and it becomes binding since the start of this same year.

Decisions on the level of the minimum wage are made on a discretionary basis, usually taking into account past and predicted inflation, with consultation of employers' and workers' representatives. The minimum wage in Spain is defined in terms of a monthly wage, but is rescaled in proportion to the hours and days actually worked.

The Government effected a significant increase in the single national minimum wage in mid-2004, of 6.6%. The motivation was the loss of purchasing power suffered by workers due to the decline in the real minimum wage between 1999 and 2004. This loss of purchasing power was estimated by the Government to be 6.6% (see **Figure 1**). The new minimum did not become obligatory until January 2005[3] when an additional rise made a total increase of 11.4% in just one year. It was the largest increase since 1990. From this moment on, real minimum wage kept growing, albeit at a lower pace, until 2010.

Figure 1 - *Year-on-year growth in the minimum wage and CPI*



Source: National Institute of Statistic (INE)

[3] This first 6.6% increase could have been anticipated by firms since mid-2004. However, all other increases were decided in the usual way, i.e. in January of the corresponding year, hence they could not be anticipated in an accurate way.

The impact of the minimum wage depends on how close it is to the productivity distribution. Consequently, we can define a directly affected group as workers with a real wage (deflated by the CPI) in year t that is less than the real minimum wage in year t+1. This affected group represents about 1% of all full-time workers each year between 2004 and 2009.

However, in Spain there is another variable closely related to the minimum wage, namely the minimum base for social security contributions. This minimum base is exactly equal to the mandatory minimum wage for lower occupational categories, but is higher for higher occupational categories (see **Table 1**). We have considered these minimum bases as the relevant minimum wage for higher occupational categories, taking into account the possibility for the employer of downgrading the occupational category of workers in order to pay them less than these minimum bases. As **Table 1** shows, minimum social security bases for high groups have also increased, albeit at a lower pace than the minimum wage. This could mean that the impact of the rise in the minimum wage may differ from one occupation to another, because employers could downgrade the occupational category of workers in order to avoid the rise in the minimum social security base. We use separate models to analyse the effect on the individual employment probability for lower and higher categories, because the options available to avoid the increase are different.

Also, another way of avoiding the minimum wage increase is for workers to become self-employed. These two ways of avoiding minimum wage increases without falling into unemployment are analysed in Section 4.

Table 1 - *Nominal minimum Social Security base*

Occupational Category	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Managers	739.1	753.8	768.9	784.2	799.8	836.1	881.1	929.7	977.4	1,016.40	1,031.70
Professionals	613.0	625.3	637.8	650.7	663.6	693.6	731.1	771.3	810.9	843.3	855.9
Technical staff	533.0	543.6	554.4	565.5	576.9	603	635.7	670.8	705.3	733.5	744.6
Others	495.7	505.8	516	526.5	537.3	598.5	631.2	665.7	699.9	728.1	738.9

Source: Social Security System.

Note: The minimum wage in 2004 refers to January 2004 and the minimum wage in 2005 refers to January 2005 which reflects the increase in mid-2004.
It is in the category "others" that the mandatory minimum wage is exactly the same as the minimum Social Security base

3. The data

The Social Security Administrative Labour Records (Muestra Continua de Vidas Laborales, hereinafter MCVL) is an organised set of anonymised micro data extracted from social security administrative records, matched with the Municipal Register to include personal data. This dataset is formed by a 4% random sample, representative of the total population of people who had any kind of relationship with the Social Security System in a given year, which includes either having a working affiliation or receiving any social security benefit at some time in the reference year, regardless of how long they have been in this situation. The advantage of this sampling method is that it will include people who have short and frequent relationships with the Social Security System in a given year who could be excluded by a sampling process with a fixed date. This can be a numerous group: on average, around three million people who have worked at some time in a given year were not affiliated on a given day. This group of people consists mainly of women and young workers with short-term contracts. The MCVL sampling process consequently reduces the bias against these collectives. In particular, our sample includes all individuals who have had a relationship with the Social Security System at least once between 2005 and 2010, because we merge all observations from wave 2005 to 2010. People not in the sample are close to inactivity or a similar situation, because if a person returns to the labour market, even for one day, this person will be in the sample.

The sample provides detailed monthly information about job characteristics such as type of contract, length, sector of activity, working time, monthly earnings, occupational group, as well as other personal information (sex, age, nationality, place of birth, place of residence, household size…) from the Municipal Register. MCVL data for a given year are published in June of the following year. For a given wave, all these variables are provided in a monthly frequency, covering the entire labour history of each individual since 1980.

The random sampling process selects everybody with a personal identification code belonging to some predetermined set, which is the same every year. This type of sampling ensures that people who maintain their relationship with the Social Security System along several years are always sampled. We merge all six waves from 2005 to 2010, and for each individual, we take the information of the most recent wave. With this procedure, we are sure we have information covering the entire labour history of each sampled person who worked or received benefits at any time between 2005 and 2010. Therefore, we can have accurate information about the transition between employment and unemployment.

For our empirical analysis, the main advantage of the MCVL is that it provides a good picture of wages, because the information does not come from a survey. The disadvantage is that the bias against people with no relationship at all during the whole period is not completely eliminated. This bias is not too relevant, because these people are very close to inactivity.

The information of working histories starts from 1980, but we study the impact of minimum wages from 2000 to 2010 because during this time there was a period in which the real minimum wage was falling (2000-2004) and another period in which the real minimum wage increased (2005-2010). In this way, we can separate the effect of low wages and minimum wages, using the period 2000-2004 as a control to estimate the effect of low-wages alone on employment and then using 2005-2010 to estimate the effect of the minimum wage increase on employment.

We focus on the transition between employment[4] and unemployment, but we have also analysed the transition to self-employment.

Experience in the workplace is computed sequentially from the first affiliation after 1980. We accumulate days worked for the same firm, but from the moment the worker changes to another firm the tenure is set to zero. With this sample it is not possible to calculate the total experience of the worker in the labour market, because records which end before 1980 are not observable.
We have defined as ***failure*** the case of a person who works full-time throughout a given month under the General Social Security Regime, but twelve months[5] later does not work on any day of the month as an employee (i.e. excluding self-employment, which is analysed later). The idea behind this definition is that a person is still in the market if he manages to work at least one day under the new minimum.

We define those workers with a current real wage below the real minimum twelve months later as the affected group. The idea is that the wages of this group must be increased (in real terms) in order to comply with the new minimum, so the employer has to take the decision either to pay them a higher salary or to fire them[6].

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[4] Defined as being employed under the General Social Security Regime.

[5] The Spanish labour market has a marked seasonality along the year, and all minimum wage increases were done from December to January. Therefore, estimating monthly transitions in the exact month when the increase happened will contaminate the estimation with the typical seasonality of January. For these reasons, we used 12-month transitions in the estimations.

[6] In Spain, firing decisions can be taken relatively fast. For temporary contracts, around one third are open-ended, meaning that the worker is hired until his associated project has ended. Firms can finish these contracts very easily. For the remaining temporary contracts, and all the permanent ones, the worker can be fired with a fifteen days' notice, provided the firm immediately pays the dismissal costs.

Table 2 - *Percentage of full-time workers affected by an increase in the real minimum wage twelve months later, by age group*

	AGE				
Year	Total	16-24	25-32	33-45	45-64
2004	0,88	1,74	1,01	0,69	0,63
2005	0,78	1,53	0,85	0,64	0,59
2006	0,76	1,48	0,79	0,64	0,62
2007	0,59	1,14	0,58	0,53	0,50
2008	0,93	2,06	0,87	0,83	0,77
2009 (*)	0,14	0,27	0,58	0,51	0,11

Source: MCVL.

(*) 2009 refers to January-March 2009 only, because there were falls in the real minimu wage from April

Table 2 shows the group of affected people, according to the previous definition, as a percentage of all workers in the same age group.[7] As can be seen, their incidence is higher among young people, a fact that is undoubtedly behind the result usually found in the literature, namely that this group is the most affected by minimum wages. However, from a micro perspective, nothing in the table suggests that the individual probabilities of losing a job are higher among the young.

Table 3 shows the percentage of workers that had lost their employment twelve months later, depending on whether the worker was affected by the new minimum wage or not. As can be seen, affected workers are more prone to lose their job than those not affected. The recent crisis raised the probability of losing a job, but the difference between the two groups remains the same.

Table 3 - *Percentages of workers who lost their employment in the period 2000-2010, classified by affected vs. unaffected*

	Year									
Group	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*
Affected workers	ND	ND	ND	ND	16.7	16.6	15.3	18.2	23.7	21.7
Not affected workers	8.6	9.1	8.6	8.6	8.6	8.5	8.7	11.0	15.1	12.6

Source: MCVL.

(*) 2009 refers to January-March 2009, there were falls in the real minimum wage from April

Note: Between 2000 and 2003 there is no affected group because there were no increases of real minimum wage

In order to estimate properly the impact of minimum wage by age, we need a large enough number of affected people for all age groups. In this respect, **Table 4** shows that this number is greater than one hundred for almost all years and groups, including the 45-64 group, for which the incidence of the minimum wage was the lowest.

[7] The age groups were selected to have a similar number of affected people in each of them (see **Table 4**).

Table 4 - *Full-time workers affected by real minimum wage twelve months later, by age group*

	AGE				
Year	Total	16-24	25-32	33-45	45-64
2004	1266	266	424	359	216
2005	1168	233	370	352	213
2006	1182	227	350	370	236
2007	941	173	255	315	198
2008	1400	264	353	478	306
2009 (*)	731	95	194	274	168

Source: MCVL.

(*) 2009 refers to January-March 2009 only, because there were falls in the real minimum wage from April

4. Methodology

This paper estimates the effect of the increase in minimum wages on employment. This effect may differ by age group and by occupational group.

The motivation for this study is that, from a macroeconomic point of view, one would expect the group of young workers to be more affected than other groups, because young workers receive lower wages. From a microeconomic perspective, however, the picture may be different, because the effect of minimum wages on individual probabilities of employment do not depend on the number of people affected, but rather on things like functional mobility, learning and long-term productivity. All of these issues have an effect that may depend on age.

In the Spanish case there is a single minimum wage after 1998, which is revised each year in nominal terms. In this study, we analyse the period 2000-2010, which includes a sub-period without increases in the real minimum wage (2000-2004) and another one with increases (2005-2009).[8] We use the period without increases as a control for the effect of low wages on the employment probability. We try to see what would have happened if the real minimum wage had not been increased.

The main characteristic of the methodology employed is the use of a large individual longitudinal dataset to compare the individual employment probability of people working in month t who had a wage lower than the real minimum wage in month t+12 (the affected group) with that of workers

[8] By contrast, Stewart (2004) uses data from 1994 to April 1999 in the NES to analyse the introduction of the minimum wage in April 1999.

who were receiving a wage higher than the minimum in t+12.[9] However, a direct comparison of these two groups can lead to an incorrect conclusion because, even in the absence of a minimum wage, workers with lower wages have more probability of losing their employment. In this respect, the increase in the real minimum wage in 2005 after a period of falls in the real minimum wage is very convenient. The fact that it approximates a "quasi-experiment" allows us to use a difference-in-differences estimator to identify the effect of the rise in the minimum wage. The strategy of identification consists of comparing a worker with a real wage below the forthcoming minimum with a worker with similar characteristics but with a real wage above (but near) the minimum, who is therefore not affected by the increase, and also with a worker with similar characteristics and same wage during the period in which the real minimum wage did not increase (2000-2004).

Besides studies focused on aggregate employment effects, which typically estimate some sort of elasticity of employment to minimum wage (for example, Card and Krueger 1994, Sabia 2009), most micro-data based papers use a Logit model to estimate the impact of minimum wage increases on the probability of losing the job (for example, Neumark et al. 2004, Portugal and Cardoso 2006, Stewart 2004). In most cases, transitions after a 12-month time span are considered, to avoid possible seasonality. Regarding the definition of the treated group, there are mainly two different approaches. The first one is to identify the treated group (for example, those whose wage is below the real minimum one year later), and compare it with some comparison group (workers with slightly higher wages, other non-affected ages, etc.) by means of a dummy variable identifying only treated observations. The problem with this approach is that the response of a worker very close to new minimum is assumed to be similar than other worker with a much lower wage.

Consequently, most studies using microdata (for example Stewart 2004, Portugal and Cardoso 2006) include also a continuous definition of treatment, which takes into account the distance between current wage and the future minimum. Given that, in our sample, real minimum wages experienced quite different increases in each year of the 2005-2010 period, we opted for this second definition.

Specifically, the approach used here defines the affected group in terms of a gap between the individual's real wage and the real minimum wage in month t+12, but only if the former is lower than the latter. Consequently, we have a continuous variable measuring the distance from the real wage to the real minimum wage in t+12. This is convenient for our case study, because in the period 2005-2010 the real minimum wage increased with varying intensity from year to year. The variable *wagegap* is defined as:

[9] We use a span of 12 months because firing has a strong seasonal pattern in Spain.

$$wageg_{i,t} = \max(m_{i,t+12} - wag_{i,t}; 0) \qquad (1)$$

Where *m* is the real monthly minimum wage of individual[10] *i* in month *t+12* and *wage* is the individual monthly real wage of the same individual in month *t*. The difference in the behaviour of the affected group and the comparison groups, after controlling for individual characteristics, can be interpreted as the effect of the minimum wage. So, we have two groups, one of them with *wagegap*=0, which includes the two comparison groups defined above, and the other with *wagegap*>0 which corresponds to the affected group. We propose the following Logit model for the probability of losing employment:

$$\Pr[d_{i,t} = 1] = \Lambda\{\beta' x_{i,t} + \theta wagegap_{i,t} + \alpha wag_{i,t} + \Phi' g_{i,t} + \epsilon_{i,t}\} \qquad (2)$$

Where Λ is the Logit transformation. The dummy d_{it} has two possible values, 0 when the worker continues working in t+12 as an employee, and 1 if the worker is no longer working in t+12 as an employee. We consider the situation twelve months later to avoid seasonality, which is particularly important in the Spanish labour market. Also, we introduce as a control a vector x_{it} with individual characteristics, including gender, tenure in the firm, nationality, type of contract (temporary or permanent), multiple job-holding, age and family size. We divide individuals into four age groups: group 1, aged 16-24, group 2, aged 25-32, group 3, aged 33-45 and finally, group 4, aged over 45. We have chosen these thresholds to have similar number of affected workers in each age group (see **Table 4**). For family size, we have four variables, to control for the different ages of the dependants in the family: less than 6 years old, 7-15, 16-65 and over 65 years old. In this way, we capture the different impact of infants, children and retired people on working decisions.

θ captures the effect of an increase in the minimum wage on the individual probability of losing employment. *Wagegap* measures how far the wage of a worker is from the new real minimum wage twelve months later. We cannot expect a similar effect for someone who would need a significant increase in their monthly wage as for someone who would need only a small increase to comply with the new minimum. Hence, the gap not only indicates who is affected, but also measures to what extent they are affected. Estimation with this variable has more precision than with a simple dummy variable capturing whether the individual is affected or not.

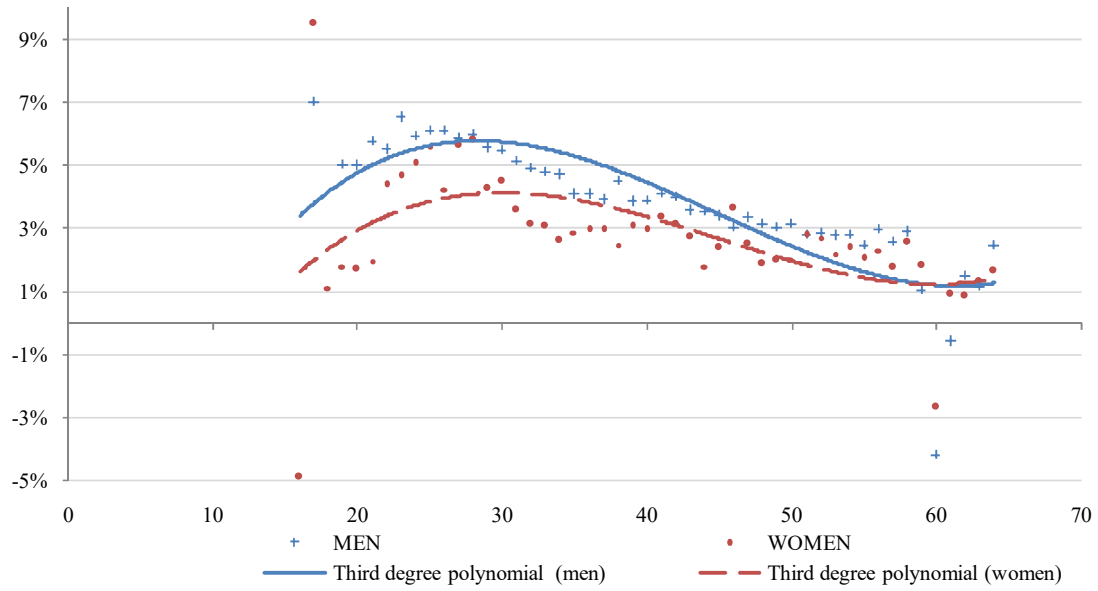
Finally, g_{it} is a set of dummies, which include month, year and the interaction of month and the variable wagegap as controls for macroeconomic and seasonal effects.

[10] The real monthly minimum wage is individual because minimum social security contributions are different depending on the occupation group.

We add to the previous specification an interaction between *wagegap* and age group. We use this interaction because we want to ascertain whether the effect of minimum wages differs according to the age of workers. The effect could be different as a result of different productivity growth rates across age groups. For demographic groups with high productivity growth rates, minimum wage increases could be non-binding if the increase in productivity is high enough to overcome the increase in minimum wage.

Figure 2 shows real wage growth by age. This graph shows that the maximum wage increases are seen in the intermediate age groups, descending as the age increases until reaching a minimum for older workers of around 1%. By gender we can see that the increase in women's wages is lower for all age groups except the oldest, where increases are similar to men's. These developments suggest that the impact of the minimum wage on employment should be higher for women and for old people.[11]

Figure 2 - *Increase in real wages by age in the period 2003-2004*



The increase in the real minimum wage in Spain depends on the occupational category, through the existence of different minimum bases for social security contributions (see **Table 5**). The largest cumulative increase was for the lowest occupational category, amounting to 18.4%. This is 7 percentage points more than the increase for the rest of the categories, and represents over €108

[11] The graph depicts wage increases between 2003 and 2004. Choosing different years (not affected by minimum wage increases) does not alter the picture.

more per month.[12] For that reason, our benchmark model of employment probability is estimated for the lowest occupational category.

Table 5 - *Cumulative increase from 2004 in the real minimum wage, by occupational category*

	Occupational category			
Period	Managers	Professionals	Technical staff	Others
2004-2005	1,13%	1,12%	1,12%	7,76%
2004-2006	2,95%	2,96%	2,98%	9,79%
2004-2007	5,69%	5,68%	5,72%	12,65%
2004-2008	6,76%	6,75%	6,81%	13,80%
2004-2009	11,34%	11,33%	11,39%	18,72%
2004-2010	11,02%	11,00%	11,08%	18,36%

Source: MCVL.

The previous model allows us to estimate if the increase in minimum wage makes low-wage workers more prone to lose their job. However, it cannot be used to assess what happens with those workers who lose their employee status. One possibility is that they simply stop working and become unemployed. But there is another possibility: They can continue working, but as self-employed, because under this status minimum wage provisions do not apply. In Spain, self-employed people still have a minimum social security contribution base, which determines minimum social security taxes. However, it is totally legal for a self-employed worker to have income below this minimum base, and it could be optimal for the individual if this is the only way he has to keep himself attached to the labour market. Hence, it is interesting to see whether those jobs destroyed by the minimum wage end up as unemployed or as self-employed. In order to cover this possibility, we estimate a multinomial Logit model (named Multinomial 1 from now on) with the same specification as above, but replacing the dependent variable with a categorical variable (S_{it}) that takes three possible values: 0, when the worker continues working twelve months later (t+12) as an employee; 1, if the worker does not continue working in t+12; and finally, 2, if the worker works as a self-employed worker in t+12 and not as an employee. Other variables of the model keep the same definition. In this case, we want to estimate the effect of the minimum wage on the transition from employment to unemployment or to self-employment, again only for workers in the lowest occupational category.

Finally, the case of people working in high occupational categories (managers, professionals and technical staff), whose minimum base was also increased, but at a lower pace, deserves a specific analysis. This is because those workers that cannot be paid according to the new minimum base can

[12] Real wages, deflated by CPI, base 2006.

go to unemployment or self-employment (as before). There is also a third possibility: the employer could decide to downgrade workers to lower categories, which still have a lower base *level,* to avoid the increase in the minimum social security base (see **Table 1**). Hence, we have proposed another multinomial Logit for analysing the transition to unemployment, to a lower occupational category or to self-employment (which we will refer to as "Multinomial 2").In this case, we have defined a category variable (M_{it}) that takes four possible values: 0, when the worker continues working as an employee and in the same or in a higher occupational category twelve months later (t+12); 1 and 2, in the same cases as defined above; and finally, 3, when the worker continues working as an employee, but in a lower occupational category, in t+12.
With these three different models we cover all the possible transitions affecting workers that could have been influenced by the increase in the real minimum wage in the period 2005-2010.

5. Results: probability of losing employment

The sample is restricted to those aged between 16 and 65 in low occupational categories who had a relationship with the Social Security System. In the first column of **Table 6**, we present the estimation results for our benchmark model, in which the dependent variable d_{it} measures the probability of not working any day in month t+12, conditional on working full-time the entire month in t.[13]

All specifications include an interaction term of age with both wage and *wagegap*, as well as other control variables. Standard errors are in parentheses in each case.

[13] These two latter restrictions (working full time the entire month) are needed to ensure that the observed wage is comparable to the minimum.

Table 6 - *Probability of losing employment. Marginal effects in percentage points for different specifications of Logit model*

	Total	Women	Men	January only (B)	48 months (C)
Dependent variable	Probability of losing employment				
Wage, 16-24 years old (euro)	-0.004***	-0.005***	-0.004***	-0.004***	-0.005***
	(6.47 10^{-5})	(0.000)	(7.62 10^{-5})	(2.38 10^{-4})	(1.90 10^{-4})
Wage, 25-32 years old (euro)	-0.006***	-0.006***	-0.005***	-0.006***	-0.009***
	(3.63 10^{-5})	(6.31 10^{-5})	(4.5 10^{-5})	(1.24 10^{-4})	(1.02 10^{-4})
Wage, 33-45 years old (euro)	-0.006***	-0.007***	-0.005***	-0.006***	-0.009***
	(3.25 10^{-5})	(6.06 10^{-5})	(3.88 10^{-5})	(1.10 10^{-4})	(9.07 10^{-5})
Wage, more than 45 years old (euro)	-0.002***	-0.004***	-0.001***	-0.002***	8.35 10^{-5}
	(3.11 10^{-5})	(7.0510^{-5})	(3.52 10^{-5})	(1.06 10^{-4})	(7. 17 10^{-5})
Wagegap[A] , 16-24 years old (euro)	0.076***	0.073**	0.093***	0.051	0.047***
	(0.021)	(0.029)	(0.029)	(0.033)	(0.018)
Wagegap, 25-32 years old (euro)	0.026	0.040	0.019	-0.009	0.038**
	(0.020)	(0.028)	(0.029)	(0.025)	(0.017)
Wagegap, 33-45 years old (euro)	0.051***	0.119***	0.020	0.030	0.061***
	(0.020)	(0.028)	(0.028)	(0.025)	(0.017)
Wagegap, more than 45 years old (euro)	0.142***	0.179***	0.092***	0.094***	0.100***
	(0.021)	(0.029)	(0.029)	(0.031)	(0.018)
Spanish nationality	-2.452***	-0.023***	-2.637***	-2.594***	-4.643***
	(0.020)	(0.037)	(0.024)	(0.071)	(0.073)
Dummy temporary contract	6.436***	6.642***	6.475***	6.479***	4.032***
	(0.016)	(0.028)	(0.020)	(0.056)	(0.047)
Tenure in the firm (days)	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(7.91·10^{-6})	(1.43·10^{-5})	(9.43·10^{-6})	(2.8·10^{-5})	(1.95·10^{-5})
Other family members, 0-6 years old	0.755***	3.050***	-0.381***	1.005***	0.622***
	(0.015)	(0.025)	(0.019)	(0.051)	(0.047)
Other family members, 7-15 years old	-0.531***	0.050*	-0.755***	-0.442***	-1.119***
	(0.015)	(0.026)	(0.017)	(0.051)	(0.044)
Other family member, 16-65 years old	-0.102***	-0.251***	-0.026***	-0.079***	-0.113***
	(0.006)	(0.012)	(0.007)	(0.022)	(0.021)
Other family members, over 65 years old	0.076***	-0.283***	0.245***	0.104	-0.361***
	(0.020)	(0.037)	(0.024)	(0.069)	(0.065)
N	16,898,400	5,656,671	11,241,729	1,350,746	3,101,399
X^2 (p-value)	6,469,947.60 (0.000)	2,191,804.95 (0.000)	4,251,639.04 (0.000)	514,538.31 (0.000)	1,093,497.32 (0.000)

Notes: Other control variables: Year and month dummies, age group, multiple job-holding and the interaction between month and wagegap.
(A) Wagegap is only for workers who receive a salary lower than real minimum wage in t+12.
(B) This model is like our benchmark, but using only January observations.
(C) This model is only estimated for 2000 and 2004 and the employment status 48 months later.
*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

The marginal effect of wages is negative and significantly different from zero for all age groups[14]. This captures the fact that wages rise with productivity, and higher productivity makes it less likely that workers will lose their jobs. On top of that, we found that the *wagegap* has an additional effect for workers with a real wage lower than the real minimum wage twelve months later. Therefore, this effect can be interpreted as the effect of yearly increases in the real minimum wage on the probability of losing employment. The *wagegap* effect is positive and significantly different from zero for all age groups, except for workers between 25 and 32 years old. Moreover, the effect is highest among the oldest workers, and almost twice the effect observed for young workers[15]. To

[14] Differences across age groups are all significant at 1%.

[15] Differences in the effect of minimum wages across age groups are all significant at 1%, except for the third age group (33-45 years), which is significantly different from the first two age groups only at 5%.

obtain some idea of the economic importance of these estimated effects, we have conducted the following exercise: We took a male Spanish worker with a wage equal to the minimum in 2004 and all other variables at their average in 2004, and simulated what would has been his probability of losing employment had the minimum wage increased in that year to the maximum observed in 2010. In other words, we simulate the impact of the accumulated increase in minimum wages for the lowest productivity worker, isolating it from movements in other covariates (including year). According to the estimations of the model, the result of the exercise for the youngest group is that the probability of losing employment one year later rises from 11.2% (no *wagegap*) to 24.9% (maximum *wagegap*). A similar exercise for the oldest group yields a substantial increase in the probability, from 11.2% to 41.9%.

Analysing the results by gender (second and third columns), we found that the impact of the real minimum wage for workers between 33 and 45 years old is due, exclusively, to female workers, as the effect on male workers in this age group is non-significant[16]. **Figure 2** sheds some light on the interpretation of this fact, since it shows that the productivity growth curve is lower in the case of females, which may explain why the impact on women affects more age groups than in the case of men. The marginal effect of the *wagegap* on older workers is also higher for women.

Table 6 shows the effects of other control variables. Nationality and tenure in the firm are negative and significant for both genders. Thus, Spanish workers have less probability of losing their employment, and as tenure in the firm increases the probability of losing employment decreases. Also, workers with temporary contracts are more prone to losing their jobs. Finally, we control for dependants in the family. In this case we find that dependants between 0 and 6 years old and dependants over the age of 65 have a positive and significant effect on the probability of losing employment. Other control variables also have the expected sign.

In the fourth column we can see results for a model which is the same as the benchmark, but restricted to January observations. This is done for the purpose of comparison with the model in Stewart (2004) using the New Earnings Survey Panel Data.[17] In his model, he analyses the effect only one month after introducing the minimum wage. Hence, restricting our sample to January observations makes these two models comparable. We find that the *wagegap* effect is only positive for workers over the age of 45. The effect of the rest of the variables is similar to that in the

[16] Differences between genders are significant at 1% for the first and third wage groups, at 5% for the second one, and at 10% for the one with 45 years or more. Not surprisingly, these differences are less significant for the age group (older than 45) with less differences in average wage growth (see figure 2).

[17] This database is based on administrative records and is the most similar to our database. Stewart analyses the period from 1994 to 1999, but the data are yearly and the survey is conducted in April, so that he really only analyses the situation one month after the introduction of the minimum wage.

benchmark model (first column). Therefore, the lack of time to fully observe the effects of the introduction of the minimum wage could be the reason for the absence of significant effects found in Stewart (2004).

In the last column we show a modified version of our main model. We take workers in year 2000 and their labour status in 2004 and workers in 2004 and their labour status in 2008. In this case, the affected group is composed by workers who had a wage that was lower than the real minimum wage 48 months later. Using this model, we assess the relevance of the problem of self-selection. In other words, with our benchmark model we may only see the evolution of surviving workers after the first increase in minimum wage, but with this variation of the main model we can see whether our estimation is affected by this problem. We find that the *wagegap* effect on the probability of losing employment is positive and significantly different from zero for all age groups. Also, the magnitude of the effect is still largest for older workers, being twice that for young workers.

Table 7 shows the estimations by sector of activity. In agriculture there are not enough observations because the majority of workers in this sector are subject to a special social security regime, and hence not well covered in the MCVL. The greatest effects are in the construction sector, although in all sectors the effect for older workers is positive and significantly different from zero, and the marginal effect is greater for older workers than for young workers. Therefore, the main conclusion is maintained. For the rest of the variables the results are similar to those obtained with the aggregate model, with some differences in the effect of dependants in the family by sector.

Table 7 - *Probability of losing employment. Marginal effects in percentage points for sector[(B)] especifications of Logit model*

	Industry	Construction	Services
Dependent variable	Probability of losing employment		
Wage, 16-24 years old (euro)	-0.004***	-0.003***	-0.004***
	$(1.1\cdot10^{-4})$	$(2.07\cdot10^{-4})$	$(8.74\cdot10^{-5})$
Wage, 25-32 years old (euro)	-0.006***	-0.005***	-0.006***
	$(6.55\cdot10^{-5})$	$(1.3\cdot10^{-4})$	$(4.5\cdot10^{-5})$
Wage, 33-45 years old (euro)	-0.006***	-0.006***	-0.006***
	$(5.85\cdot10^{-5})$	$(1.1\cdot10^{-4})$	$(4.13\cdot10^{-5})$
Wage, more than 45 years old (euro)	-0.002***	-0.004***	-0.002***
	$(4.7\cdot10^{-5})$	$(1.13\cdot10^{-4})$	$(4.25\cdot10^{-5})$
Wagegap[A], 16-24 years old (euro)	-0.026	0.254**	0.099***
	(0.063)	(0.106)	(0.021)
Wagegap, 25-32 years old (euro)	-0.019	0.271**	0.052**
	(0.062)	(0.109)	(0.020)
Wagegap, 33-45 years old (euro)	0.037	0.348***	0.078***
	(0.061)	(0.105)	(0.020)
Wagegap, more than 45 years old (euro)	0.178***	0.525***	0.162***
	(0.063)	(0.120)	(0.021)
Spanish nationality	-1.470***	-2.717***	-2.331***
	(0.045)	(0.053)	(0.025)
Dummy temporary contract	6.064***	5.740***	5.616***
	(0.032)	(0.056)	(0.020)
Tenure in the firm (days)	$-8.42\cdot10^{-4}$ ***	-0.005***	-0.002***
	$(1.1\cdot10^{-5})$	$(3.29\cdot10^{-5})$	$(1.05\cdot10^{-5})$
Other family members, 0-6 years old	0.350***	-0.240***	1.151***
	(0.030)	(0.042)	(0.019)
Other family members, 7-15 years old	0.668***	-0.755***	-0.438***
	(0.029)	(0.039)	(0.019)
Other family member, 16-65 years old	-0.036***	-0.115***	-0.172***
	(0.013)	(0.017)	(0.008)
Other family members, over 65 years old	0.101***	0.575***	0.043***
	(0.038)	(0.060)	(0.025)
N	3,977,113	2,775,198	9,955,216
X^2 (p-value)	1,544,532.23 (0.000)	970,603.94 (0.000)	3851917.69 (0.000)

Notes: Other control variables: Year and month dummies, age group, multiple job-holding and the interaction between month and wagegap

(A) Wagegap is only for workers who receive a salary lower than real minimum wage in t+12

(B) The agriculture sector cannot be analysed because it has a special Social Security regime and hence there are not enough observations

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Standard errors in parenthesis.

The overall conclusion is that increases in the real minimum wage have negative effects on the individual probability of employment for both young and older workers. However, the magnitude of this effect in the case of older workers is double that for young workers. Moreover, for older workers (and to some extent female workers) the negative impact on the probability of employment

could be more harmful because the affected workers may be definitively expelled from the labour market, as the probability of future increments in productivity overcoming the effect of the minimum wage is lower. In contrast, young workers have greater chances of finding another job sooner or later because they are at the beginning of their careers, and situated on the upward-sloping part of their productivity curve, which is not the case of older workers. Interestingly, the negative effects of minimum wages on employment appear to be associated with groups with low productivity growth, which is consistent with this theory.

In the next model (see **Table 8**) we incorporate the possibility that workers may choose to keep working for the same or different firm, but with self-employed status, so that the firm does not have to increase their wages. We estimate a multinomial Logit model with a categorical dependent variable (S_{it}) with three possible values, 0 is when the worker continues working twelve months later (t+12) as an employee; 1 if the worker is unemployed in t+12 and finally, 2 if the worker works as self-employed in t+12.

The marginal effects of wages have the expected sign. Their effect on the probability of maintaining the job is positive and significant, and it is negative and significant in the probability of going to unemployed or self-employed. Other control variables have the same effect as in the benchmark model. Regarding the *wagegap* variable, the effect is negative and significant in the probability of maintaining employment for young and older workers, while it is non-significant for other age groups. In both affected groups, we find positive and significant effects on the probability of going to unemployment. In contrast, we find significant (positive) effect on the probability of working as self-employed only for older workers.[18] As an example, we use an exercise similar to the one previously defined. According to the estimated model, a young, male, Spanish worker in 2004 had probabilities of 10.9% and 0.5% of losing employment or becoming self-employed, respectively. These probabilities would have been increased to 23.6% and 2.2%, respectively, had the minimum wage been increased in one year up to the maximum in 2010. The corresponding increase for an older worker is from 11.1% and 0.3% to 33.6% and 16.1%.

In conclusion, young and older workers have a significant and positive effect on the probability of becoming unemployment. Also, the group of older workers has a significant and positive effect to change their employment status to self-employed. Therefore, (a small) part of the effect find for older workers in previous Logit models is capturing a change to self-employment status.

[18] All differences across age groups are significantly different at 1%, with the following exceptions: The effect of going into unemployment for the two intermediate age groups, and the effect of becoming self-employed for the two youngest groups. Also, the difference between first and third groups in the probability of becoming self-employed is only significant at 5%.

Table 8 - *Effect on the probability of ending in state (marginal effects in percentage points): Reference group: Employee*

Dependent variable	Employed	Unemployed	Self- employed
	Probability of ending in state indicated above		
Wage, 16-24 years old (euro)	0.004*** ($6.5\cdot10^{-5}$)	-0.004*** ($6.3\cdot10^{-5}$)	$-1.42\cdot10^{-4}$*** ($1.81\cdot10^{-5}$)
Wage, 25-32 years old (euro)	0.006*** ($3.64\cdot10^{-5}$)	-0.006*** ($3.57\cdot10^{-5}$)	$-2.64\cdot10^{-4}$*** ($8.5\cdot10^{-6}$)
Wage, 33-45 years old (euro)	0.007*** ($3.25\cdot10^{-5}$)	-0.006*** ($3.18\cdot10^{-5}$)	$-4.31\cdot10^{-4}$*** ($8.17\cdot10^{-6}$)
Wage, more than 45 years old (euro)	0.002*** ($3.13\cdot10^{-5}$)	-0.002*** ($3.00\cdot10^{-5}$)	$-1.47\cdot10^{-4}$*** ($1.05\cdot10^{-5}$
Wagegap[A] , 16-24 years old (euro)	-0.071*** (0.021)	0.061*** (0.020)	0.009 (0.006)
Wagegap, 25-32 years old (euro)	-0.012 (0.201)	0.003 (0.019)	0.009 (0.006)
Wagegap, 33-45 years old (euro)	-0.030 (0.019)	0.001 (0.019)	0.016*** (0.006)
Wagegap, more than 45 years old (euro)	-0.130*** (0.021)	0.105*** (0.020)	0.024*** (0.006)
Spanish nationality	2.890*** (0.020)	-2.786*** (0.019)	-0.106*** (0.006)
Dummy temporary contract	-6.440*** (0.016)	6.358*** (0.016)	0.084*** (0.004)
Tenure in the firm (days)	0.003*** ($8\cdot10^{-6}$)	-0.003*** ($7.82\cdot10^{-6}$)	$-1.44\cdot10^{-4}$ *** ($2.13\cdot10^{-6}$)
Other family members, 0-6 years old	-0.762*** (0.015)	0.661*** (0.015)	0.101*** (0.004)
Other family members, 7-15 years old	0.417*** (0.015)	-0.442*** (0.014)	0.024*** (0.004)
Other family member, 16-65 years old	0.065*** (0.006)	-0.059*** (0.006)	-0.006*** (0.002)
Other family members, over 65 years old	-0.125*** (0.020)	0.125*** (0.020)	$-6.52\cdot10^{-4}$ (0.006)
N	16,898,400		
X^2 (p-value)	622,916.78 (0.000)		

Notes: Other control variables: Year and month dummies, age group, multiple job-holding and the interaction between month and wagegap.
(A) Wagegap is only for workers who receive a salary lower than real minimum wage in t+12
*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

In the last model estimated (**Table 9**) we have covered the analysis of workers in higher occupational categories, in which the increase in the minimum social security contribution has been

lower. For these occupational categories, the employer could decide either to downgrade workers to lower categories to avoid the increase in minimum wage, or to fire them. And as before, workers could choose to work on a self-employed basis.

In order to cover all these possibilities, we have proposed another multinomial Logit that covers all these transitions (see **Table 9**).In particular, we have defined a categorical variable (M_{it}) that takes four possible values: 0 when the worker continues working as an employee and in the same or in a higher occupational category twelve months later (t+12); 1 and 2 in the same cases as defined above; and finally 3 when the worker continues working as an employee, but in a lower occupational category in t+12.

The marginal effects of wages have the expected sign. Their effect on the probability of staying employed is positive and significant, while it is negative and significant in the probability of changing to unemployed, self-employed or to a lower occupational category. Regarding the *wagegap* variable, only young workers of higher occupational categories have a significant and positive effect on the probability of changing to unemployed status or to be downgraded to a lower occupational category, while all these effects for older workers are not significantly different from zero. The presence of high firing costs in the Spanish labour market could explain these results, making young qualified workers more prone to be fired or downgraded than their older counterparts. Another interpretation could be the importance of specific human capital for qualified jobs, which makes an older worker less replaceable.

Table 9 - *Effect on the probability of ending in state (estimated coefficients) for higher occupation categories: Reference group: Employee*

Dependent variable	Maintaining employment	Unemployed	Self- employed	Downgrade of occupational category
	Probability of ending in state indicated above			
Wage, 16-24 years old (euro)	0.007***	-0.003***	$-2.98\cdot10^{-4}$ ***	-0.004***
	($2.4\cdot10^{-4)}$	($1.73\cdot10^{-4}$)	($8.5\cdot10^{-5}$)	($1.47\cdot10^{-4}$)
Wage, 25-32 years old (euro)	0.006***	-0.003***	$-3.73\cdot10^{-4}$ ***	-0.003***
	($6.9\cdot10^{-5}$)	($5.34\cdot10^{-5}$)	($1.9\cdot10^{-5}$)	($4.54\cdot10^{-5}$)
Wage, 33-45 years old (euro)	0.006***	-0.003***	$-5.32\cdot10^{-4}$ ***	-0.003***
	($6.92\cdot10^{-5}$)	($5.16\cdot10^{-5}$)	($1.9\cdot10^{-5}$)	($5.1\cdot10^{-5}$)
Wage, more than 45 years old (euro)	0.005***	-0.001***	$-3.6\cdot10^{-4}$ ***	-0.003***
	($9.92\cdot10^{-5}$)	($6.15\cdot10^{-5}$)	($2.6\cdot10^{-5}$)	($8.06\cdot10^{-5}$)
Wagegap[A] , 16-24 years old (euro)	-0.229***	0.165***	-0.003	0.094**
	(0.0692)	(0.0428)	(0.032)	(0.040)
Wagegap, 25-32 years old (euro)	-0.014	0.050	-0.006	-0.030
	(0.055)	(0.036)	(0.019)	(0.035)
Wagegap, 33-45 years old (euro)	-0.037	0.060	-0.011	-0.012
	(0.056)	(0.036)	(0.019)	(0.036)
Wagegap, more than 45 years old (euro)	0.017	-0.008	-0.002	-0.006
	(0.062)	(0.0415)	(0.020)	(0.041)
Spanish nationality	3.145***	-2.142***	-0.162***	-0.842***
	(0.080)	(0.056)	(0.021)	(0.056)
Dummy temporary contract	-4.890***	2.696***	0.027**	2.168***
	(0.047)	(0.035)	(0.013)	(0.032)
Tenure in the firm (days)	0.003***	-0.001 ***	$-1.53\cdot10^{-4}$ ***	-0.002***
	($2.5\cdot10^{-5}$)	($1.7\cdot10^{-5}$)	($1.42\cdot10^{-5}$)	($2.1\cdot10^{-5}$)
Other family members, 0-6 years old	0.032	0.368***	0.058***	-0.458***
	(0.044)	(0.031)	(0.011)	(0.033)
Other family members, 7-15 years old	0.769***	-0.626***	0.043***	-0.19***
	(0.051)	(0.037)	(0.012)	(0.036)
Other family member, 16-65 years old	-0.122***	0.044**	-0.004	0.082***
	(0.021)	(0.016)	(0.006)	(0.015)
Other family members, over 65 years old	-0.173***	0.272***	0.272***	-0.151***
	(0.059)	(0.042)	(0.015)	(0.043)
N	1,948,383			
X^2 (p-value)	1,497,944.84 (0.000)			

Notes: Other control variables: Year and month dummies, age group, multiple job-holding and the interaction between month and wagegap.
(A) Wagegap is only for workers who receive a salary lower than real minimum wage in t+12
*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

6. Conclusions

There was a strong increase in the real minimum wage in Spain between 2004 and 2010. We use it as a case study to estimate the impact of increases in real minimum wages on employment probabilities for affected workers, using Social Security Administrative Labour Records. Our identification strategy compares a worker with real wage lower than the real minimum wage twelve months later (affected group) with a worker of similar characteristics but with a real wage high enough so that he is not affected by the increase, and also with a worker of similar characteristics and same wage, but in a period in which the real minimum wage did not increase.

Across many different specifications, we find that an increase in the minimum wage induces a positive and significant impact on the probability of losing the employment for young and older workers. The magnitude of this effect in the case of older workers doubles that of young workers. A small part of these job losses for older workers actually comes from some of them becoming self-employed.

In high occupational categories (for which the increase was much lower) we only find some effects for young people.

The intuition of our results is that, from a macroeconomic point of view, one would expect the group of young workers to be more affected than other groups, because young workers receive a lower wage. From a microeconomic perspective, however, the picture can be different, because the effect of minimum wages on individual employment probabilities does not depend on the number of people affected, but rather on characteristics like functional mobility, learning, or long-term productivity. All of these issues are against older people. This is of particular importance because the negative impact on employment probabilities might be very harmful in the case of older workers. They may be definitively expelled from the labour market if their productivity does not grow enough to overcome minimum wage increases, something that is likely to occur, as many of these people are in (or close to) the downward part of their life-cycle productivity profile. In contrast, young workers still have to enjoy the fastest part of their productivity profile, so they probably have greater chances of finding another job sooner or later, even if they are temporarily expelled from the labour market.

In summary, our work departs from other papers in the literature based on an aggregate or firm-level approach, by looking at the minimum wage problem from an individual perspective. Our results suggest that this individual approach is important, because an aggregate approach overlooks

important individual consequences for specific groups of workers. In particular, the effects on young people (where most of the previous studies have been focused) could be overwhelmed by the corresponding consequences for older people, once different effects by age are properly analysed.

Appendix: Robustness checks and other estimations

In this section we present a robustness check using alternative specifications. In all of them the increase in the minimum wage significantly reduced the probability of older people to keep their employment. Other age groups have also significant effects, but they are always of a smaller magnitude than in the case of older people. Hence, our main results are robust to these alternative specifications.

The first column of **Table 10** presents a model equivalent to the one in the last column of **Table 6**. Results are very similar, and hence we do not comment them in detail. If any, differences across age groups become less apparent.

The second and third columns present the results of estimating random and fixed effects models, respectively. In a fixed effects model, identification comes from the comparison of the outcomes of the same individual in different moments in which the individual is affected or not affected. Consequently, we ignore the information provided by the comparison of the affected individual with people earning a slightly higher wage (and therefore not affected) in the same moment. Moreover, the specific situation at hand makes identification of a fixed effects model very weak, because if an individual is in the treatment group one year, the employee will probably lose his job, and hence he will not be observed again. Indeed, the average times an individual lose the job is 3.13, and this figure is reduced to 1.04 while in the treatment group[19]. These criticisms more or less also apply for random effects estimation. Hence, most of our identification comes from comparing different individuals, and therefore models with individual non-observable effects are not best suited for our problem and database. Still, as can be seen in the table, we find significant effects for older people, although the effect for the youngest groups disappears. A new effect of the opposite sign appears in the intermediate age groups, which is against theory, and it is probably related to the problems with these type of models already commented.

[19] Note that, since we are looking at job losses twelve months later, these figures imply an average of 0.261 and 0.086 job losses per year, respectively.

Table 10 *– Probability of losing employment. Marginal effects in percentage points for different specifications of Logit model*

	24 months (B)	Random effects	Fixed effects	Retirement
Dependent variable	Probability of losing employment			
Wage, 16-24 years old (euro)	-0.005***	-0.001***	-0.003***	-0.004***
	(1.63 10^{-4})	(7.11 10^{-5})	(2.52 10^{-4})	(6.32 10^{-5})
Wage, 25-32 years old (euro)	-0.007***	-0.002***	-0.005***	-0.006***
	(8.73 10^{-5})	(4.30 10^{-5})	(1.52 10^{-4})	(3.56 10^{-5})
Wage, 33-45 years old (euro)	-0.008***	-0.002***	-0.003***	-0.006***
	(8.18 10^{-5})	(4.13 10^{-5})	(1.48 10^{-4})	(3.18 10^{-5})
Wage, more than 45 years old (euro	-0.001***	-3.05 10^{-4}***	-0.008***	-0.002***
	(6.86 10^{-5})	(5.33 10^{-5})	(2.01 10^{-4})	(3.41 10^{-5})
Wagegap[A] , 16-24 years old (euro)	0.154***	6.39 10^{-4}	-0.053	0.071***
	(0.033)	(0.019)	(0.067)	(0.020)
Wagegap, 25-32 years old (euro)	0.113***	-0.042**	-0.174**	0.022
	(0.032)	(0.018)	(0.064)	(0.019)
Wagegap, 33-45 years old (euro)	0.131***	-0.043**	-0.164**	0.048**
	(0.032)	(0.018)	(0.063)	(0.019)
Wagegap, more than 45 years old (eur	0.171***	0.051***	0.170*	0.138***
	(0.033)	(0.019)	(0.067)	(0.020)
N	3,276,657	16,898,400	9,411,070	16,587,057
X^2 (p-value)	1,306,774.15 (0.000)	354,835.41 (0.000)	479,470.85 (0.000)	6,276,510.62 (0.000)

Notes: Other control variables: Year and month dummies, age group, multiple job-holding and the interaction between month and wagegap.
(A) Wagegap is only for workers who receive a salary lower than real minimum wage in t+12
(B) This model is only estimated for 2002 and 2004 and the employment status 24 months later
*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

The last column estimates a model similar to the first column of **Table 6**, but excluding observations older than 60. The purpose is to clear the result find for older people from early-retirement decisions. **Table 6** is still the preferred model, because retirement may be a consequence of being expelled from the labour market, and hence it should be included in the estimation of minimum wage effects. Nevertheless, the main results do not change when we exclude those observations from the estimation, finding estimates of *wagegap* very close to those in the benchmark model in **Table 6**.

Finally, we want to discuss a situation very important in the Spanish labour market, which is also indirectly related to minimum wages, this situation is related to another possible wage floor in Spain. Another possible wage floor in Spain is provided by collective bargaining, which determines a minimum wage for each occupational category, mandatory for all the workers in the sector or firm considered in the agreement. These bounds are higher than the mandatory minimum wage. The increase in the mandatory minimum wage may have been passed through to these bargained wages, at least in the case of those that were already close to the minimum, if the social agents that participate in the negotiations wanted to keep relative wages relatively constant. To study this possibility we have considered another affected group of people. The model proposed is the same as our benchmark, but we have added a second affected group of workers who have a real wage that is less than 110%[20] of the real minimum wage twelve months later, but also higher than the real minimum wage twelve months later (corresponding to people not directly affected, but maybe affected by a possible pass-through to bargained wages). We estimate different effects for these two groups by adding a new variable (*wagegap_2*) defined as:

$$wageg\quad_{2_{i,t}} = max\left(\left(1.1 \cdot m_{i,t+12} - wage_{i,t}\right) \cdot I\left(m_{i,t+12} < wage_{i,t}\right); 0\right) \qquad (3)$$

Where I is the indicator function that takes the value 1 if the condition is true. **Table 11**, presents the estimation results for our benchmark model adding this second group of affected workers. The main result of our benchmark model is maintained. On top of that, we find that the *wagegap_2* for the second affected group has an effect for workers with a real wage that is lower than 110% of the real minimum wage twelve months later. This effect can be interpreted as a proxy for the effect of yearly increases in the real minimum wage on bargained wages, and sequentially on the probability of losing employment. This *wagegap_2* effect is positive and significantly different from zero for all age groups. In any case, the magnitude of the effect of this second wage gap is much lower than the original. This means that the pass-through of minimum wages to collectively bargained wages has some effect on the probability of losing employment, but is of secondary importance when compared to the minimum wage increase itself.[21]

[20] The number 110% is completely arbitrary. It is chosen to be very close to the minimum, so that it captures the mentioned pass through effect relatively clean of other possible movements in wages. It could have been better to directly use collective bargained wages. Unfortunately, these are easily available in growth terms, but not in levels, which are reported by very few agreements. The type of analysis developed here requires levels; hence we needed to make the very imprecise approximation already mentioned as a first approach to the problem.

[21] This is true in terms of individual probabilities. The aggregate macroeconomic effect of bargained minimum wages on employment could be higher, because they affect more people.

Table 11 *– Probability of losing employment. Marginal effects in percentage points*

	110%
Dependent variable	Probability of losing employment
Wage, 16-24 years old (euro)	-0.004*** ($6.69 \cdot 10^{-5}$)
Wage, 25-32 years old (euro)	-0.006*** ($3.7 \cdot 10^{-5}$)
Wage, 33-45 years old (euro)	-0.006*** ($3.30 \cdot 10^{-5}$)
Wage, more than 45 years old (euro)	-0.002*** ($3.15 \cdot 10^{-5}$)
Wagegap[A], 16-24 years old (euro)	0.079*** (0.021)
Wagegap, 25-32 years old (euro)	0.027 (0.019)
Wagegap, 33-45 years old (euro)	0.053*** (0.020)
Wagegap, more than 45 years old (euro)	0.144*** (0.020)
Wagegap_2[B] 16-24 years old (euro)	0.016*** (0.003)
Wagegap_2, 25-32 years old (euro)	0.007*** (0.003)
Wagegap_2, 33-45 years old (euro)	0.017*** (0.002)
Wagegap_2, more than 45 years old (euro)	0.032*** (0.003)
N	16,898,400
X^2 (p-value)	6,470,551.31 (0.000)

Notes: Other control variables: Year and month dummies, age group, multiple job-holding and the interaction between month and wagegap.
(A) Wagegap is only for workers who receive a salary lower than real minimum wage in t+12
(B) Wagegap_2 is only for workers who receive a wage that is higher than the real minimum wage in t+12, but by less than 10%
*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

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CAPÍTULO 2 - CHAPTER 2: ANALYSIS OF COMPOSITION EFFECTS ON WAGE BEHAVIOUR

Abstract

This chapter estimates the role played by changes in the composition of the characteristics of workers in the cyclical evolution of wages in Spain between 1992 and 2012 based on the data provided by the Social Security Administrative Labour Records (MCVL). The cyclical behaviour of the aggregate level of wages in the Spanish labour market is small, and it is also found that this behaviour is even lower in times of recession. In a labour market such as Spanish, characterized by high inflows and outflows, aggregate wage developments may be significantly affected by changes in the composition of employment. This effect may have been especially important in a period such as that since 2008, when the intense destruction of observed employment has been concentrated in the groups of workers with lower education level and professional experience, who, on average, received lower wages than the average wage of the economy.

Resumen

En este trabajo se estima el papel desempeñado por los cambios en la composición de las características de los trabajadores en la evolución cíclica de los salarios en España entre 1992 y 2012 a partir de los datos proporcionados por la MCVL. El comportamiento cíclico de nivel agregado de los salarios en el mercado de trabajo español es reducido, encontrándose, además, que este comportamiento es aún más bajo en las épocas de recesión. En un mercado de trabajo como el español, caracterizado por elevados flujos de entrada y salida, la evolución salarial agregada puede verse afectada de manera relevante por los cambios que se producen en la composición del empleo. Este efecto puede haber sido especialmente importante en un período como el transcurrido desde 2008, en el que la intensa destrucción de empleo observada ha estado concentrada en los colectivos de trabajadores con menor nivel de formación y experiencia profesional, que, en promedio, cobran unos salarios inferiores al salario medio de la economía.

1. Introduction

The countercyclical pattern in the growth of wages over the last Great Recession is one of the most interesting and well researched topics in labour economics. This is especially so in Euro Area countries like Spain, where unemployment has more than tripled since 2008 while wages, at least in the initial phase of the crisis, failed to react to the strong deterioration of the labour market and a rise in real wages was observed.

Basic economic theory states that in a perfectly competitive economy, an increase in wages has been linked to an increase in labour productivity, although, it could depend on the company situation. In an economic crisis, the response of companies is to reduce employment level (expel less productive workers) or to try to adapt the wages to the new labour productivity.

In the Spanish labour market, characterized by high labour market inflows and outflows, aggregate wage behaviour may be significantly affected by changes in the composition of employment. This effect may have been particularly important in the period dating from 2008, in which the marked job destruction was concentrated in lower skilled and in less experienced workers whose average wage is below the Spanish average. Therefore, it is important to isolate the mechanical changes which this phenomenon may have caused in wages, in order to determine accurately how wages have responded to economic developments.

Some papers have studied the impact of worker characteristics in the evolution of wages. For example, Card and DiNardo (2002), Goos and Manning (2007) find these characteristics play an important role in the evolution of wages and increase the polarization of wages distribution in the UK. For the Spanish case, there is significant number of papers which try to analyze the role of the composition effect on wage inequality. Pijoan and Sanchez-Marcos (2010), Carrasco et al. (2011), Lacuesta and Izquierdo (2012), Casado and Simón (2013) use the Wage Structure Survey, and Bonhomme and Hospido (2012) use MCVL. However, none of these papers study the role of the composition effect in the evolution of aggregate wages during The Great Recession. So, in this paper it is needed to disentangle the role of the changes in the Spanish labour market and the evolution of wages.

There is extensive literature about different methods to decompose[22] general distributional features, like quantiles or inequality measures. At the same time, these methods allow complex nonlinear

[22] See Fortin et al. (2011).

relationships between the covariates and the outcome variable. For instance, Abadie (1997), Buchinsky (1994), DiNardo et al. (1996), Gosling et al. (2000), Donald et al. (2000), Barsky et al. (2002), Machado and Mata (2005), Chernozhukov et al. (2013) and Rothe (2012), among many others.

The Spanish case is particularly interesting because wage responsiveness was in the core of the economic and European political debate. For instance, we can review news from multiple sources from two years ago and can realize that all international institutions advised Spain of the necessity in decreasing wages in order to increase employment[23]. Nevertheless, they only focused on the aggregate statistics to make this affirmation and they did not take into account that changes in the composition of employment have been extremely significant since 2008 and generally skewed towards a significant loss in the relative weight of lower-paid workers. These changes in employment composition could have played an important role, which, maybe, were not taken into account in these suggestions.

For example, the share of younger workers in total employment fell by nearly 9 percentage points (pp) between 2008 and 2012, and foreign workers dropped by nearly 2 pp in the same period. Similarly, the fall in employment was particularly pronounced in workers with a lower educational level, the proportion of which dropped from 14.8% in 2008 to 10.2% in 2012. Finally, in terms of work experience, the share of workers with fewer years of service in the company decreased sharply, reflecting the greater impact of the crisis on temporary jobs. Specifically, the share of workers with more than three years' experience expressed as a percentage of total employment increased from 61.7% in 2008 to 73% in 2012.

At macro level, such large changes in composition of employment may have given a relatively significant increase to these statistical effects which have to be taken into account when attempting to make a precise diagnosis on the behaviour of labour costs and their relationship with the business cycle. However to do this analysis, workers' disaggregated information about their characteristics is required, as well as, the characteristics of the job held to be able to disentangle and estimate these effects.

This article estimates these composition effects in the private sector of the Spanish economy using data from the Social Security Administrative Labour Records[24] which provides information on the entire labour history of individual workers. This study considers the period from 2000 to 2012,

[23] February 2010 and August 2013 the IMF advised to reduce wages (regarding August IMF advice to reduce 10% wages). Also, European Commission has advised, in different moment, that Spain had to reduce wages.

[24] Muestra Continua de Vidas Laborales.

with both an economic expansion and recession. I use the decomposition approach by characteristics of workers to disentangle changes in the characteristics of workers in the aggregate labour market and changes in prices, to value these characteristics. In the identification strategy, some sort of semi-parametric estimation will be used, constructing different "cells", defining cell as a group of workers with the same characteristics. Based on that definition, the real wages changes will be decomposed between two periods, say t and t+1 into three components: (i) change in composition, (ii) changes among prices and finally, (iii) change in real term by "cell". So, I estimate the relationship between all these variables and the wage in t. After that, I estimate the conditional wage in t conditioned by the characteristics in t+1 (twelve months later). This conditional estimation corresponds to the evolution of wages that would have prevailed whether the composition of workers had remained constant from t to t+1.That is to say, $\hat{W}_{it+1}$ denotes the wage level which would be observed in year t+1 given the characteristics of the workers employed in the year t+1 and provided that, the remuneration of those characteristics remains unchanged and equal to year t. The impact of composition effects on aggregate wage behaviour can be estimated through the difference between $\hat{W}_{it+1}$(estimated wages in t+1) and W_{it}(observed wages in year t), since in both cases the same functional form is used (the remuneration associated is maintained in both cases), but the individual characteristics observed are different. Meanwhile, the difference between the observed wages at t+1 (W_{it+1}) and the estimated wage level at t+1($\hat{W}_{it+1}$) may be interpreted as the wage variation after stripping out composition effects, since in both cases workers' individual characteristics are the same, but the remuneration associated with each characteristic are different.

Using this strategy, I can see the role of the composition effects due to the fact of the average of real wages was increasing after 2008 in spite of the Spanish economic crisis and the world economic crisis well known as "The Great Recession". The significant number of observations in our database allows us to properly estimate different effects by gender, age, skills and tenure. I find that the estimated impact of the changes in the composition of employment on wages has been clearly positive, as evidenced by the increase in the groups with a higher relative wage. There are, however, some differences in the successive phases of the crisis. Specifically, in the initial years the changes in the average experience of workers had a stronger positive effect, reflecting the high destruction of temporary employment in that period. The changes in average skills followed a more stable course, although they too were particularly significant between 2008 and 2010. Finally, the changes in the composition by age had less impact on aggregate wage behaviour, although their contribution grew throughout the period.

The next section sets out the historical developments in wages in Spain. After that, it describes the database (Social Security Administrative Labour Records), discussing its advantages and disadvantages. Section 3 presents the methodology used in this paper. The results for the role of composition effects are then presented in Section 4 and, finally, the conclusions are set out in Section 5.

2. Historical developments in wages in Spain

The current system of political and labour rights was only developed at the end of the 1970s. Collective bargaining is regulated by the chapter on fundamental rights in the Spanish Constitution of 1978, which states that the law guarantees the right to collective bargaining between workers' representatives and employers and protects the binding power of the agreements. The 1994 reform of the "Estatuto de los trabajadores" included new regulations extending the remit of collective bargaining over employment conditions and reducing the role of the Government in this area. Collective bargaining coverage is high but complicated with a system of regional, provincial and company-level agreements. In addition to that in 2002 an inter-sectorial framework agreement negotiated at national level was also introduced. Currently, Trade union density is around 16% while collective bargaining coverage is just over 70%.

There are two main national trade unions that operate across most sectors –CCOO (Comisiones Obreras) and UGT (Union General de los Trabajadores). In addition, there are national federation of civil servants and regional confederations in some regions as the Basque region and Galicia. Trade union density in Spain is relatively low at 16% but as in France the strength of support for trade unions is also reflected in participation of voting in elections for worker representatives. Overall collective bargaining coverage is high at 81% of employees across all sectors, with a system of national, regional and local agreements. Sectorial and provincial agreements cover 55% of workers while national agreements cover 27% and around 10% of workers are covered by company-level agreements.

Wage determination mechanisms tend to play a prominent role when it comes to explaining how much of the adjustment ends up being pushed onto employment. In this respect, collective bargaining systems conducive to the adaptation of wages to cyclical fluctuations and shocks of various kinds smooth the changes in the level of employment. By contrast, systems with greater wage rigidity tend to generate more pronounced fluctuations in employment over the business cycle.

Wage dynamics in Spain are characterised by the fact that the impact of the cyclical position of the labour market on wage settlements is very small. Currently, the Spanish wage settlements model is based on collective bargaining[25] by social agents (the workers' and employers' representatives). The Spanish wage settlement has two main characteristics. On the one hand it is a system with a high level of workers' coverture, in other words almost all wages of total workers are regulated by collective bargaining, although there is a low number of workers affiliated to Unions. This collective bargaining operates at sectorial or company level, but there is a predominance of sectorial collective bargaining to company's collective bargaining. These negotiations are carried out by the Government and the main workers' and employers' representatives or Unions, but temporary workers or small or medium companies are not represented in this kind of negotiation.

On the other hand, the negotiated wage settlements are closely linked to the evolution of inflation. In other words, there is a very close relationship between wage settlements and past inflation due to the fact that decisions on the increases of wages usually take into account past and predicted inflation, which in terms of compensation per employee is strengthened by the impact of indexation clauses. In fact, the percentage of workers covered by indexation clauses averaged 69% over the period 2001-08. At the same time, wage increases above the predicted inflation can be agreed but this increase cannot be above the annual worker's productivity increase and, also these agreements of wage increases can be revised through the incorporation of guarantee or wage indexation in collective agreements.

The Spanish wage bargaining model has introduced an important rigidity in the labour market due to the high inertia to past inflation and inflexibility[26]. On one hand, at macroeconomic level, aggregate wages in Spain have traditionally shown a low sensitivity to economic cyclical conditions. Such behaviour can clearly be seen since 2007. In 2007 and 2008 negotiated wage rates grew, driven by, among other factors, adjustments to reflect the previous years' inflation deviations, causing wages to rise while demand was falling. For instance, wage statistics of the Spanish Labour Ministry shows wage increase above 3.5% in 2008 while inflation was 1.4% (see **Table 12**). However, this behaviour is due to the strong inflation indexation linked to other factors such as multi-annual duration, the principle of "ultra" activity[27] and safeguard clauses in collective agreements. On the other hand, this system of wages determination has limited ability to adjust relative wages, since the increase agreed in sectorial agreements are characterised, in practice, by a remarkable homogeneity in both its structure and its temporal evolution and as result of this system, the evolution of wages shows strong temporal inertia. Subsequently, the adjustment of

[25] See García-Perea (1991), Izquierdo et al. (2003) and Jimeno and Toharia (1994).
[26] See Wölfl and Mora-Sanguinetti (2011).
[27] If there is no agreement, the provisions negotiated in a collective agreement continue to apply indefinitely.

wages in 2009 almost exclusively reflected the sharp fall in inflation, despite the deterioration in the labour market. Only in 2010, with a two year lag from the start of the crisis, did more genuine wage moderation occur, under the agreement signed by the social agents for the period 2010-12, in a propitious lower inflation environment. However, the activation at the beginning of 2011 of the indexation clause led to an average wage increase of 2% in the 2010 collective agreements.

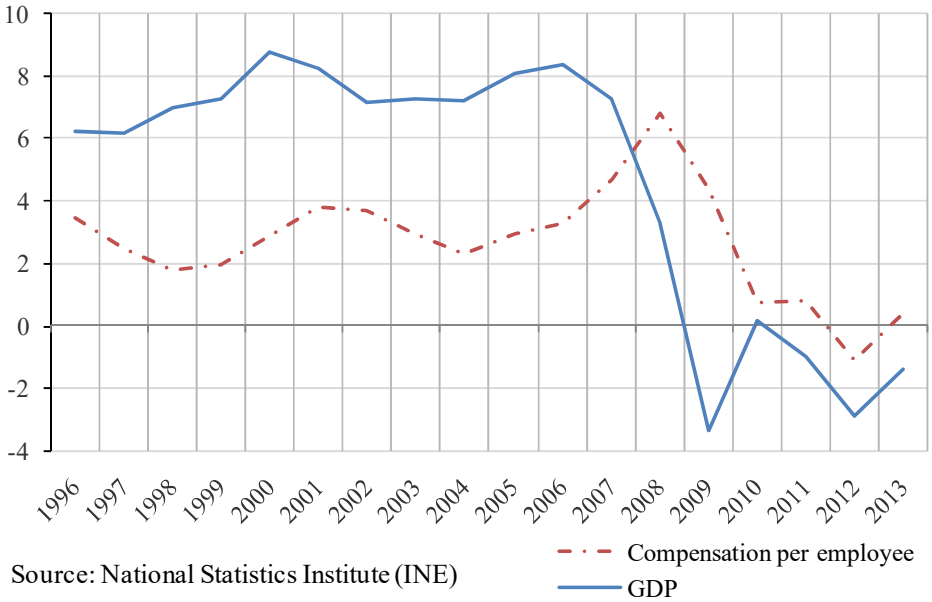
Table 12 *– Year on year growth rate (%) of main macroeconomic indicator*

Year	Indicator		
	GDP	*Agreed wage increase*	*CPI*
1995		3.67	4.3
1996	6.24	3.8	3.2
1997	6.16	2.88	2
1998	6.95	2.56	1.4
1999	7.27	2.44	2.9
2000	8.74	3.09	4
2001	8.24	3.5	2.7
2002	7.11	3.14	4
2003	7.23	3.48	2.6
2004	7.21	3.01	3.2
2005	8.03	3.17	3.7
2006	8.32	3.29	2.7
2007	7.23	3.14	4.2
2008	3.28	3.6	1.4
2009	-3.33	2.25	0.8
2010	0.17	1.48	3
2011	-0.97	1.98	2.4
2012	-2.86	1	2.9
2013	-1.36	0.52	0.3
2014	1.11	0.57	-1

Source: National Statistics Institute (INE) and Labour Ministry

Therefore, the set of factors described above has driven a different evolution between aggregate wages and the economic situation and, in some cases, moving in complete opposite directions, as for instance some years have shown increases above the annual growth of Gross Domestic Product since the beginning of the last crisis (see **Figure 3**).

Figure 3 *– Year on year growth rate GDP and compensation per employee*



Source: National Statistics Institute (INE)

Regarding the labour market, the evolution of wages has shown increases, in real terms, in a context of losing employment and a dire economic situation. Therefore, such rigid system of wage negotiation has not helped in a context of losing competitiveness. This fact in addition to the labour market deterioration is the cause of the slow wages adjustment. In a system with more flexibility in the negotiation model, wages will immediately incorporate the shock thus the level of employment remains unchanged. However, if nominal wages are rigid, a shock will change the real wage (through the level of prices) altering the level of employment in the economy (see **Figure 4**). For instance, this effect can be clearly appreciated at the beginning of The Great Recession. In this period, despite the difficult economic situation and marked job destruction, wage rates agreed in collective bargaining experienced growth rate above inflation, leading to increases in real wages (see **Table 12**).

Figure 4 *– A few facts on the Spanish economy*

2.1 Latest reforms in collective bargaining

The existence of a rigid negotiation wage system is considered as a barrier to employment creation in the aftermath of the crisis. Trying to reduce the consequences of this characteristic of the Spanish labour market, the Government introduced some reform packages (2010, 2011 and 2012) in order to reduce the labour market dualism and introduce more flexibility in the wage negotiation system. The main components of the three most relevant reform packages since the beginning of the economic crisis are explained in the section below.

2.1.1 Collective bargaining reform in 2010

The objective of the 2010 reform was to introduce flexibility to the wage negotiation system. In that sense, the reform aimed at the adaptability of the labour market to economic shocks. First, the reform introduced company-internal flexibility in terms of reductions in working time (including short-time work). And second, the conditions by which a company can opt out from collective agreements were modified. For example, the reform extended the causes through which companies can opt out from lower level agreements and it eased the conditions for opting out from higher level collective agreements at sectorial or regional level. In this case, an agreement between employers and their employees is enough. If such an agreement between employers and employees cannot be reached, collective bargaining must be provided for solutions through arbitration. Such flexibility was then given independent to the number of workers concerned; previously it could be applied only in the case of full suspension of contracts or collective dismissal. With the 2010 reform, the Government wanted to adapt wage evolution to the companies' economic situation.

2.1.2 Collective bargaining reform in 2011

The 2011 reform introduced that the labour conditions established in collective bargaining agreements at the company level have priority to the higher level collective agreements, at sectoral or regional level in a long list of labour conditions, including wage settlement, except contrary agreements between workers' and employers' representatives at regional level. As a consequence, this reform introduced the priority to collective bargaining agreements at the company level to other kinds of agreements. In the case of small and medium companies, firms could decide not to apply wages' increases specified in the high level agreement, without an agreement with their workers. As the 2010 reform, this was another attempt to adapt the wage evolution to the company economic situation.

2.1.3 Collective bargaining reform in 2012

The 2012 reform[28] modified several aspects of the Spanish labour market regulation, including collective bargaining rules and collective and individual redundancy procedures and costs. The objective of the reform of collective bargaining was to restore competitiveness by aligning labour costs more closely with productivity and allow employers to exploit internal flexibility measures as

[28] In July 2012, the *Ley 3/2012 de medidas urgentes para la reforma del Mercado laboral* was introduced by the Spanish Government.

an alternative to dismissals in the presence of adverse company shocks and reduce employment losses in bad times.

Among the main modifications[29], the new law introduced more priority to collective bargaining agreements at the company level over those at the sector or regional level. For instance, collective agreements at company level could adjust wages more closely to the specific needs of the company. So, the company could easily decide about wages, working hours and work schedules whenever the company had an economic, technical, production or organisational reason. The 2012 reform removed the need to recover the level of wages when these causes disappeared. This was another attempt to introduce internal flexibility measures. This new regulation also introduced substantial changes with respect to dismissal legislation and monetary compensations[30].

3. Empirical specification and data description

3.1 Data and descriptive

The MCVL data is used also in this chapter. For this study, I merge all observations from wave 2005 to 2012. People not in the sample are close to inactivity or a similar situation, because if a person returns to the labour market, even for 1 day, this person will be in the sample.

The information of working histories starts from 1980, but I study the evolution of wages from 2000 to 2012 because during this time there was a period in which there was an economic expansion (2000–2007) and another period in which there was an economic crisis (2007–2012). In this way, the effect of each characteristic on wages each year and see the impact at the end of the period can be estimated.

I consider only the case of a person who works full time throughout a given month under the General Social Security Regime (i.e. excluding self-employment, which is analysed later). Regarding the experience in the workplace; it is computed sequentially from the first affiliation after 1980. The days worked for the same company are accumulated, but from the moment the worker changes to another company the tenure is set to zero. With this sample, it is not possible to

[29] Regarding wages agreements, another important aspect introduced in 2012 was *"Acuerdo para el empleo y la negociación colectiva para el periodo 2012-2014"*. In this agreement wage increases below 0.5% in 2012 and below 0.6% in 2013 and between 0.6% and 1.5% in 2014 were established.

[30] See Boletín Oficial Del Estado number 162 Section I (7 July 2012).

calculate the total experience of the worker in the labour market, because records which end before 1980 are not observable.

In this study, I try to focus on the evolution of the employment composition in order to capture all changes produced from the beginning of the crisis. For example, the share of younger workers in total employment fell by nearly 11 pp between 2006 (year without macroeconomic negative shock) and 2012, while the contribution of older workers (normally this proportion of workers has higher wages) increased its contribution in the same period[31] by 3 pp. Similarly, the fall in employment was particularly pronounced in workers with a lower educational level, the proportion of which dropped from 15.8% in 2006 to 10.2% in 2012. Finally, in terms of work experience, the share of workers with fewer years of service in the company decreased sharply, reflecting the greater impact of the crisis on temporary jobs. Specifically, the share of workers with more than three years' experience expressed as a percentage of total employment increased from 60.8% to 73% in the same period[32] (see **Table 13**).

Table 13 *– Composition of the employed population in Spain.*

		Year			
		2006	2008	2010	2012
By gender	Male	59.5	57.9	55.8	54.6
	Female	40.5	42.1	44.2	45.4
By age	Age 16 - 34	40.1	38	33.5	29.3
	Age 35 - 44	27.9	28.4	29.8	31
	Age 45 - 54	20.8	21.9	24.1	25.6
	Over 55	11.1	11.7	12.7	14.1
By educational level	Low	15.8	14.8	12.8	10.2
	Medium	61.5	61.8	61.1	61.6
	High (university)	22.7	23.5	26.1	28.2
By nationality	Spanish	87.5	85.5	86.2	87.3
	Foreign	12.5	14.5	13.8	12.7
By experience	Less than 6 months	13.7	11.9	9.9	9.1
	6 months to 2 years	18.5	18.8	13.7	12.3
	2 to 3 years	7	7.6	7.6	5.6
	More than 3 years	60.8	61.7	68.9	73

Source: National Statistical Institute (Spanish Labour Force Survey)

[31] Foreign workers dropped by nearly 2 pp from 2008 to 2012, but I don't consider this group of workers due to the low observation in the database.

[32] This cannot be the same proportion that there is in MCVL database, because this base is formed by 4% random sample.

3.2 Empirical specification: decomposition exercise

This paper estimates the importance of changes in the composition of employment in the evolution of the average of real wages in The Great Recession. This effect may differ by age group, gender, experience and occupational category. In this study occupational category is used as a proxy of skill.

The motivation for this study is that, from a macroeconomic point of view, there was an increase in real wages from 2007 to 2010 while Spain was facing the worst economic situation in its history. However, the picture may be very different from a microeconomic perspective because the changes in the composition of employment could be playing an important role. For instance, different issues as loss of employment by younger, temporary or lower skilled workers[33] could have an important effect on the evolution of the average of real wages, because these types of worker have lower real wages. If they lost their job during The Great Recession, the wage average could be increased only due to an increase of the share of higher wage workers'.

The main characteristic of the methodology employed is the use of a large individual longitudinal dataset to compare the estimation of the relationship between wages and a set of worker characteristics in month t with the same estimation twelve months later (t+12)[34]. Up to now, all similar studies had to use a quantile regression due to the inexistence of a dataset with individual worker wage information. For this reason, the main advantage of this dataset is the possibility of doing a direct comparison of these different groups using a reweighting model to identify the effect of the changes in composition of employment. The strategy of identification is similar to Lemieux (2006), in which he uses a standard Mincer type wage equation to estimate the effect of changes in skill and experience of workers. In this study, the same model is used to estimate a real wage of a group of workers due to their characteristics and it will be compared to the same estimation but twelve months later in order to know if changes in real wage are due to the change in the appreciation of the characteristics or in the workers' characteristics.

Specifically, the approach used here estimates the impact of individual characteristics on wages in a flexible manner using "cells". These cells are built using dummy variables for covering all the possible combinations of age group, gender, experience and occupational categories. Regarding this classification, I take into account the economic theory about the gender gap in wages or the evolution of wages differing by ages. For instance, **Figure 5** shows all these issues. In this Chart,

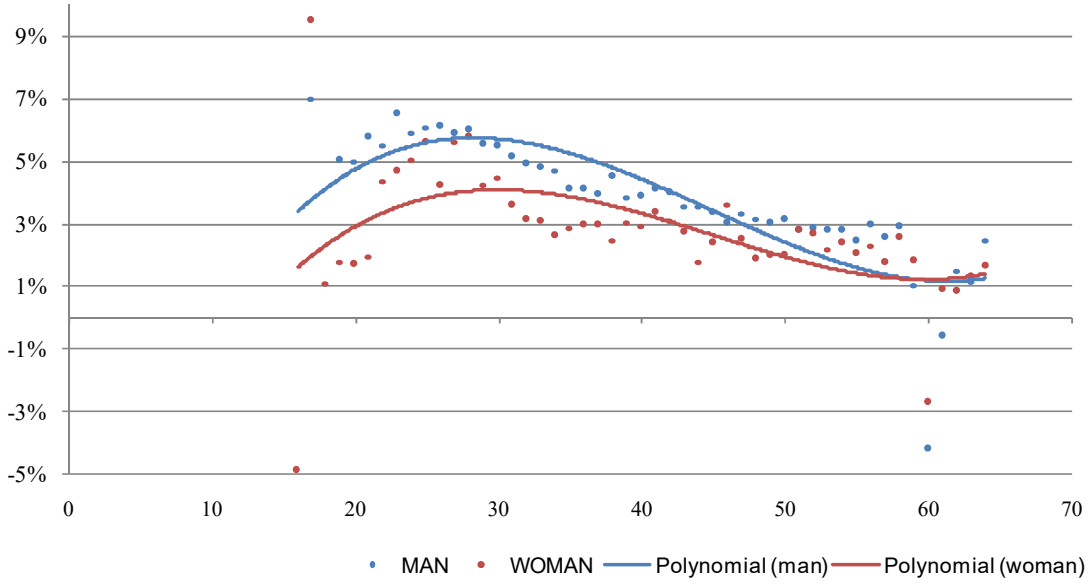
[33] Felgueroso et al. (2010) explain the role of skills in the wage evolution.

[34] I use a space of 12 months because the employment behaviour has a strong seasonal pattern in Spain.

the evolution of growth in real wages differs between women and men and also, it shows that the biggest increases are produced at the beginning of working life (from 16 to 35 years old) and from this age the increases in real wages are lower, because normally the base salary is more elevated from 35 years old and less increases are observed. Based on that, four age groups are considered in this study: age from 16 to 34 years old, from 35 to 44 years old, from 45 to 54 years old and over 55 years old.

In order to know exactly which is the role played by the evolution of skills and experience in this last recession, I decompose the change in real wages between two periods, say t and t+1 into three components: (i) change in composition, (ii) changes among prices and (iii) change in real term by cell. We try to see what would have happened if the crisis had not been triggered.

Figure 5 *– Evolution of real contribution bases by gender and age (2003-2004)*



3.2.1 Methodology

In this paper, reweighting is used as a decomposition method. In this manner, I decompose the real change in wages between two periods, say t_A and t_B, being $t_B > t_A$ into change in composition and change in prices. To calculate this, first I estimate the re-weighting of real wage in t_B conditional by the prices (β')estimated in t_A and the proportion of worker characteristics in t_B. Therefore, finding the difference with the real wages in t_A the composition effect is obtained, because the estimation is done based on prices estimated in t_A. At the same time, finding the difference with the real wages in t_B the changes in prices is obtained, because the estimation is based on the same the proportion of worker characteristics and only change the β (prices) estimated in each year.

Applying this reweighting decomposition method to this study, first I estimate the relationship between all these variables and the wage in t. After that, I estimate the conditional wage in t conditioned by the characteristics in t+1 (twelve months later). This conditional estimation corresponds to the evolution of wages that would have prevailed whether the composition of workers had remained constant from t to t+1.

To see this, first a standard Mincer-type wage equation is considered:

$$W_{it} = \beta_t * X_{it} + \varepsilon_{it} \qquad (1)$$

Where *i* represents an individual, W_{it} the logarithm of real wages[35] of an individual at time *t* and X_{it} is a vector of observed workers' individual characteristics. In particular, worker gender, age, occupational category and years of service to the company (experience) are included to define the cell. Taking into account these characteristics there are 128 different cells which can be estimated. The occupational category contribution, in which the worker is registered in the Social Security System, is included as a proxy of skill level. In this case, I distinguish four different groups[36]. Group 1 includes category 1 and 2, this group has the highest skills workers including university graduates and diploma-holders; group 2 includes category 3 and 4 this group has highly skilled workers including professional staff; group3 includes categories from 5 to 8 including technical staff and group 4 includes categories from 9 to 11, this category has the lowest skilled workers, including manual workers. In the case of experience in the company, four categories are also distinguished: less than half a year in the job position, from 0.5 to 1.5 years, from 1.5 to 3 years, and over 3 years. In this manner, not only the direct effect which, for example, experience has on wages, but also how the effect may vary depending on, for example, skills[37]are taken into account. This relationship estimated between wages and worker's characteristics is used below to predict the wage which individuals would have had in year t+1 (twelve months later) whether that functional relationship remained unchanged:

$$\hat{W}_{it+1} = \beta_{it} * X_{it+1} \qquad (2)$$

This is simply obtained by reweighting the time t conditional by the proportions of age, occupational category and experience groups at time t+1.In the context, a simple cell-by-cell model

[35] Deflated using the overall CPI for each period. CPI is based on 2006.

[36] These occupational groups have different minimum contribution bases in the Social Security System.

[37] Also, an additional dummy variable denoting whether the individual is Spanish or not has been introduced. The nationality variable has been included separately in the estimate because for certain combinations of the other variables the number of observations of foreign workers is too low for an accurate estimate.

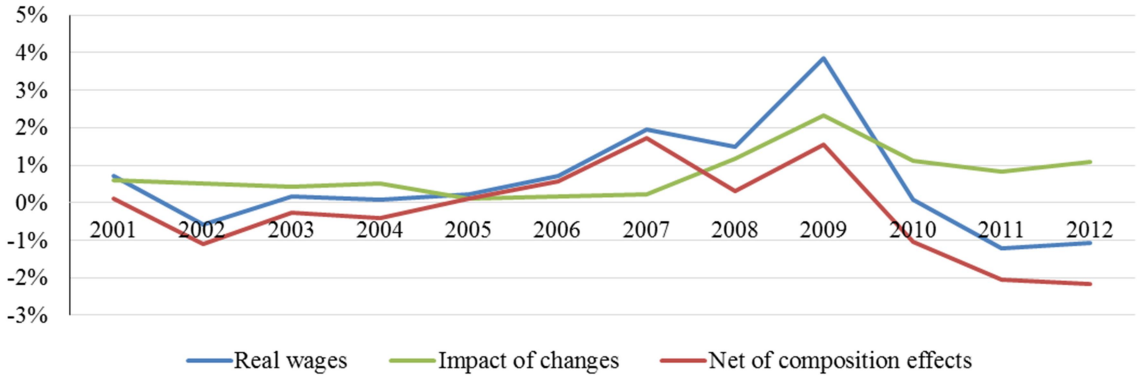
using dummy variables to cover all possible combinations of age group, gender, experience and occupational category is used. In this exercise, we opted to estimate the impact of individual characteristics on wages using cell by cell reweighting model because it is the most flexible manner to disentangle this effect. That is to say, $\hat{W}_{it_{+1}}$ denotes the wage level which would be observed in year t+1 given the characteristics of the workers employed in the year t+1 and provided that, the remuneration of those characteristics remains unchanged and equal to year t. The impact of composition effects on aggregate wage behaviour can be estimated through the difference between $\hat{W}_{it_{+1}}$(estimated wages in t+1) and W_{it}(observed wages in year t), since in both cases the same functional form is used (the remuneration associated is maintained in both cases), but the individual characteristics observed are different. Meanwhile, the difference between the observed wages at t+1 ($W_{it_{+1}}$) and the estimated wage level at t+1 ($\hat{W}_{it_{+1}}$) may be interpreted as the wage variation after stripping out composition effects, since in both cases workers' individual characteristics are the same, but not so the remuneration associated with each characteristic.

4. Results

4.1 Impact of changes in the composition of employment on wages

Figure 6 shows the results of the exercise for the period 2001-2012. Three variables are plotted for each of these years. First, the growth rate of wages in real terms, estimated using the average contribution bases taken from the MCVL; second, the estimated impact of changes in the composition of employment on wages; and, finally, the change in real wages net of these composition effects.

***Figure 6** – Increase in contribution bases and composition effects (2001-2012)*



The average contribution bases in real terms rose from 2006 in the private sector of the economy, after having remained steady in the preceding years. Subsequently they marked on a progressive moderation. This behaviour is broadly consistent with that indicated by other information sources, such as the remuneration per employee according to the National Accounts. The results shown in **Figure 6** suggest that changes in the composition of employment played a significant role in this wage behaviour. In particular, from 2008 onwards, and coinciding with the process of job destruction, the contribution of the estimated composition effects began to increase significantly. In other words, the change in the employment composition explains an important part of the real wages evolution from 2007 to 2010. On average in the period 2008-12, composition effects contributed 1.3 pp each year to the observed increase in contribution bases. Overall, this result is consistent with the changes in the characteristics of the employed population due to the economic crisis, i.e. basically a higher relative weight of the groups of workers with higher average remuneration.

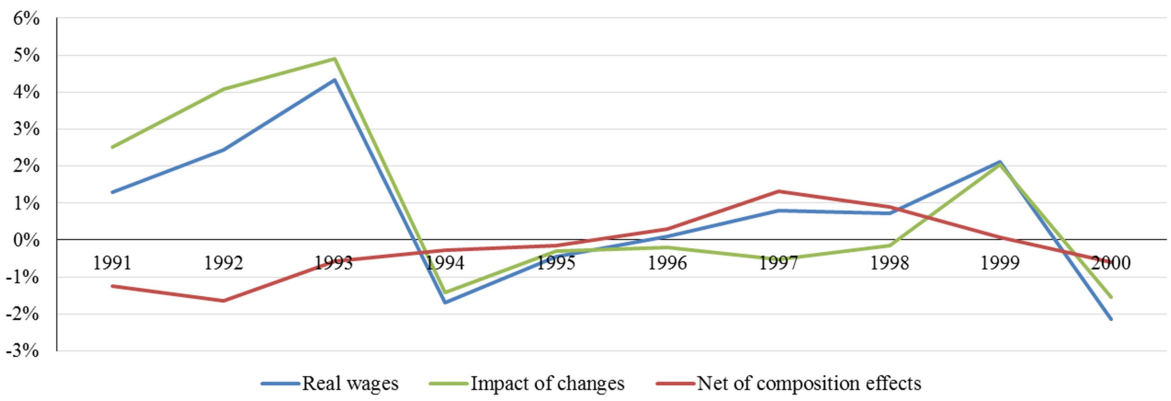
Figure 6 also shows that, even when these effects are stripped out, wages rose in real terms in the initial phase of the crisis, and only from 2010 do they begin to behave more in line with the cyclical weakness of the labour market.

In order to compare this behaviour with that observed in another crisis period, the exercise is repeated for the period from 1991 to 2000. The results are shown in **Figure 7**. In this exercise the average contribution bases in real terms rose till 1994, this evolution remained steady in the following three years and they marked on a progressive moderation from 1996 to 2000. This behaviour is broadly consistent with that indicated by other information sources, such as the remuneration per employee according to the National Accounts. The results shown in **Figure 7** suggest that changes in the composition of employment played a significant role in the wage behaviour during this period. In particular, from 1991 to 1994, and coinciding with the process of

job destruction, the contribution of the estimated composition effects was significant explaining the evolution of the average of real wages. On average in the period 1991-93, impact of composition effects contributed 3.8 pp each year to the observed increase in contribution bases.

Figure 7 also shows that, when these effects are stripped out, wages decreased in real terms in the crisis from 1991-93, on average, 1.15 pp each year, and they begin to behave more in line with the business cycle from 1994.

***Figure** 7 – Increase in contribution bases and composition effects (1990-2000)*



4.2 Contribution of the different characteristics to the behaviour of wages

Given the importance of the estimated composition effects, it is of interest to analyse the relative contribution of the different characteristics to the behaviour of wages. To do so, the exercise is repeated successively excluding each of the characteristics considered. In this case, W_{it} also represents the logarithm of real wages of individuals at time *t*, the only difference in this equation is X_{it}. **Figure 8** sets out the main results of this exercise for the three most significant variables in the analysis: age, experience and skills. For this exercise, the equation (1) is the same, however we have three different vectors of observed workers' individual characteristics. In particular, $X_{1_{it}}$ hasworker gender, occupational category and years of service to the company (experience)to define the cell, $X_{2_{it}}$ has worker gender, age and years of service to the company and $X_{3_{it}}$ does not have occupational category.

$$W_{it} = \beta t * X_{1_{it}} + \varepsilon_{it}$$
$$W_{it} = \beta t * X_{2_{it}} + \varepsilon_{it}$$
$$W_{it} = \beta t * X_{3_{it}} + \varepsilon_{it}$$

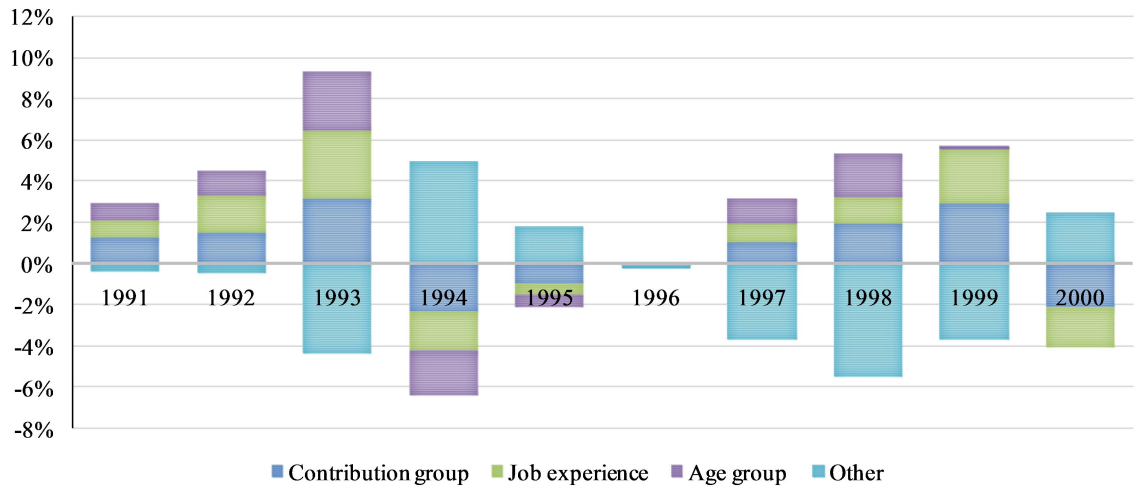
The difference between the results obtained in each estimation and the previously estimated total effect is a measure of the relative contribution of each characteristic.

Figure 8 *– Contribution of each characteristic to the composition effect (2001-2012)*

It can be seen in **Figure 8** that, in the three cases, the impact of the changes in the composition of employment on wages has been clearly positive from 2008, as evidenced by the increase in the groups with a higher relative wage. There are, however, some differences in the successive phases of the period 2001-2012. Specifically, in the initial years the changes in average skills has positive but not significant contribution, this could reflect the increase of employment in the construction sector where employment has a higher composition of lower skilled workers. However during this first part of the period work experience in the company seems to be a higher contributing factor, this could be related to an important characteristic of the Spanish labour market (successive temporary contracts) where a worker can be on a temporary contract for six years due to company necessities (this kind of contracts were used in the construction sector). From 2005 a change in this behaviour can be seen, where contribution group starts to have a positive and significant contribution, however from 2007 (first year with employment destruction in Spain) changes in the average experience of workers and the average skills had a stronger positive effect, reflecting the high destruction in the construction sector and of temporary employment in that period. The changes in average skills followed a more stable course, although they too were particularly significant between2008 and 2010. Finally, the changes in the composition by age had less impact on aggregate wage behaviour, although their contribution grew throughout the period. In the last

few years the changes in the composition of employment have been marked and the relative weight of more highly trained and experienced workers who, on average, receive higher wages, has increased.

Figure 9 *– Contribution of each characteristic to the composition effect (1991-2000)*



The same exercise is done for the period from 1991 to 2000 (see **Figure 9**) and the same conclusion is taken. At the beginning of the period (1991, 1992 and 1993) the average experience and the average skills of workers have a positive contribution, reflecting the high destruction of temporary jobs in Spain. Since that year the contribution of worker characteristics does not follow a clear pattern reflecting the no significant impact of the composition of the labour market during this period until 2008. This result could be a mirror of the counter cyclical pattern in Spanish labour productivity, in which when employment increases labour productivity decreases and viceversa.

After this exercise, it proved that the changes in the composition of employment have not played an important role in the aggregate wage evolution and may, depending on the methodology used, explain a part of the increase in real wages early in the crisis, although the net increase in wages from these effects was still positive, despite the sharp deterioration in employment. The process of wage moderation initiated in 2010 may be sharper than is indicated by the aggregate statistics on labour costs.

5. Conclusions

This study presents evidence for Spain during The Great Recession suggesting that composition effect on employment has an impact on wages' aggregate evolution. To estimate the degree of importance of changes in composition on the Spanish labour market, it is needed to disentangle these effects on the wages' evolution. However, individual information about workers' characteristics is required, as well as, the characteristics of the job held to be able to disentangle and estimate these effects. For this reason, I use information of the Social Security Administrative Labour Records to test if higher wage growth during a recession responds to changes in the evolution of employment composition. A conditional analysis based on re-weighting estimation shows that changes on the composition of employment have been important in the last few years and the relative weight of more highly trained and experienced workers who, on average, receive higher wages, has increased. These changes on the composition of employment have played an important role in the evolution of aggregate wage behaviour and could, depending on the methodology used, explain part of the increases in the real wages early in the crisis, although the net increase in wages from these effects was still positive, despite the sharp deterioration in employment. The process of wage moderation initiated in 2010 may be somewhat sharper than is indicated by the aggregate statistics on labour costs.

This study shows that the average contribution bases in real terms rose from 2006 in the private sector of the economy, after having remained steady in the preceding years. Subsequently they marked on a progressive moderation. The results of the decomposition exercise suggest that changes in the composition of employment played a significant role in this wage behaviour. In particular, from 2008 onwards, and coinciding with the process of job destruction, the contribution of the estimated composition effects began to increase significantly. In other words, the change in the employment composition explains an important part of the real wages evolution from 2007 to 2010. On average in the period 2008-12, composition effects contributed 1.3 pp each year to the observed increase in contribution bases due to the higher relative weight of the groups of workers with higher qualifications, more experience and with higher average remuneration. However, even when these effects are stripped out, wages rose in real terms in the initial phase of the crisis, and only from 2010 do they begin to behave more in line with the cyclical weakness of the labour market.

This evidence is relevant for policy debate. It suggests that the role of the composition effect needs to be taken into account to elaborate proper labour policy recommendation. Additionally, the role of downward wage rigidity, the countercyclical pattern and the composition effect of the Spanish

labour market are key elements to make a proper assessment of future implications of labour reforms and to understand how the labour market reacts to downward wage rigidity.

6. Annex: Tables and Charts

Table 14 – *Composition of the MCVL employed population in (from 1990 to 2012)*

	By gender		By age				By occupational contribution group				By experience			
	Male	Female	16 - 34	35 - 44	45 - 54	> 55	Managers	Professionals	Technical staff	Others	Less 6 months	6 months to 1.5 years	1.5 to 3.5 years	More than 3.5 years
1990	67.4	32.6	51.0	22.2	13.9	12.8	6.6	4.6	31.3	25.2	59.2	16.0	12.9	11.9
1991	66.3	33.7	50.7	22.4	13.9	13.1	6.9	4.9	32.2	25.1	58.3	15.8	13.6	12.2
1992	65.4	34.6	49.8	22.8	14.1	13.3	6.9	4.9	31.5	23.2	58.8	13.9	14.1	13.2
1993	64.9	35.1	48.2	23.3	14.9	13.6	6.9	4.9	30.9	21.4	60.6	11.7	13.6	14.2
1994	64.3	35.7	46.7	24.0	15.5	13.7	6.5	4.6	29.1	19.7	61.4	10.8	12.1	15.6
1995	63.7	36.3	45.6	24.5	15.6	14.2	6.4	4.7	29.2	19.8	61.7	10.5	11.2	16.6
1996	63.0	37.0	44.8	24.9	15.9	14.4	6.4	4.6	28.7	19.6	61.7	11.0	10.5	16.8
1997	62.4	37.6	44.2	25.0	16.3	14.5	6.5	4.6	28.6	19.8	61.8	10.8	10.4	17.0
1998	61.7	38.3	44.0	25.0	16.2	14.7	6.6	4.6	29.0	20.4	62.0	12.3	9.9	15.9
1999	61.0	39.0	43.8	25.1	16.2	14.9	6.8	4.6	29.7	20.9	60.5	13.2	10.8	15.4
2000	60.3	39.7	43.8	25.1	16.2	15.0	7.2	4.8	30.8	21.3	57.9	14.2	12.5	15.4
2001	59.6	40.4	43.6	25.1	16.3	15.0	7.5	4.9	31.6	21.3	56.1	13.5	13.8	16.7
2002	59.1	40.9	43.2	25.3	16.6	14.9	7.7	5.0	32.2	21.4	55.6	12.7	13.6	18.1
2003	58.6	41.4	42.7	25.4	16.8	15.1	8.0	5.0	32.9	22.3	54.1	13.2	12.8	19.9
2004	57.9	42.1	42.1	25.5	17.2	15.2	8.2	5.1	33.5	22.6	53.1	12.5	13.0	21.3
2005	57.4	42.6	41.7	25.7	17.5	15.1	8.3	5.2	34.0	22.8	53.0	12.3	12.6	22.1
2006	57.0	43.0	41.1	26.0	17.8	15.1	8.5	5.2	34.2	22.6	52.7	13.0	11.6	22.8
2007	56.5	43.5	40.2	26.3	18.2	15.4	8.7	5.2	34.4	22.2	52.8	13.1	11.5	22.5
2008	56.0	44.0	39.1	26.6	18.6	15.7	8.9	5.3	34.0	21.3	53.0	12.6	12.0	22.4
2009	55.7	44.3	37.4	27.0	19.3	16.3	8.9	5.1	31.7	18.1	55.9	9.7	11.8	22.5
2010	55.4	44.6	35.6	27.5	19.9	17.0	8.9	5.0	30.3	17.1	57.6	8.2	10.8	23.4
2011	55.2	44.8	33.7	28.0	20.5	17.8	8.8	4.8	29.0	16.4	59.1	7.9	8.9	24.0
2012	55.0	45.0	31.8	28.4	21.0	18.7	8.7	4.7	28.1	15.7	60.9	7.7	7.7	23.7

Table 15 – *Average of wages of the MCVL population (Male gender)*

	By age				By experience				By occupational contribution group			
	16 - 34	35 - 44	45 - 54	> 55	Less 6 months	6 months to 1.5 years	1.5 to 3.5 years	More than 3.5 years	Managers	Professionals	Technical staff	Others
1990	963.43	1422.24	1466.29	1297.72	779.75	1404.43	1563.53	1727.67	2381.27	2141.52	1331.49	1066.03
1991	1013.84	1492.81	1550.64	1379.72	809.42	1509.16	1601.87	1768.19	2416.87	2212.13	1354.12	1089.07
1992	1012.68	1478.76	1553.73	1374.01	769.74	1478.74	1673.56	1779.13	2424.86	2235.92	1359.32	1099.24
1993	1027.96	1524.50	1634.75	1429.26	796.88	1514.38	1744.13	1888.88	2451.03	2244.75	1432.74	1118.46
1994	962.96	1464.12	1585.17	1323.59	677.84	1511.42	1669.29	1886.73	2468.47	2226.85	1414.34	1105.37
1995	952.92	1470.27	1615.11	1400.47	729.27	1406.59	1652.90	1880.85	2456.11	2192.02	1396.84	1075.72
1996	939.64	1460.23	1623.42	1425.54	703.06	1413.26	1624.59	1888.98	2456.45	2189.11	1390.23	1064.47
1997	942.35	1465.71	1646.48	1467.30	717.73	1395.43	1618.44	1921.67	2465.58	2205.54	1407.72	1076.39
1998	964.84	1486.89	1683.23	1507.55	759.90	1436.23	1637.62	1956.48	2482.31	2240.24	1437.66	1090.23
1999	1042.59	1530.45	1731.84	1582.05	808.01	1494.00	1728.88	1983.67	2501.93	2283.24	1500.44	1146.99
2000	1043.90	1532.39	1724.35	1591.30	802.75	1473.02	1657.63	1956.09	2451.58	2238.65	1471.82	1128.07
2001	1073.92	1539.81	1728.17	1616.06	791.16	1449.02	1677.56	1957.84	2435.14	2226.67	1484.65	1140.12
2002	1076.67	1517.18	1702.02	1621.48	792.62	1405.45	1668.19	1941.74	2420.72	2202.71	1480.41	1129.89
2003	1080.18	1504.09	1673.15	1588.08	770.18	1397.67	1632.72	1950.51	2419.71	2196.47	1481.00	1102.64
2004	1087.29	1502.84	1668.12	1574.92	775.99	1354.69	1610.99	1948.23	2412.25	2187.60	1480.16	1098.48
2005	1085.55	1492.91	1649.25	1549.59	782.35	1372.26	1580.13	1939.82	2403.25	2180.46	1476.29	1093.02
2006	1101.04	1496.58	1641.70	1542.63	793.73	1376.24	1577.66	1938.16	2398.29	2173.77	1481.61	1101.20
2007	1138.41	1524.92	1658.12	1545.75	828.69	1432.61	1609.99	1947.07	2422.88	2188.55	1506.91	1124.46
2008	1138.20	1519.77	1633.74	1524.17	808.53	1462.79	1626.86	1932.47	2412.79	2167.40	1509.19	1124.54
2009	1128.57	1539.29	1667.81	1545.16	806.74	1500.45	1697.16	1965.21	2482.21	2215.22	1548.45	1148.09
2010	1077.21	1507.01	1642.10	1527.14	765.24	1440.64	1700.87	1949.84	2452.95	2187.76	1534.23	1126.07
2011	1021.23	1460.10	1593.58	1488.18	735.03	1407.82	1639.53	1904.46	2386.24	2135.03	1497.51	1094.64
2012	968.06	1417.96	1547.18	1437.17	707.08	1422.09	1587.91	1864.60	2313.10	2070.52	1444.47	1063.91

Table 16 – *Average of wages of the MCVL population (Female gender)*

	By age				By experience				By occupational contribution group			
	16 - 34	35 - 44	45 - 54	> 55	Less 6 months	6 months to 1.5 years	1.5 to 3.5 years	More than 3.5 years	Managers	Professionals	Technical staff	Others
1990	855.59	1173.97	1068.29	992.15	655.27	1181.31	1337.75	1422.66	1999.54	1750.35	1148.62	810.29
1991	890.36	1196.40	1108.25	1020.49	680.71	1215.01	1358.72	1482.12	2049.02	1796.02	1152.24	811.22
1992	884.45	1190.70	1121.69	1027.08	632.88	1244.54	1404.93	1522.48	2114.57	1849.06	1171.41	824.50
1993	909.03	1269.96	1199.67	1075.84	646.39	1273.36	1445.68	1596.91	2155.81	1870.74	1218.11	831.22
1994	846.97	1228.25	1174.47	1032.26	559.70	1243.53	1387.95	1586.19	2130.23	1854.35	1203.96	816.82
1995	839.00	1227.45	1204.41	1058.47	574.52	1178.56	1372.90	1576.54	2114.66	1841.36	1185.91	788.08
1996	819.96	1223.04	1218.85	1052.49	554.39	1154.87	1359.36	1595.09	2115.09	1838.80	1177.47	773.53
1997	812.35	1211.02	1235.60	1063.71	560.67	1135.63	1333.35	1618.99	2098.48	1846.27	1177.18	774.51
1998	814.64	1213.68	1256.60	1079.83	591.28	1196.92	1317.34	1639.82	2109.46	1851.95	1184.62	777.89
1999	859.97	1214.85	1285.10	1109.36	592.49	1254.26	1440.54	1668.36	2117.68	1885.21	1225.15	807.53
2000	851.30	1206.44	1283.95	1123.53	592.72	1184.00	1409.68	1644.20	2081.54	1831.70	1187.78	792.01
2001	873.07	1202.38	1293.31	1142.25	586.64	1165.72	1398.41	1660.49	2085.26	1826.40	1192.19	796.32
2002	873.35	1185.70	1285.98	1144.35	604.90	1135.13	1355.73	1653.51	2080.78	1807.89	1185.94	786.84
2003	877.18	1164.59	1255.21	1103.05	572.18	1181.39	1324.75	1654.40	2095.84	1789.14	1188.56	770.50
2004	885.53	1156.66	1251.11	1089.91	569.66	1129.05	1359.49	1651.65	2106.66	1779.38	1187.80	769.30
2005	891.22	1146.30	1237.11	1094.47	572.02	1131.94	1363.90	1645.79	2111.33	1774.52	1186.14	773.40
2006	910.55	1153.56	1234.33	1120.61	590.02	1139.69	1336.97	1665.35	2126.69	1768.47	1193.88	783.89
2007	947.53	1180.44	1239.60	1134.44	623.91	1202.37	1353.69	1686.13	2171.11	1779.29	1217.71	797.96
2008	967.56	1192.16	1241.63	1144.49	623.12	1227.81	1376.85	1683.95	2179.09	1772.32	1229.29	805.97
2009	985.26	1239.71	1305.95	1248.29	617.59	1244.61	1435.97	1718.41	2251.67	1831.34	1276.06	838.15
2010	957.03	1233.46	1298.85	1255.69	601.75	1202.04	1421.45	1693.28	2218.88	1812.92	1267.71	827.78
2011	913.91	1202.72	1266.56	1242.32	601.82	1171.11	1359.76	1632.42	2143.37	1767.14	1237.89	808.38
2012	871.12	1182.41	1236.46	1193.51	583.14	1198.34	1306.31	1571.08	2064.14	1714.99	1186.45	783.02

Table 17 *– Number observation of the MCVL employed population*[31] *(from 1990 to 2012)*

	By gender		By age				By occupational contribution group				By experience			
	Male	Female	16 - 34	35 - 44	45 - 54	> 55	Managers	Professionals	Technical staff	Others	Less 6 months	6 months to 1.5 years	1.5 to 3.5 years	More than 3.5 years
1990	315,554.17	152,327.33	238,628.58	104,035.50	65,240.25	59,977.17	30,948.17	21,496.67	146,400.25	117,815.83	276,918.00	74,867.58	60,554.08	55,541.83
1991	330,525.42	167,897.00	252,662.17	111,530.92	69,083.17	65,146.17	34,171.67	24,409.67	160,422.50	125,087.75	290,820.92	78,939.83	67,652.83	61,008.83
1992	342,938.17	181,207.17	260,842.83	119,559.00	74,046.08	69,697.42	36,336.17	25,618.17	165,078.33	121,514.92	308,145.42	72,982.42	73,701.42	69,316.08
1993	353,634.00	191,614.42	262,645.92	127,255.33	81,010.83	74,336.33	37,802.50	26,935.83	168,469.17	116,534.08	330,337.08	63,577.42	73,990.08	77,343.83
1994	362,156.50	201,263.92	263,395.75	135,031.00	87,575.17	77,418.50	36,473.83	26,016.08	163,969.83	110,984.00	346,190.25	61,050.42	68,387.50	87,792.25
1995	371,341.00	211,735.50	266,004.25	143,119.17	90,991.67	82,961.42	37,462.42	27,395.75	170,346.92	115,690.75	359,920.25	61,425.92	65,049.25	96,681.08
1996	380,822.33	223,589.42	270,926.67	150,301.33	96,335.00	86,848.75	38,750.58	28,084.17	173,518.42	118,333.83	372,753.92	66,472.08	63,534.67	101,651.08
1997	391,647.25	236,175.75	277,536.17	157,037.83	102,080.83	91,168.17	40,500.42	28,938.50	179,732.75	124,255.50	388,029.67	67,903.67	65,207.50	106,682.17
1998	405,467.08	251,565.50	289,020.83	164,511.00	106,656.50	96,844.25	43,055.83	29,981.25	190,527.67	134,307.00	407,163.00	80,761.58	64,941.25	104,165.83
1999	420,248.75	268,757.42	301,865.58	173,227.42	111,531.75	102,381.42	47,081.50	31,795.75	204,711.50	144,257.25	416,796.75	91,239.67	74,707.33	106,261.58
2000	435,567.83	287,128.67	316,646.00	181,076.08	116,761.50	108,212.92	52,088.67	34,371.33	222,444.17	154,138.08	418,674.50	102,433.58	90,416.42	111,170.58
2001	450,788.08	305,543.33	329,781.75	190,181.58	123,283.33	113,084.75	56,546.67	36,980.50	238,624.17	161,072.33	424,136.25	101,867.25	104,163.17	126,163.92
2002	465,295.83	322,129.75	340,360.08	198,859.42	130,533.83	117,672.25	60,507.42	39,018.83	253,859.42	168,272.42	437,573.92	100,015.42	107,143.50	142,692.25
2003	480,304.25	339,994.67	350,160.92	208,067.58	137,969.42	124,101.00	65,217.67	41,239.50	270,262.25	183,179.50	443,638.67	108,523.25	105,118.75	163,017.75
2004	489,831.67	356,763.50	356,723.00	216,089.67	145,344.67	128,437.83	69,254.58	43,231.00	283,781.33	190,957.08	449,881.08	105,631.42	110,444.25	180,638.08
2005	506,491.33	375,391.33	367,661.83	226,523.58	154,736.00	132,961.25	73,500.67	45,486.92	299,689.42	201,038.17	467,529.50	108,825.75	110,927.58	194,599.83
2006	524,727.25	395,432.92	378,195.33	239,089.25	164,101.58	138,774.00	77,854.50	47,531.75	315,031.58	208,015.00	484,969.33	119,226.17	106,393.00	209,571.67
2007	538,716.42	415,227.75	383,663.83	250,415.42	173,356.00	146,508.92	83,063.83	49,891.08	328,536.00	211,448.08	503,727.08	125,263.42	109,993.67	214,960.00
2008	550,233.67	432,057.00	384,027.58	261,148.00	182,931.75	154,183.33	87,168.42	51,598.92	333,955.58	209,356.92	520,664.83	123,702.92	117,447.75	220,474.33
2009	556,980.08	442,886.42	374,272.83	269,898.00	193,057.25	162,638.42	89,000.17	50,862.83	317,369.83	181,231.08	559,296.42	97,200.25	117,904.58	225,462.75
2010	561,099.08	451,084.58	360,004.42	278,779.00	201,424.67	171,975.92	89,838.17	50,221.17	306,655.08	172,688.25	583,240.83	82,822.08	109,770.08	236,349.33
2011	564,628.67	458,466.92	344,628.42	286,965.00	209,753.33	181,749.83	90,418.25	49,581.58	297,185.25	167,471.83	605,122.50	81,119.67	91,133.42	245,720.42
2012	566,534.17	464,149.00	327,357.92	293,214.08	216,873.08	193,239.08	90,182.67	48,742.00	289,376.83	161,448.00	627,734.08	79,274.42	79,584.25	244,091.42

Table 18 *– Estimation output (from 1990 to 2000)*

Worker's characteristics	Year										
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
celda_1111	7.66***	7.64***	7.63***	7.63***	7.6***	7.56***	7.57***	7.57***	7.59***	7.63***	7.63***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2111	7.54***	7.55***	7.58***	7.58***	7.54***	7.51***	7.51***	7.5***	7.5***	7.52***	7.5***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1211	7.77***	7.74***	7.73***	7.74***	7.78***	7.78***	7.79***	7.81***	7.84***	7.87***	7.84***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
celda_2211	7.62***	7.61***	7.64***	7.66***	7.66***	7.64***	7.65***	7.67***	7.7***	7.68***	7.67***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
celda_1311	7.8***	7.76***	7.76***	7.76***	7.81***	7.82***	7.81***	7.86***	7.88***	7.92***	7.89***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_2311	7.56***	7.54***	7.59***	7.56***	7.64***	7.62***	7.61***	7.65***	7.68***	7.73***	7.69***
	(0.01)	(0.009)	(0.008)	(0.01)	(0.009)	(0.01)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
celda_1411	7.8***	7.73***	7.73***	7.74***	7.78***	7.77***	7.8***	7.81***	7.83***	7.88***	7.87***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
celda_2411	7.57***	7.54***	7.58***	7.59***	7.56***	7.62***	7.59***	7.6***	7.67***	7.66***	7.65***
	(0.016)	(0.014)	(0.014)	(0.018)	(0.018)	(0.019)	(0.018)	(0.015)	(0.014)	(0.018)	(0.017)
celda_1121	7.67***	7.69***	7.69***	7.67***	7.68***	7.63***	7.62***	7.61***	7.64***	7.68***	7.69***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
celda_2121	7.58***	7.6***	7.61***	7.6***	7.58***	7.54***	7.56***	7.53***	7.54***	7.55***	7.56***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_1221	7.76***	7.78***	7.78***	7.77***	7.78***	7.82***	7.83***	7.83***	7.85***	7.87***	7.88***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2221	7.63***	7.64***	7.67***	7.68***	7.66***	7.69***	7.69***	7.69***	7.72***	7.72***	7.72***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
celda_1321	7.78***	7.8***	7.8***	7.79***	7.79***	7.87***	7.87***	7.87***	7.91***	7.92***	7.91***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)
celda_2321	7.59***	7.56***	7.62***	7.62***	7.6***	7.68***	7.69***	7.64***	7.73***	7.74***	7.75***
	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.006)	(0.007)	(0.006)
celda_1421	7.79***	7.78***	7.76***	7.75***	7.74***	7.8***	7.81***	7.84***	7.85***	7.89***	7.88***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)
celda_2421	7.55***	7.52***	7.58***	7.59***	7.59***	7.62***	7.61***	7.61***	7.64***	7.74***	7.71***
	(0.013)	(0.012)	(0.011)	(0.012)	(0.015)	(0.016)	(0.016)	(0.014)	(0.012)	(0.013)	(0.012)
celda_1131	7.68***	7.71***	7.76***	7.76***	7.72***	7.72***	7.72***	7.7***	7.71***	7.76***	7.72***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_2131	7.58***	7.64***	7.68***	7.67***	7.63***	7.62***	7.62***	7.6***	7.6***	7.65***	7.6***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_1231	7.78***	7.76***	7.8***	7.82***	7.81***	7.81***	7.85***	7.85***	7.87***	7.88***	7.87***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_2231	7.63***	7.66***	7.7***	7.72***	7.69***	7.7***	7.73***	7.72***	7.72***	7.74***	7.73***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
celda_1331	7.79***	7.79***	7.83***	7.85***	7.82***	7.83***	7.89***	7.9***	7.91***	7.92***	7.91***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2331	7.59***	7.59***	7.64***	7.66***	7.64***	7.64***	7.7***	7.71***	7.71***	7.74***	7.74***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.005)
celda_1431	7.81***	7.81***	7.83***	7.81***	7.77***	7.78***	7.83***	7.85***	7.87***	7.91***	7.89***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
celda_2431	7.56***	7.58***	7.58***	7.57***	7.54***	7.59***	7.66***	7.7***	7.73***	7.71***	7.71***
	(0.009)	(0.009)	(0.01)	(0.01)	(0.01)	(0.011)	(0.013)	(0.013)	(0.013)	(0.012)	(0.01)
celda_1141	7.75***	7.75***	7.76***	7.79***	7.79***	7.79***	7.79***	7.78***	7.79***	7.8***	7.77***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2141	7.63***	7.63***	7.66***	7.69***	7.67***	7.66***	7.66***	7.66***	7.66***	7.67***	7.65***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1241	7.84***	7.83***	7.83***	7.82***	7.84***	7.85***	7.86***	7.87***	7.9***	7.9***	7.89***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2241	7.65***	7.68***	7.69***	7.7***	7.7***	7.7***	7.73***	7.74***	7.76***	7.77***	7.76***
	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Worker's characteristics	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
celda_1341	7.85***	7.85***	7.86***	7.87***	7.88***	7.89***	7.9***	7.9***	7.94***	7.93***	7.92***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2341	7.64***	7.65***	7.69***	7.69***	7.69***	7.7***	7.72***	7.72***	7.76***	7.77***	7.78***
	(0.008)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1441	7.86***	7.85***	7.85***	7.86***	7.84***	7.84***	7.85***	7.87***	7.91***	7.92***	7.91***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2441	7.63***	7.64***	7.68***	7.69***	7.63***	7.62***	7.66***	7.67***	7.73***	7.77***	7.78***
	(0.011)	(0.009)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
celda_1112	7.48***	7.47***	7.48***	7.47***	7.44***	7.4***	7.41***	7.41***	7.44***	7.52***	7.46***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2112	7.37***	7.32***	7.35***	7.34***	7.29***	7.28***	7.3***	7.32***	7.33***	7.37***	7.34***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
celda_1212	7.69***	7.64***	7.63***	7.63***	7.62***	7.63***	7.59***	7.6***	7.61***	7.68***	7.65***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2212	7.5***	7.46***	7.48***	7.48***	7.48***	7.52***	7.47***	7.48***	7.5***	7.58***	7.51***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.006)	(0.006)
celda_1312	7.69***	7.68***	7.67***	7.66***	7.66***	7.69***	7.63***	7.67***	7.68***	7.78***	7.69***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
celda_2312	7.58***	7.5***	7.48***	7.47***	7.49***	7.49***	7.45***	7.48***	7.55***	7.78***	7.56***
	(0.011)	(0.011)	(0.01)	(0.011)	(0.011)	(0.011)	(0.01)	(0.01)	(0.009)	(0.006)	(0.009)
celda_1412	7.64***	7.64***	7.62***	7.63***	7.61***	7.61***	7.59***	7.63***	7.66***	7.72***	7.68***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
celda_2412	7.46***	7.42***	7.43***	7.35***	7.43***	7.47***	7.41***	7.4***	7.46***	7.55***	7.45***
	(0.016)	(0.015)	(0.015)	(0.016)	(0.019)	(0.018)	(0.016)	(0.018)	(0.016)	(0.016)	(0.017)
celda_1122	7.52***	7.57***	7.56***	7.55***	7.51***	7.49***	7.48***	7.49***	7.51***	7.54***	7.56***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_2122	7.41***	7.45***	7.43***	7.46***	7.4***	7.39***	7.38***	7.43***	7.39***	7.45***	7.43***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
celda_1222	7.67***	7.75***	7.69***	7.68***	7.68***	7.65***	7.69***	7.67***	7.67***	7.71***	7.72***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2222	7.54***	7.59***	7.54***	7.56***	7.5***	7.55***	7.6***	7.58***	7.56***	7.6***	7.6***
	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)
celda_1322	7.7***	7.77***	7.73***	7.72***	7.71***	7.7***	7.73***	7.72***	7.74***	7.74***	7.76***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2322	7.52***	7.61***	7.6***	7.56***	7.54***	7.59***	7.55***	7.56***	7.56***	7.67***	7.75***
	(0.01)	(0.009)	(0.009)	(0.009)	(0.01)	(0.01)	(0.009)	(0.008)	(0.008)	(0.008)	(0.005)
celda_1422	7.67***	7.72***	7.69***	7.66***	7.66***	7.66***	7.67***	7.66***	7.71***	7.74***	7.72***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
celda_2422	7.54***	7.54***	7.46***	7.49***	7.4***	7.48***	7.53***	7.52***	7.55***	7.58***	7.56***
	(0.014)	(0.014)	(0.013)	(0.014)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.013)
celda_1132	7.52***	7.57***	7.63***	7.64***	7.6***	7.57***	7.56***	7.55***	7.58***	7.61***	7.58***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2132	7.44***	7.5***	7.55***	7.53***	7.51***	7.5***	7.47***	7.48***	7.52***	7.52***	7.46***
	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
celda_1232	7.69***	7.7***	7.76***	7.76***	7.72***	7.7***	7.7***	7.71***	7.74***	7.75***	7.73***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_2232	7.59***	7.6***	7.65***	7.66***	7.59***	7.54***	7.59***	7.62***	7.65***	7.64***	7.6***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
celda_1332	7.72***	7.76***	7.8***	7.81***	7.76***	7.73***	7.74***	7.78***	7.79***	7.8***	7.76***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2332	7.64***	7.62***	7.65***	7.64***	7.61***	7.6***	7.62***	7.62***	7.63***	7.64***	7.61***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.006)
celda_1432	7.68***	7.74***	7.76***	7.77***	7.71***	7.69***	7.7***	7.7***	7.72***	7.77***	7.74***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
celda_2432	7.53***	7.59***	7.61***	7.56***	7.49***	7.46***	7.52***	7.56***	7.57***	7.61***	7.64***
	(0.01)	(0.012)	(0.011)	(0.011)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.011)
celda_1142	7.55***	7.58***	7.6***	7.65***	7.66***	7.65***	7.66***	7.66***	7.68***	7.65***	7.64***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
celda_2142	7.47***	7.48***	7.51***	7.55***	7.57***	7.57***	7.59***	7.59***	7.6***	7.61***	7.59***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_1242	7.74***	7.76***	7.75***	7.77***	7.77***	7.76***	7.76***	7.77***	7.78***	7.78***	7.77***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2242	7.64***	7.67***	7.67***	7.69***	7.7***	7.68***	7.66***	7.67***	7.7***	7.7***	7.69***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
celda_1342	7.78***	7.8***	7.8***	7.83***	7.83***	7.83***	7.83***	7.84***	7.86***	7.85***	7.84***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Worker's characteristics	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
celda_2342	7.64***	7.68***	7.7***	7.73***	7.73***	7.72***	7.75***	7.78***	7.79***	7.75***	7.74***
	(0.009)	(0.007)	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
celda_1442	7.73***	7.76***	7.77***	7.8***	7.79***	7.78***	7.79***	7.8***	7.82***	7.82***	7.8***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
celda_2442	7.57***	7.65***	7.68***	7.72***	7.71***	7.67***	7.67***	7.68***	7.73***	7.71***	7.71***
	(0.013)	(0.01)	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
celda_1113	7.06***	7.06***	7.07***	7.08***	7.04***	7.03***	7.03***	7.04***	7.07***	7.11***	7.1***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2113	7***	6.97***	7***	7.01***	6.98***	6.96***	6.95***	6.95***	6.98***	7.01***	6.98***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1213	7.21***	7.18***	7.18***	7.21***	7.17***	7.16***	7.14***	7.15***	7.18***	7.21***	7.18***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2213	7.16***	7.08***	7.13***	7.17***	7.13***	7.12***	7.11***	7.11***	7.14***	7.16***	7.12***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1313	7.23***	7.2***	7.21***	7.27***	7.23***	7.22***	7.2***	7.22***	7.23***	7.3***	7.25***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2313	7.14***	7.05***	7.11***	7.14***	7.12***	7.11***	7.1***	7.1***	7.15***	7.26***	7.17***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1413	7.24***	7.22***	7.23***	7.26***	7.23***	7.2***	7.2***	7.22***	7.25***	7.28***	7.25***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
celda_2413	7.11***	7.03***	7.11***	7.1***	7.05***	7.06***	7.07***	7.07***	7.12***	7.16***	7.12***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
celda_1123	7.09***	7.13***	7.13***	7.13***	7.09***	7.08***	7.07***	7.09***	7.11***	7.17***	7.16***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2123	7.02***	7.03***	7.05***	7.05***	7.01***	7***	6.99***	7.01***	7.02***	7.08***	7.04***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1223	7.22***	7.27***	7.26***	7.28***	7.24***	7.22***	7.22***	7.21***	7.23***	7.25***	7.26***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2223	7.2***	7.17***	7.2***	7.2***	7.19***	7.17***	7.17***	7.18***	7.2***	7.21***	7.2***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1323	7.23***	7.29***	7.28***	7.32***	7.31***	7.28***	7.3***	7.29***	7.32***	7.33***	7.33***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
celda_2323	7.14***	7.15***	7.17***	7.19***	7.16***	7.16***	7.18***	7.19***	7.21***	7.25***	7.27***
	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1423	7.24***	7.3***	7.27***	7.31***	7.29***	7.26***	7.27***	7.28***	7.3***	7.34***	7.31***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
celda_2423	7.14***	7.11***	7.14***	7.15***	7.09***	7.09***	7.11***	7.11***	7.14***	7.2***	7.18***
	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
celda_1133	7.14***	7.16***	7.19***	7.22***	7.18***	7.16***	7.14***	7.15***	7.18***	7.24***	7.19***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2133	7.07***	7.08***	7.12***	7.13***	7.08***	7.06***	7.06***	7.07***	7.09***	7.15***	7.1***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1233	7.27***	7.29***	7.32***	7.39***	7.33***	7.29***	7.28***	7.29***	7.3***	7.32***	7.3***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2233	7.27***	7.24***	7.27***	7.3***	7.24***	7.23***	7.22***	7.21***	7.25***	7.27***	7.23***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1333	7.29***	7.3***	7.34***	7.42***	7.37***	7.37***	7.37***	7.38***	7.39***	7.43***	7.39***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2333	7.21***	7.19***	7.24***	7.29***	7.22***	7.2***	7.21***	7.24***	7.27***	7.32***	7.28***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_1433	7.27***	7.29***	7.32***	7.39***	7.34***	7.32***	7.31***	7.33***	7.37***	7.4***	7.35***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2433	7.17***	7.14***	7.16***	7.21***	7.14***	7.14***	7.13***	7.14***	7.17***	7.18***	7.18***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
celda_1143	7.25***	7.26***	7.26***	7.3***	7.29***	7.28***	7.27***	7.28***	7.31***	7.32***	7.3***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2143	7.17***	7.17***	7.18***	7.21***	7.18***	7.18***	7.18***	7.19***	7.2***	7.23***	7.2***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1243	7.36***	7.37***	7.37***	7.43***	7.42***	7.41***	7.41***	7.42***	7.43***	7.44***	7.42***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2243	7.3***	7.33***	7.33***	7.37***	7.35***	7.34***	7.33***	7.34***	7.36***	7.37***	7.35***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1343	7.37***	7.38***	7.38***	7.48***	7.48***	7.48***	7.48***	7.5***	7.53***	7.54***	7.53***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2343	7.24***	7.28***	7.3***	7.36***	7.36***	7.37***	7.37***	7.39***	7.43***	7.43***	7.42***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1443	7.33***	7.35***	7.35***	7.42***	7.42***	7.42***	7.43***	7.45***	7.48***	7.5***	7.5***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Worker's characteristics	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
celda_2443	7.18***	7.18***	7.21***	7.25***	7.23***	7.24***	7.24***	7.25***	7.29***	7.3***	7.31***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1114	6.89***	6.88***	6.89***	6.91***	6.93***	6.93***	6.93***	6.96***	6.98***	7.01***	7.01***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2114	6.75***	6.72***	6.75***	6.78***	6.79***	6.79***	6.8***	6.83***	6.86***	6.88***	6.88***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
celda_1214	7.09***	7.07***	7.07***	7.1***	7.07***	7.06***	7.04***	7.04***	7.05***	7.07***	7.06***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2214	6.91***	6.86***	6.9***	6.92***	6.9***	6.89***	6.89***	6.91***	6.92***	6.93***	6.94***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_1314	7.14***	7.13***	7.12***	7.17***	7.17***	7.14***	7.13***	7.12***	7.13***	7.11***	7.09***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
celda_2314	6.92***	6.87***	6.9***	6.91***	6.89***	6.87***	6.89***	6.91***	6.93***	6.94***	6.96***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1414	7.12***	7.11***	7.13***	7.16***	7.12***	7.1***	7.15***	7.11***	7.12***	7.13***	7.09***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_2414	6.94***	6.92***	6.94***	6.95***	6.91***	6.9***	6.92***	6.94***	6.96***	6.97***	6.98***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
celda_1124	6.93***	6.94***	6.93***	6.95***	6.93***	6.97***	6.98***	7***	7.02***	7.07***	7.05***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2124	6.78***	6.76***	6.77***	6.79***	6.79***	6.82***	6.82***	6.85***	6.87***	6.93***	6.89***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1224	7.12***	7.17***	7.15***	7.14***	7.15***	7.12***	7.13***	7.1***	7.11***	7.13***	7.13***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2224	6.98***	6.94***	6.95***	6.97***	6.96***	6.97***	6.94***	6.97***	6.98***	6.98***	6.98***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
celda_1324	7.17***	7.23***	7.2***	7.23***	7.26***	7.23***	7.24***	7.22***	7.23***	7.23***	7.18***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2324	6.96***	6.97***	6.95***	6.97***	6.95***	6.95***	6.92***	6.97***	6.98***	7.04***	7.01***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)
celda_1424	7.14***	7.21***	7.19***	7.23***	7.2***	7.2***	7.2***	7.27***	7.2***	7.22***	7.22***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
celda_2424	6.99***	6.99***	7.01***	7.02***	7***	6.99***	6.97***	6.98***	7.02***	7.05***	7.03***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)
celda_1134	7.03***	7.04***	7.05***	7.05***	7.02***	7.02***	7.03***	7.06***	7.08***	7.15***	7.1***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2134	6.85***	6.85***	6.87***	6.86***	6.83***	6.84***	6.86***	6.88***	6.9***	6.96***	6.91***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1234	7.2***	7.2***	7.23***	7.25***	7.19***	7.18***	7.18***	7.2***	7.2***	7.21***	7.18***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2234	7.01***	7.04***	7.07***	7.06***	7***	7.02***	7.01***	7***	7.01***	7.04***	7.01***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1334	7.24***	7.24***	7.28***	7.33***	7.26***	7.29***	7.3***	7.32***	7.32***	7.36***	7.31***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2334	7***	7.02***	7.06***	7.04***	6.99***	7***	7***	6.98***	7.01***	7.07***	7.03***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
celda_1434	7.19***	7.2***	7.25***	7.28***	7.21***	7.25***	7.26***	7.29***	7.37***	7.38***	7.28***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2434	7***	7***	7.04***	7.06***	7***	7.03***	7.01***	7.01***	7.05***	7.08***	7.07***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
celda_1144	7.16***	7.17***	7.18***	7.2***	7.18***	7.17***	7.16***	7.17***	7.19***	7.23***	7.21***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2144	7***	7***	7.01***	7***	6.97***	6.96***	6.95***	6.96***	6.97***	7***	6.96***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
celda_1244	7.32***	7.33***	7.32***	7.36***	7.34***	7.32***	7.3***	7.31***	7.32***	7.34***	7.32***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2244	7.12***	7.15***	7.15***	7.18***	7.17***	7.16***	7.16***	7.16***	7.16***	7.16***	7.11***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1344	7.34***	7.35***	7.35***	7.42***	7.42***	7.41***	7.4***	7.42***	7.44***	7.46***	7.45***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2344	7.07***	7.1***	7.12***	7.15***	7.14***	7.13***	7.13***	7.14***	7.17***	7.19***	7.15***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
celda_1444	7.28***	7.31***	7.32***	7.37***	7.35***	7.35***	7.35***	7.37***	7.4***	7.43***	7.46***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Table 19 *– Estimation output (from 2001 to 2012)*

Worker's characteristics	Year										
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
celda_1111	7.65***	7.63***	7.61***	7.59***	7.6***	7.62***	7.6***	7.61***	7.61***	7.6***	7.59***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
celda_2111	7.53***	7.53***	7.5***	7.49***	7.49***	7.5***	7.5***	7.5***	7.51***	7.51***	7.49***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
celda_1211	7.81***	7.8***	7.79***	7.79***	7.8***	7.79***	7.82***	7.79***	7.81***	7.79***	7.77***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2211	7.66***	7.65***	7.66***	7.66***	7.65***	7.66***	7.68***	7.67***	7.67***	7.66***	7.65***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
celda_1311	7.85***	7.85***	7.82***	7.84***	7.83***	7.83***	7.84***	7.83***	7.87***	7.86***	7.84***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
celda_2311	7.66***	7.69***	7.71***	7.69***	7.69***	7.7***	7.71***	7.73***	7.73***	7.73***	7.71***
	(0.009)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
celda_1411	7.85***	7.83***	7.84***	7.82***	7.82***	7.83***	7.85***	7.83***	7.84***	7.85***	7.85***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.008)	(0.008)	(0.007)
celda_2411	7.65***	7.6***	7.69***	7.64***	7.66***	7.66***	7.72***	7.66***	7.69***	7.73***	7.74***
	(0.017)	(0.015)	(0.014)	(0.016)	(0.016)	(0.015)	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)
celda_1121	7.7***	7.69***	7.67***	7.64***	7.64***	7.65***	7.65***	7.65***	7.67***	7.66***	7.63***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2121	7.57***	7.57***	7.56***	7.53***	7.53***	7.53***	7.55***	7.55***	7.56***	7.55***	7.52***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1221	7.86***	7.83***	7.83***	7.82***	7.81***	7.82***	7.83***	7.83***	7.84***	7.83***	7.81***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
celda_2221	7.71***	7.7***	7.69***	7.71***	7.7***	7.69***	7.71***	7.72***	7.73***	7.71***	7.69***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1321	7.9***	7.89***	7.87***	7.86***	7.87***	7.85***	7.87***	7.86***	7.9***	7.88***	7.86***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
celda_2321	7.74***	7.71***	7.73***	7.75***	7.74***	7.73***	7.74***	7.76***	7.8***	7.76***	7.76***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
celda_1421	7.87***	7.86***	7.84***	7.86***	7.86***	7.85***	7.87***	7.85***	7.88***	7.87***	7.87***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
celda_2421	7.67***	7.69***	7.66***	7.72***	7.68***	7.65***	7.74***	7.77***	7.75***	7.78***	7.75***
	(0.013)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.01)	(0.01)	(0.01)	(0.01)
celda_1131	7.74***	7.74***	7.73***	7.72***	7.7***	7.7***	7.71***	7.71***	7.72***	7.71***	7.67***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2131	7.61***	7.61***	7.62***	7.61***	7.59***	7.58***	7.6***	7.61***	7.63***	7.62***	7.58***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1231	7.88***	7.87***	7.85***	7.85***	7.84***	7.83***	7.84***	7.84***	7.87***	7.85***	7.82***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2231	7.73***	7.74***	7.72***	7.73***	7.72***	7.72***	7.73***	7.73***	7.77***	7.75***	7.72***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1331	7.9***	7.9***	7.9***	7.89***	7.89***	7.88***	7.88***	7.88***	7.91***	7.91***	7.88***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2331	7.77***	7.76***	7.74***	7.75***	7.77***	7.78***	7.78***	7.77***	7.81***	7.82***	7.77***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
celda_1431	7.88***	7.89***	7.87***	7.88***	7.88***	7.88***	7.89***	7.87***	7.89***	7.88***	7.87***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
celda_2431	7.73***	7.75***	7.73***	7.69***	7.73***	7.75***	7.72***	7.75***	7.83***	7.81***	7.78***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)
celda_1141	7.77***	7.78***	7.79***	7.79***	7.79***	7.79***	7.8***	7.79***	7.8***	7.78***	7.74***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2141	7.65***	7.64***	7.65***	7.67***	7.68***	7.68***	7.69***	7.68***	7.69***	7.67***	7.63***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1241	7.88***	7.87***	7.88***	7.88***	7.87***	7.87***	7.87***	7.86***	7.89***	7.87***	7.85***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2241	7.76***	7.76***	7.76***	7.77***	7.76***	7.77***	7.78***	7.78***	7.81***	7.79***	7.76***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1341	7.9***	7.9***	7.91***	7.92***	7.91***	7.91***	7.92***	7.91***	7.94***	7.93***	7.9***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2341	7.78***	7.79***	7.8***	7.81***	7.81***	7.82***	7.83***	7.83***	7.87***	7.85***	7.82***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1441	7.9***	7.9***	7.9***	7.91***	7.91***	7.91***	7.91***	7.9***	7.94***	7.93***	7.91***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2441	7.76***	7.78***	7.81***	7.83***	7.82***	7.82***	7.84***	7.84***	7.87***	7.86***	7.83***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Worker's characteristics	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
celda_1112	7.47***	7.43***	7.41***	7.4***	7.41***	7.41***	7.46***	7.46***	7.48***	7.42***	7.42***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2112	7.33***	7.29***	7.23***	7.25***	7.25***	7.26***	7.3***	7.3***	7.33***	7.3***	7.31***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
celda_1212	7.61***	7.58***	7.55***	7.55***	7.59***	7.58***	7.62***	7.59***	7.61***	7.59***	7.64***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)
celda_2212	7.47***	7.45***	7.4***	7.42***	7.42***	7.39***	7.43***	7.41***	7.48***	7.47***	7.58***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
celda_1312	7.61***	7.62***	7.58***	7.59***	7.65***	7.6***	7.63***	7.62***	7.67***	7.67***	7.73***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_2312	7.44***	7.43***	7.37***	7.35***	7.41***	7.37***	7.39***	7.38***	7.44***	7.49***	7.66***
	(0.01)	(0.01)	(0.01)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.006)
celda_1412	7.6***	7.61***	7.57***	7.63***	7.6***	7.6***	7.64***	7.6***	7.65***	7.67***	7.74***
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
celda_2412	7.46***	7.44***	7.32***	7.44***	7.38***	7.36***	7.35***	7.5***	7.52***	7.58***	7.61***
	(0.019)	(0.019)	(0.017)	(0.017)	(0.015)	(0.016)	(0.013)	(0.015)	(0.014)	(0.015)	(0.014)
celda_1122	7.54***	7.53***	7.5***	7.47***	7.49***	7.48***	7.51***	7.53***	7.56***	7.52***	7.48***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
celda_2122	7.43***	7.39***	7.36***	7.34***	7.34***	7.35***	7.39***	7.39***	7.42***	7.37***	7.36***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1222	7.7***	7.65***	7.63***	7.6***	7.64***	7.64***	7.65***	7.67***	7.68***	7.65***	7.64***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
celda_2222	7.61***	7.53***	7.54***	7.51***	7.5***	7.51***	7.49***	7.5***	7.53***	7.53***	7.54***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_1322	7.74***	7.67***	7.65***	7.63***	7.71***	7.67***	7.67***	7.68***	7.73***	7.7***	7.72***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)
celda_2322	7.66***	7.49***	7.48***	7.42***	7.46***	7.46***	7.49***	7.47***	7.49***	7.51***	7.58***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)
celda_1422	7.7***	7.65***	7.66***	7.62***	7.66***	7.65***	7.69***	7.66***	7.68***	7.7***	7.71***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
celda_2422	7.47***	7.49***	7.47***	7.44***	7.53***	7.46***	7.45***	7.41***	7.55***	7.54***	7.63***
	(0.014)	(0.015)	(0.014)	(0.013)	(0.013)	(0.012)	(0.011)	(0.01)	(0.011)	(0.011)	(0.012)
celda_1132	7.61***	7.6***	7.57***	7.57***	7.56***	7.56***	7.58***	7.58***	7.59***	7.6***	7.56***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
celda_2132	7.49***	7.48***	7.46***	7.43***	7.42***	7.44***	7.46***	7.47***	7.48***	7.47***	7.44***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)
celda_1232	7.74***	7.74***	7.7***	7.68***	7.66***	7.67***	7.69***	7.68***	7.71***	7.71***	7.67***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2232	7.62***	7.64***	7.62***	7.59***	7.56***	7.56***	7.57***	7.56***	7.59***	7.59***	7.55***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1332	7.77***	7.78***	7.76***	7.7***	7.68***	7.72***	7.75***	7.72***	7.73***	7.74***	7.72***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_2332	7.74***	7.73***	7.64***	7.54***	7.53***	7.53***	7.55***	7.52***	7.52***	7.53***	7.51***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
celda_1432	7.76***	7.76***	7.71***	7.69***	7.67***	7.68***	7.69***	7.7***	7.72***	7.7***	7.69***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_2432	7.63***	7.61***	7.5***	7.55***	7.56***	7.6***	7.57***	7.5***	7.51***	7.51***	7.53***
	(0.01)	(0.01)	(0.011)	(0.01)	(0.009)	(0.01)	(0.01)	(0.009)	(0.008)	(0.008)	(0.009)
celda_1142	7.63***	7.62***	7.63***	7.63***	7.63***	7.64***	7.65***	7.65***	7.66***	7.64***	7.6***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2142	7.57***	7.57***	7.57***	7.56***	7.55***	7.54***	7.55***	7.54***	7.54***	7.53***	7.51***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1242	7.77***	7.76***	7.77***	7.76***	7.76***	7.76***	7.76***	7.75***	7.77***	7.76***	7.73***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2242	7.68***	7.67***	7.69***	7.7***	7.7***	7.7***	7.7***	7.69***	7.71***	7.7***	7.65***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1342	7.82***	7.82***	7.82***	7.82***	7.81***	7.81***	7.81***	7.81***	7.83***	7.82***	7.79***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2342	7.74***	7.74***	7.76***	7.76***	7.75***	7.73***	7.73***	7.72***	7.73***	7.72***	7.67***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1442	7.79***	7.8***	7.81***	7.81***	7.8***	7.8***	7.8***	7.8***	7.82***	7.81***	7.79***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2442	7.7***	7.68***	7.69***	7.68***	7.69***	7.7***	7.7***	7.7***	7.74***	7.73***	7.67***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
celda_1113	7.11***	7.1***	7.1***	7.11***	7.11***	7.13***	7.16***	7.17***	7.18***	7.16***	7.15***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2113	6.99***	6.98***	6.98***	6.98***	6.98***	7***	7.04***	7.05***	7.07***	7.07***	7.09***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1213	7.17***	7.17***	7.15***	7.16***	7.17***	7.18***	7.21***	7.22***	7.24***	7.23***	7.23***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Worker's characteristics	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
celda_2213	7.1***	7.09***	7.06***	7.06***	7.06***	7.07***	7.1***	7.1***	7.14***	7.14***	7.2***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1313	7.22***	7.21***	7.17***	7.18***	7.19***	7.19***	7.21***	7.22***	7.25***	7.24***	7.25***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
celda_2313	7.1***	7.12***	7.09***	7.08***	7.06***	7.06***	7.09***	7.11***	7.15***	7.14***	7.21***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
celda_1413	7.23***	7.22***	7.18***	7.2***	7.2***	7.2***	7.22***	7.23***	7.27***	7.27***	7.27***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
celda_2413	7.14***	7.14***	7.05***	7.05***	7.06***	7.07***	7.09***	7.14***	7.18***	7.15***	7.21***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
celda_1123	7.16***	7.16***	7.16***	7.16***	7.17***	7.18***	7.21***	7.23***	7.25***	7.21***	7.19***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2123	7.03***	7.03***	7.03***	7.03***	7.03***	7.05***	7.08***	7.1***	7.12***	7.1***	7.1***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1223	7.24***	7.23***	7.22***	7.21***	7.22***	7.23***	7.26***	7.28***	7.31***	7.28***	7.26***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2223	7.17***	7.15***	7.14***	7.11***	7.12***	7.12***	7.15***	7.16***	7.18***	7.18***	7.19***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
celda_1323	7.31***	7.27***	7.26***	7.23***	7.24***	7.24***	7.26***	7.28***	7.31***	7.29***	7.29***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
celda_2323	7.23***	7.18***	7.17***	7.14***	7.12***	7.1***	7.13***	7.15***	7.18***	7.18***	7.2***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1423	7.3***	7.28***	7.25***	7.23***	7.25***	7.25***	7.26***	7.27***	7.32***	7.3***	7.31***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
celda_2423	7.16***	7.19***	7.14***	7.1***	7.08***	7.12***	7.12***	7.15***	7.2***	7.2***	7.19***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
celda_1133	7.22***	7.22***	7.23***	7.23***	7.23***	7.24***	7.27***	7.28***	7.3***	7.29***	7.26***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2133	7.11***	7.1***	7.1***	7.1***	7.11***	7.12***	7.14***	7.15***	7.17***	7.16***	7.13***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1233	7.32***	7.32***	7.3***	7.3***	7.28***	7.29***	7.3***	7.32***	7.35***	7.35***	7.32***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2233	7.25***	7.23***	7.21***	7.2***	7.19***	7.18***	7.19***	7.2***	7.24***	7.23***	7.2***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1333	7.38***	7.39***	7.36***	7.34***	7.3***	7.3***	7.31***	7.32***	7.34***	7.34***	7.32***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2333	7.32***	7.3***	7.26***	7.24***	7.22***	7.2***	7.18***	7.18***	7.22***	7.22***	7.2***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1433	7.36***	7.35***	7.36***	7.32***	7.29***	7.29***	7.31***	7.3***	7.32***	7.34***	7.33***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_2433	7.22***	7.19***	7.21***	7.21***	7.16***	7.15***	7.17***	7.16***	7.21***	7.21***	7.22***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
celda_1143	7.31***	7.3***	7.31***	7.32***	7.33***	7.34***	7.36***	7.36***	7.37***	7.36***	7.34***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2143	7.2***	7.19***	7.2***	7.2***	7.2***	7.22***	7.24***	7.24***	7.26***	7.24***	7.2***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1243	7.42***	7.41***	7.42***	7.42***	7.42***	7.43***	7.44***	7.44***	7.45***	7.44***	7.42***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2243	7.35***	7.33***	7.34***	7.34***	7.33***	7.33***	7.34***	7.34***	7.36***	7.34***	7.31***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1343	7.53***	7.51***	7.51***	7.51***	7.5***	7.49***	7.49***	7.49***	7.5***	7.49***	7.46***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2343	7.42***	7.42***	7.42***	7.42***	7.41***	7.41***	7.41***	7.4***	7.41***	7.39***	7.35***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_1443	7.5***	7.49***	7.49***	7.49***	7.49***	7.49***	7.5***	7.49***	7.51***	7.5***	7.47***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2443	7.32***	7.31***	7.34***	7.35***	7.36***	7.37***	7.38***	7.38***	7.41***	7.4***	7.37***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
celda_1114	7.02***	7.01***	7.01***	7.02***	7.02***	7.03***	7.06***	7.06***	7.06***	7.05***	7.02***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
celda_2114	6.88***	6.88***	6.87***	6.88***	6.88***	6.9***	6.92***	6.93***	6.93***	6.92***	6.91***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
celda_1214	7.05***	7.04***	7.01***	7.02***	7.03***	7.05***	7.08***	7.07***	7.07***	7.05***	7.03***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
celda_2214	6.92***	6.92***	6.9***	6.9***	6.9***	6.93***	6.94***	6.94***	6.94***	6.93***	6.92***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
celda_1314	7.09***	7.06***	7.02***	7.02***	7.03***	7.04***	7.06***	7.07***	7.06***	7.05***	7.03***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

Worker's characteristics	Year										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
celda_2314	6.93*** (0.003)	6.93*** (0.003)	6.9*** (0.003)	6.9*** (0.003)	6.92*** (0.003)	6.92*** (0.003)	6.94*** (0.002)	6.96*** (0.002)	6.97*** (0.003)	6.96*** (0.003)	6.94*** (0.003)
celda_1414	7.09*** (0.004)	7.07*** (0.004)	6.98*** (0.004)	7*** (0.004)	7.01*** (0.003)	7.01*** (0.003)	7.04*** (0.003)	7.04*** (0.004)	7.03*** (0.004)	7.02*** (0.004)	7.02*** (0.004)
celda_2414	6.96*** (0.006)	6.96*** (0.006)	6.92*** (0.005)	6.92*** (0.005)	6.93*** (0.005)	6.94*** (0.005)	6.94*** (0.005)	6.98*** (0.005)	7*** (0.005)	6.98*** (0.005)	6.96*** (0.005)
celda_1124	7.06*** (0.001)	7.04*** (0.001)	7.05*** (0.001)	7.06*** (0.001)	7.06*** (0.001)	7.07*** (0.001)	7.1*** (0.001)	7.11*** (0.001)	7.11*** (0.001)	7.09*** (0.001)	7.08*** (0.001)
celda_2124	6.9*** (0.002)	6.88*** (0.002)	6.89*** (0.002)	6.89*** (0.002)	6.91*** (0.002)	6.91*** (0.001)	6.94*** (0.001)	6.95*** (0.001)	6.96*** (0.002)	6.95*** (0.002)	6.94*** (0.002)
celda_1224	7.12*** (0.002)	7.09*** (0.002)	7.08*** (0.002)	7.06*** (0.002)	7.08*** (0.001)	7.09*** (0.001)	7.12*** (0.001)	7.13*** (0.001)	7.12*** (0.002)	7.1*** (0.002)	7.1*** (0.002)
celda_2224	6.96*** (0.002)	6.94*** (0.002)	6.95*** (0.002)	6.94*** (0.002)	6.93*** (0.002)	6.95*** (0.002)	6.97*** (0.002)	6.99*** (0.002)	7*** (0.002)	6.98*** (0.003)	6.98*** (0.003)
celda_1324	7.14*** (0.002)	7.13*** (0.002)	7.09*** (0.002)	7.06*** (0.002)	7.09*** (0.002)	7.09*** (0.002)	7.11*** (0.002)	7.11*** (0.002)	7.11*** (0.002)	7.09*** (0.002)	7.1*** (0.002)
celda_2324	7*** (0.003)	6.96*** (0.003)	6.96*** (0.003)	6.96*** (0.003)	6.95*** (0.003)	6.97*** (0.003)	6.97*** (0.002)	7*** (0.002)	7.03*** (0.003)	7.01*** (0.003)	7.02*** (0.003)
celda_1424	7.16*** (0.004)	7.14*** (0.004)	7.09*** (0.004)	7.03*** (0.003)	7.07*** (0.003)	7.08*** (0.003)	7.08*** (0.003)	7.1*** (0.003)	7.09*** (0.004)	7.07*** (0.004)	7.07*** (0.004)
celda_2424	7.04*** (0.005)	6.98*** (0.005)	6.99*** (0.005)	6.98*** (0.005)	6.97*** (0.005)	7*** (0.005)	6.99*** (0.005)	7.02*** (0.004)	7.06*** (0.005)	7.05*** (0.005)	7.03*** (0.005)
celda_1134	7.12*** (0.001)	7.1*** (0.001)	7.11*** (0.001)	7.11*** (0.001)	7.12*** (0.001)	7.13*** (0.001)	7.14*** (0.001)	7.15*** (0.001)	7.17*** (0.001)	7.15*** (0.001)	7.13*** (0.001)
celda_2134	6.92*** (0.002)	6.91*** (0.002)	6.92*** (0.002)	6.92*** (0.002)	6.93*** (0.002)	6.94*** (0.002)	6.96*** (0.002)	6.97*** (0.002)	7*** (0.002)	6.98*** (0.002)	6.96*** (0.002)
celda_1234	7.2*** (0.002)	7.18*** (0.002)	7.16*** (0.002)	7.15*** (0.002)	7.14*** (0.002)	7.14*** (0.001)	7.17*** (0.001)	7.18*** (0.001)	7.2*** (0.002)	7.18*** (0.002)	7.15*** (0.002)
celda_2234	7.02*** (0.002)	6.99*** (0.002)	6.99*** (0.002)	6.99*** (0.002)	6.98*** (0.002)	6.97*** (0.002)	6.99*** (0.002)	7*** (0.002)	7.04*** (0.002)	7.03*** (0.002)	7*** (0.002)
celda_1334	7.26*** (0.002)	7.21*** (0.002)	7.2*** (0.002)	7.17*** (0.002)	7.15*** (0.002)	7.15*** (0.002)	7.17*** (0.002)	7.17*** (0.002)	7.17*** (0.002)	7.16*** (0.002)	7.13*** (0.002)
celda_2334	7.06*** (0.003)	7.05*** (0.003)	7.03*** (0.003)	7.01*** (0.003)	7.02*** (0.002)	7.01*** (0.003)	7.02*** (0.002)	7.02*** (0.002)	7.05*** (0.002)	7.05*** (0.002)	7.03*** (0.003)
celda_1434	7.29*** (0.003)	7.23*** (0.003)	7.2*** (0.003)	7.18*** (0.003)	7.12*** (0.003)	7.12*** (0.003)	7.15*** (0.003)	7.14*** (0.003)	7.14*** (0.003)	7.14*** (0.003)	7.12*** (0.004)
celda_2434	7.06*** (0.004)	7.04*** (0.004)	7.02*** (0.004)	7.03*** (0.004)	7.04*** (0.004)	7.03*** (0.004)	7.03*** (0.004)	7.02*** (0.004)	7.06*** (0.004)	7.07*** (0.004)	7.07*** (0.004)
celda_1144	7.21*** (0.001)	7.2*** (0.001)	7.21*** (0.001)	7.22*** (0.001)	7.23*** (0.001)	7.24*** (0.001)	7.26*** (0.001)	7.27*** (0.001)	7.27*** (0.001)	7.25*** (0.001)	7.23*** (0.001)
celda_2144	6.96*** (0.002)	6.95*** (0.002)	6.97*** (0.002)	6.98*** (0.002)	6.99*** (0.002)	7.01*** (0.002)	7.03*** (0.002)	7.03*** (0.002)	7.05*** (0.002)	7.03*** (0.002)	7.01*** (0.002)
celda_1244	7.31*** (0.001)	7.3*** (0.001)	7.3*** (0.001)	7.31*** (0.001)	7.31*** (0.001)	7.31*** (0.001)	7.32*** (0.001)	7.32*** (0.001)	7.33*** (0.001)	7.32*** (0.001)	7.31*** (0.001)
celda_2244	7.11*** (0.002)	7.08*** (0.002)	7.08*** (0.002)	7.07*** (0.002)	7.07*** (0.002)	7.08*** (0.002)	7.09*** (0.002)	7.09*** (0.002)	7.11*** (0.002)	7.1*** (0.002)	7.09*** (0.002)
celda_1344	7.45*** (0.001)	7.42*** (0.001)	7.41*** (0.001)	7.39*** (0.001)	7.38*** (0.001)	7.37*** (0.001)	7.37*** (0.001)	7.35*** (0.001)	7.36*** (0.001)	7.35*** (0.001)	7.33*** (0.001)
celda_2344	7.14*** (0.002)	7.13*** (0.002)	7.15*** (0.002)	7.15*** (0.002)	7.15*** (0.002)	7.15*** (0.002)	7.15*** (0.002)	7.15*** (0.002)	7.17*** (0.002)	7.15*** (0.002)	7.12*** (0.001)
celda_1444	7.45*** (0.002)	7.45*** (0.002)	7.43*** (0.002)	7.42*** (0.002)	7.4*** (0.002)	7.39*** (0.002)	7.39*** (0.002)	7.37*** (0.002)	7.36*** (0.002)	7.35*** (0.002)	7.33*** (0.002)

*** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.
Standard errors in parenthesis.

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CAPÍTULO 3 - CHAPTER 3: SCARRING EFFECTS YOUTH UNEMPLOYMENT

Abstract

The long-term youth unemployment has a negative effect on economic growth and productivity. From a microeconomic point of view, prolonged unemployment at a young age can have broader harmful effects on one's career. This chapter analyses the long-term impact of youth unemployment using the MCVL. The data suggests that individuals who spent more than 6 months unemployed before 30 years old suffer another unemployment experience during their adult labour life. There are a number of observable characteristics which increase the probability of experiencing another unemployment episode. The magnitude is that conditional on background characteristics, an extra six months' youth unemployment (pre-30) leads to an extra 10% of time spent in unemployment over the age of 30. The effect for women is 10% higher than for men workers. Other factors such as nationality, occupational category, family members below 6 or over 65 years old or type of contract also have an impact on the probability to be unemployed over the age of 30 years old.

Resumen

El desempleo juvenil tiene un impacto a largo plazo sobre el crecimiento económico y la productividad de un país. Desde un punto de vista microeconómico, sufrir episodios prolongados de desempleo cuando se es joven, tiene efectos dañinos permanentes en el desarrollo de la carrera de un trabajador. Este capítulo analiza los efectos a largo plazo del desempleo juvenil usando los datos de la MCVL. Los resultados encontrados en este capítulo confirman que episodios de desempleo experimentados antes de los 30 años tienen impacto negativo en la evolución laboral del individuo 5 años después e incluso 10 años después, aunque los efectos disminuyen. Es decir, aquellos trabajadores que pasaron más de 6 meses desempleados antes de los 30 años sufren con mayor probabilidad otra experiencia de desempleo durante su vida laboral. No obstante, hay una serie de características observables que aumentan la probabilidad de experimentar otro episodio de desempleo. Por ejemplo, el efecto para las mujeres es un 10% superior que para los hombres. Otros factores, como la nacionalidad, el nivel educativo, los miembros dependientes en la familia (aquellos menores de 6 años o mayores de 65 años) o el tipo de contrato, también tienen un impacto en la probabilidad de estar desempleado a partir de los 30 años.

1. Introduction

The financial and economic crisis has hit young people very hard in every European country. In the EU-27, the youth unemployment rate (15-24) rose by 6 percentage points in the two years to the end of 2009, to reach almost 19%. There are currently nearly 15 million unemployed youths in the EU-27 and about the half of them are from Spain, about four million more than at the end of 2007. In countries like France and Italy, about one in four active youths are unemployed, while in Spain more than 45% of them are jobless. An economic recovery is already ongoing in Spain, but the short-term prospects for youth unemployment remain rather bleak. The recovery is expected to be gradual given the large spare capacity accumulated by many firms during the crisis, job creation is likely to lag significantly behind the modest recovery.

In this context, the youth unemployment rate is expected to stay at a high level and many unemployed youths are likely to experience a prolonged period of joblessness. Facing a job loss or an unsuccessful job search in a weak labour market is difficult for anyone. But for disadvantaged youths lacking basic education, failure to find a first job or keep it for long, can have negative long-term consequences on their career prospects that some experts refer to as "scarring". Beyond the negative effects on direct loss of income, long spells of unemployment while young, often create permanent scars through the harmful effects for their employability. There are plenty of studies which examine the cost of job loss, which show that a period of unemployment imposes disadvantages to individuals above and beyond this direct cost. For example, Jacobson et al. (1993) provide evidence of a wage loss associated with displacement from employment which commences up to three years prior to the date of displacement and is still evident five years following. Furthermore, according to Stevens (1997), the effects of displacement are quite persistent and this persistence can be explained by repeated incidences of unemployment. Stewart (2007), suggests that low pay and higher incidences of job loss are correlated to create a cycle; whereby low-wage jobs act as the main conduit for repeat unemployment and considerably increases their probability to be unemployed. This combined with the widening gap between pre- and post- displacement wages in the UK (Nickell et al. 2002) results in long lasting negative effects from a spell of unemployment. The deterioration of labour market prospects stemming directly from an initial spell of unemployment is sometimes termed a 'scar'; and can come in the form of either higher unemployment, a lower subsequent wage or a combination of both.

There are potential policy implications related to evidence of scarring. Further efforts should be made in many countries to ensure that no youth enters the labour market without a recognised

and valued qualification. Early school leaving is a big problem in some European countries, it is linked to unemployment, social exclusion and poverty. This may imply that teenagers should be encouraged to stay in further education, provided that this is accompanied by measures to diversify educational choices and focuses on the acquisition of a qualification that is valued by employers. School drop-outs also need special attention from the education authorities to ensure they remain engaged in, or re-connect with, education through the completion of an upper secondary diploma or its equivalent, preferably with an on the-job training component. Moreover, factors as leaving school early, the job mismatch or temporary contracts that tend to penalise youths even in good times should be reconsidered.

According to Eurostat data, Spain is the country with the highest rate of early school leavers among the countries in the EU-28 (20% in 2015 followed by Romania with 19.1%). At the same time, Spain is the country with the second highest youth unemployment rate and the highest proportion of temporary contracts in EU-28. Among people with temporary contracts, the proportion of young people is higher. For many of them, temporary contracts are the opportunity to gain permanent jobs. On the contrary the first temporary contract is for others the beginning of a succession of temporary contracts that end in unemployment. For this reason, promoting policies that reduce the gap between regulations for temporary and permanent contracts and combat school drop-out will give young people better tools to promote the smoother transition of newcomers from entry jobs with short duration to more stable jobs. These factors are important in order to reduce the youth unemployment problem.

The effect of youth unemployment is important due to the consequences in the short term, due to a high rate of unemployment, and also in the long-term impact because the young people of today are the leaders of tomorrow. The current youth unemployment means a loss of human capital in the long run and therefore, loss of competitiveness for Spain.

The motivation for the study is to analyse the long-term effect of youth unemployment. From a macroeconomic point of view, one would expect the group of young workers to be less affected than other groups, because young workers are at the beginning of their labour career. From a microeconomic perspective, however, the picture may be different, because the effect of the youth unemployment could cause higher probabilities of losing their future jobs and could affect their long term productivity. The Spanish case is really interesting because it is the country with the second highest GDP growth rate among European countries, but at the same time is the country with the second highest youth unemployment rate (measured as the age group 15 to 24 years) and with the third highest dropout rate. All these factors produce some doubts about the future growth rates.

After a review of youth labour market developments in Spain, I use the Labour Administrative Records of Social Security System database to study the long-term effect on the proportion of time unemployed when the person had suffered youth unemployment episodes.

I find that individuals who spent more than 6 months unemployed before 30 has higher probability to suffer another unemployment experience during their adult labour life. However, there are a number of observable characteristics which increase the probability of experiencing another episode of unemployment. For instance, the effect for women is 10% higher than for men. Other factors such as nationality, occupational category, family members below 6 or over 65 years old or type of contract, also have an impact on the proportion of time unemployed over the age of 30.

The structure of my analysis of the scar from youth unemployment is as follows. First, I review the literature related to this topic in section 2. Section 3 defines youth unemployment and explains the main features of youth unemployment in Spain. Section 4 details the data set used in this study and the sample selection, the methodology is explained in section 5, the final results are shown in section 6 and robustness checks in section 7. Following this, section 8 concludes.

2. Literature

The literature on the effects from scarring show two kinds of impact: damage to future probability to be an employee and lowering subsequent wages. In this section, I review the literature of effect on wages in the first term, second the existing literature on the persistence of youth unemployment and lastly, I review the existing literature for the Spanish labour market.

Over the past decade, empirical economic studies have sought identification of the scarring effect from unemployment by observing wages in the periods preceding and following the spell for workers, where the displacement can be reasonably thought to be exogenous to their quality. Rhum (1991) compares a control group of non-displaced workers to a group of displaced workers in the three years prior to displacement and four years following. He found significant negative long-term effects on wages and unemployment duration from periods spent unemployed. Using administrative records from Pennsylvania, Jacobson et al. (1993) detect an earnings loss three years prior to displacement. At the date of displacement there will be a dramatic drop in earnings, followed by a recovery. Even after 5 years displaced workers tend to

have 25% lower earnings than non-displaced workers. The UK literature explores the effects of unemployment more generally rather than focusing on displaced workers, with similar findings.

Gregg and Tominey (2005) analyse the impact of youth unemployment upon the wage up to twenty years later. They find a significant wage penalty (residual wage scar of around 9 -11% persists up to twenty years later) even after controlling for education, region and wealth of family and individual characteristics. They use instrumental variable approach to estimate the relationship between youth unemployment and the wage as causal.

Focusing at the scar imposed upon an individual from youth unemployment, Gregg (2001) explores whether a person's unemployment experience when young is correlated with their later adult employment patterns. Also, the paper analyses whether this correlation is causal rather than just being due to some individuals being unusually prone to unemployment. The paper uses the National Child Development Survey to look at whether the cumulated experience of unemployment before the age of 23 drives individuals' unemployment patterns between 5 and 10 years later, up to the age of 33. The National Child Development Survey (NCDS) is a census cohort of all individuals born in the same week of March 1958 and follows them through childhood into early adulthood. Surveys of the NCDS birth cohort were undertaken at birth, 24 and 42 months and ages 7, 11, 16 (1974), 23 (1981) and 33 (1991). This survey also provides individuals' personal and family background information. The long panel with complete histories allows the author to isolate the effect from individual heterogeneity. The author uses instrumental variables approach to identify structural dependence from many residual unobserved heterogeneity. The paper highlights how early unemployment experience is concentrated on a minority of men in the cohort and that the same people experience disproportionably large amounts of unemployment as adults. The study finds a structural dependence induced by early unemployment experience for men. The paper also suggests that low education attainment, a disadvantaged family background and individual ability and behavioural problems in childhood raise a person's susceptibility to unemployment. Arulampalam et al. (2000) estimate a dynamic panel data models of unemployment incidence for men using the British Household Panel Survey. They find a positive effect of state dependence consistent with the scarring theory of unemployment. Bell and Blanchflower (2011) reviews the effects of The Great Recession on youth labour markets. Using the USA and UK as case studies, they analyse youth unemployment using micro-data. They find that there is convincing evidence that the effects of unemployment when young impose costs on individuals and society well into the future. Focus on the economic conditions, Kahn (2010) studies the labour market experiences of white male college graduates as a function of economic conditions at the time of college graduation. The study uses the National Longitudinal Survey of Youth

whose respondents graduated from college between 1979 and 1988 and are followed for 14 to 23 years after college graduation. The paper uses national and state variation in economic conditions at time of college graduation to identify the effect because timing and location of college graduation could potentially be affected by economic conditions. The paper uses instrumental variable approach to solve a potential endogeneity problem of experience and also instrument for the national unemployment rate using year of birth and for the state unemployment rate using year of birth and state of residence at age 14. Finally, the study finds a persistent, negative wage effect to graduating in a worse economy which persists for the entire period studied. It also finds that cohorts who graduate in worse national economies are in lower level occupations and have slightly higher educational attainment. This paper suggests that workers who graduate in bad economies are unable to fully shift into better jobs after the economy picks up. Lastly, years enrolled in school post college and the probability of attaining a graduate degree increase slightly for those who graduate in times of higher national unemployment.

Regarding the Spanish case, Lassibille et al. (2001) use the Encuesta Socio-Demográfica conducted in 1991 to analyse the labour market entrance of Spanish school leavers and the match between education and work at the early stages of working life. They show that human capital exerts a strong influence on the duration of unemployment. Their results also show that young workers are more likely to be underutilized compared to their adult co-workers and that people with higher education have a lower probability of being overeducated and a shorter length of unemployment. On the other hand, Dolado et al. (2000) study the role of education on unemployment. They found that an increase in the educational attainment of the labour force does not always solve the unemployment problem unless other labour market rigidities are reduced.

3. Definition of youth unemployment

The European Commission defines youth as the age group between 15 and 24. The European Commission divides this group into teenagers (15-19 years old) and young adults (20-24 years old). Some authors argue that the unemployment[38] numbers for these two groups and the challenges they face vary significantly and would thus call for separate approaches for alleviating unemployment.

[38] See Clark and Summers (1982).

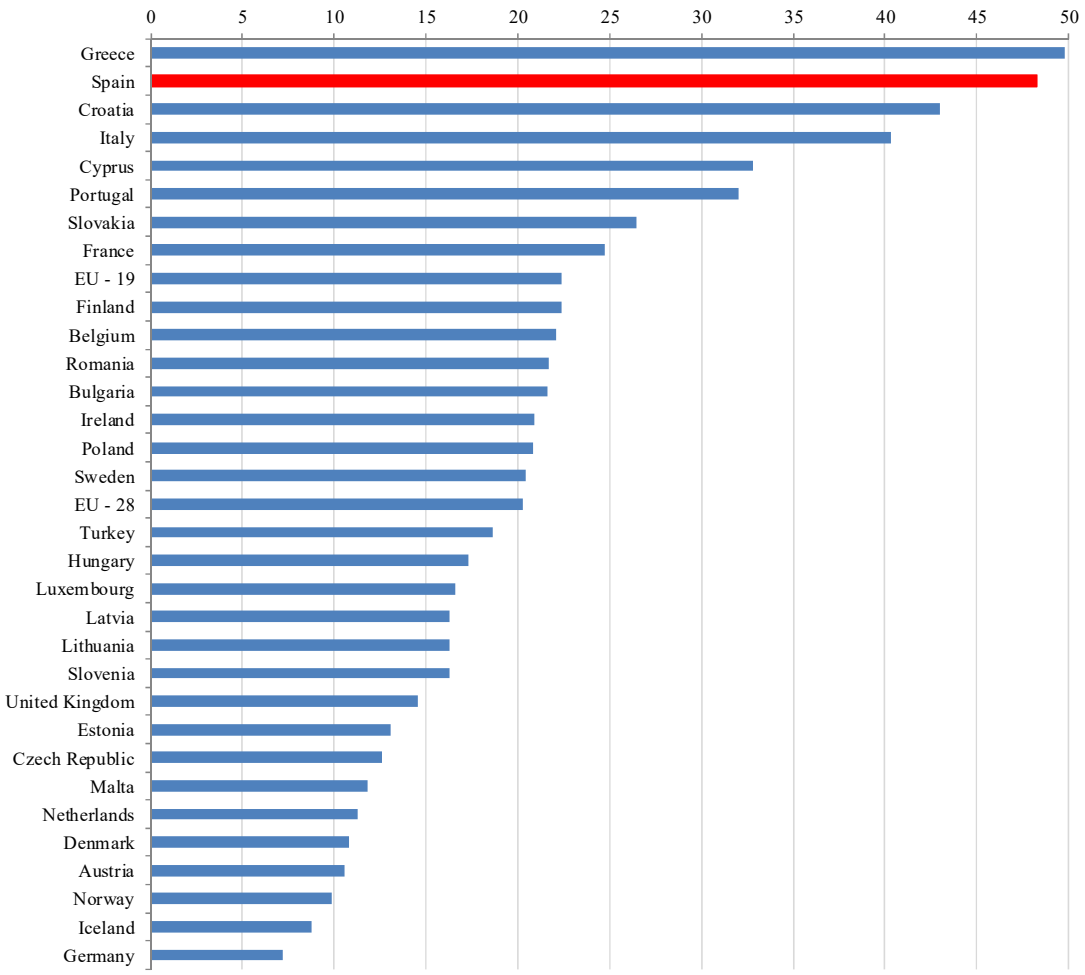
An individual is typically considered unemployed when he or she has not worked for a specific period of time but would like to and is, hence, actively searching for work. Yet, the definition of unemployment can also vary from country to country. In some countries, students who are actively looking for a job are counted as part of the work force while in other countries like Spain, they are not[39]. The number of inactive youth, i.e. those not actively searching for work and not being in the labour force or in education can also exhibit quite a variation across countries. Such data of the non-employed, which comprises of both unemployed and inactive individuals, can be more meaningful as it gives a clearer idea of the real magnitude of the problem. It is, however, less viable due to differences in definitions and problems with availability. There is a significant variation in youth unemployment rates across countries. **Figure 10** below shows the percentage of unemployed youth as a fraction of active youth population in the European countries. The graph[40] shows two differentiated groups. The first group, which includes Greece, Spain, Croatia and Italy, with a youth unemployment rate of over 40%, in other words, four out of ten young people are looking for a job without success. The second group is formed of the rest of the European countries[41] with youth unemployment rates below 35% in 2015.

[39] They are considered under the definition "potentially active population". See "Economically Active Population Survey 2005 Methodology" (National Statistics Institute).

[40] The information is shown for 2015 because information for the year 2016 is not complete.

[41] Youth unemployment is a general problem in Europe. See for example, Banerji et al. (2014), Eichhorst et al. (2013), Ljungqvist and Sargent (2008) and Machin and Manning (1999).

Figure 10 - *Youth unemployment rate (% of active population aged 15-24) in 2015*



Source: Eurostat.

3. 1 Why is youth unemployment a problem?

The issue of high unemployment is detectable across Europe and with 22.4% of people under the age of 25 without a job in the EU, the economic and social effects of youth unemployment should be considered. Early unemployment has a negative effect not only on the future employability of young people but also on the future economic situation of the country, because the young people of today are the future to maintain the welfare system.

Being young and unemployed can lead to the increase of the risk of poverty, loss of human capital and social exclusion as well as cause loss of motivation. These are the main consequences of youth unemployment which were made by Scarpetta et al. (2010) in the OECD

working paper. These concerns were also stressed by the International Labour Office (ILO) in one of its Policy Brief Documents[42]. These are two examples of the multiple international organizations which have shown their concerns about this serious problem.

More and more new graduates lacking experience often find themselves in a vicious cycle. They often lack the experience needed to fill a job opening, which prevents them from getting employed. Thus, the job-searching period for them becomes considerably longer than for experienced workers, which leads to gaps in employment history, loss of skills and productivity, and harms their future work prospects. Young people who want to find permanent jobs are conditioned to accept temporary and intern positions. However, trainings and internships are limited by the law, so a young person cannot always work as an intern because this internship is linked to a course or university. At the same time, temporary jobs are less protected, often pay less, do not offer job-related training and social benefits. As a result, unemployed young people are more prone to the risk of poverty, lower wages and worse career opportunities.

Unemployment among young people could also lead to reduced levels of happiness and mental health problems. Being employed is important for young people in order to feel accepted in society, thus not having a job can cause economic, cultural and social isolation. Social exclusion, stress and employment worries can cause mental health problems, such as depression. Last but not the least, high youth unemployment has a negative effect on economic growth and productivity. There is a risk of loss of talent and skills since a great amount of university graduates are unable to find a job and to put their knowledge and capabilities into producing innovation and contributing to economic growth. Moreover, having a large share of the young workforce unemployed, not only leads to reduced productivity and gross domestic product (GDP) but also increases the economic costs for the country, since there are more expenses to be paid on social benefits and less income coming in from taxes.

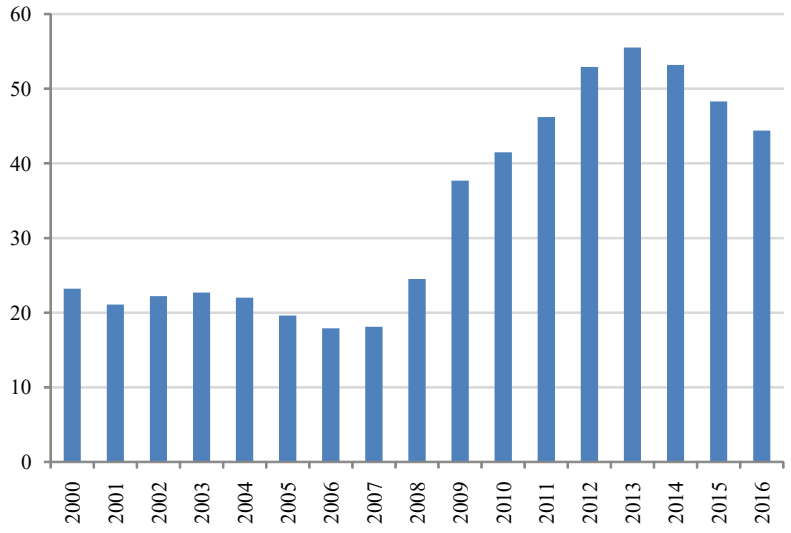
Young people should be properly integrated in the labour market, so that the negative consequences of youth unemployment are reduced as much as possible. It is important to understand that having so many unemployed young people does not only bring personal struggles to them but impacts society as a whole and poses a threat to the economic welfare of Europe.

42 Increasing the employability of disadvantaged youth. Skills for employment: Policy Brief. International Labour Organization (ILO)

3.2 Youth unemployment in Spain

Spain has had one of the highest persistent rates of unemployment in the EU for several years. **Figure 11** shows that according to Eurostat (Labour Force Survey), the youth unemployment rate, measured as the percentage of unemployed young people less than 25 years old over the total active population for this age group, has not dropped from 18% since 2000. This rate has marked its lowest level in 2006 with 17.9%.

Figure 11 - *Youth unemployment rate in Spain from 2000 to 2016(% of active population aged 15-24)*

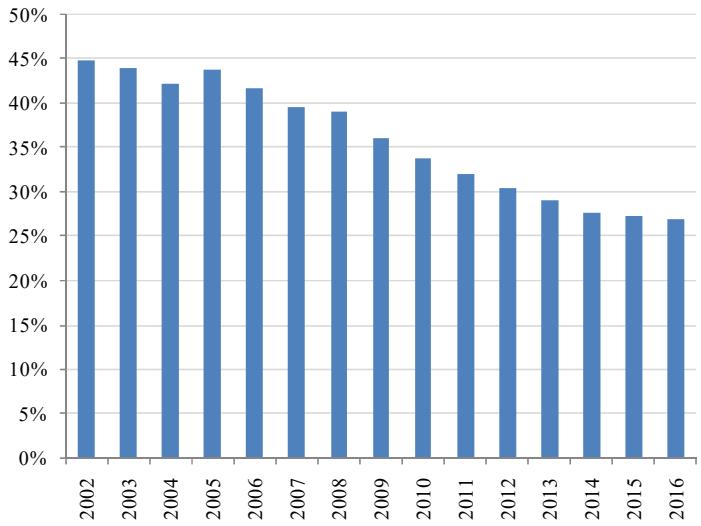


Source: Eurostat.

Since the financial crisis began in 2008, unemployment has grown by more than 2.5 million according to data of the last quarter in 2016 published by the National Statistics Institute. In **Figure 12**, it can be seen that the past year finished with a total unemployment of 4.2 million of which 27% were less than 30 years old. However, youth unemployment is a structural problem in Spain with historically high rates. This rate has never been below 27% since 2002[43].

[43] There is break in the way to consider a person as unemployed from 2002 in the National Statistics Institute. The numbers before 2002 are not comparable.

Figure 12 - *Total youth unemployment (less than 30 years old) over the total unemployment in Spain from 2002 to 2016*



Source: National Statistics Institute.

This youth unemployment can be due to various factors. Firstly on the demand side, the Spanish economy is in a difficult situation and Spanish businesses are relatively less competitive. Secondly, the Spanish economy was affected by the housing boom. The construction sector was once a major employer of young workers, but now jobs are scarce. However, although demand side factors are behind the unemployment developments, it does not explain the persistent and high structural youth unemployment.

Some studies indicate that one factor causing youth unemployment is early–school-leaving.The European Commission pointed out that the dropout rate is linked to unemployment, social exclusion, poverty and poor health. Other studies explain that there are many factors that affect the level of early school leavers such as the nature of the education and training system, the productive model, the role of the parental involvement, family background, flexitime at work and economic cycle conditions (Felgueroso et al. (2014)). Early-school-leaving is an important problem, because education is essential for the employment prospects of every young person[44]. A person who leaves school early has a greater probability of accessing low-skilled jobs where workers are more easily substitutable. At the same time, these jobs are more exposed to the economic cycle, have lower remuneration, are more unstable and have lower promotion probabilities. Early school dropout is not just important to the worker, it is also important for the

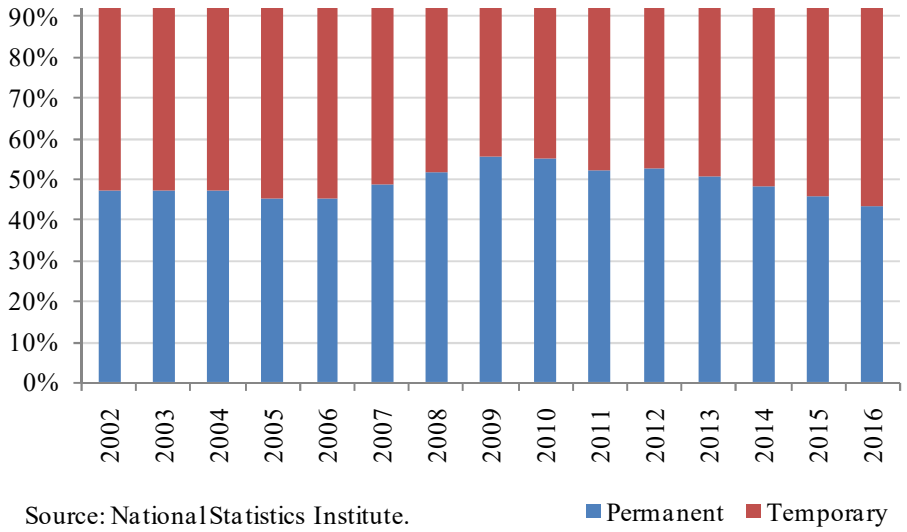
[44] Moral-Carcedo and García-Belenguer (2010) find that structure of the educational system may affect the school-to-work transition of young unexperienced workers.

growth of our economy and for social cohesion. Investing in education helps to break the cycle of deprivation and poverty leading to the social exclusion of too many young people across Europe. Currently, Spain is the European country with the highest proportion of early leavers with 20% of the early leavers from education for the young people between 18 to 24 years old[45].

Other studies indicate that another important factor is the strong labour protection for existing workers. It means workers with jobs have good contracts with strong protection against dismissals. This aspect makes it difficult to fire older and less productive workers. Businesses often employ young workers on very different contracts of short term, and no guarantees of job protection. When hard times come, it is no surprise that it is the young on flexible contracts who are the first to leave the firm. It is a classic example of an insider / outsider labour market.

Table 20 shows that the proportion of young workers with a temporary contract is higher than the proportion with permanent contracts. In 2002, five out of ten employees with a temporary contract were less than 30 years old. However, this figure has decreased over time and with 2016 data only three of them were less than 30 years old. Nevertheless, if I focus only on young workers, the framework is not encouraging because almost six out of ten workers with less than 30 years of age had a temporary contract in 2016 and this proportion did not change from 2002 (see **Figure 13**).

Figure 13 - *Young employees by type of contract in Spain from 2002 to 2016*



Source: National Statistics Institute.

[45] Alba-Ramirez (1993) analyse the mismatch problem in the Spanish labour market and the overeducation as a possible reason.

Aside from labour market protection, there are concerns over the quality and validity of education and vocational training in Spain[46]. But, even more concerning are the low expectations many young workers are developing.

I consider in the study youth unemployment up to 30 years of age. In Spain the normal age to finish a degree is 23 years old, but it is usual that it takes one or two additional years to finish the degree. Then if I consider only the youth unemployment until 25 years of age I would be omitting the youth unemployment problem for Spanish university graduates. In 2012, there was an educational reform and as a result the Spanish University Education System is now very similar to the European System. Unfortunately, I cannot observe the new educational system in the database.

[46] See Santiago et al. (2009) and Dolado et al. (2000).

Table 20 - *Employees by type of contract or labour relationship and age group*

	Employees under permanent contracts					Employees under temporary contracts				
	Total	Less than 30 years old	Other	Less than 30 years old	Other	Total	Less than 30 years old	Other	% less than 30 years old	% Other
	Thousands Persons			%		Thousands Persons			%	
2002	9,269.10	1,910.30	7,358.80	20.60%	79.40%	4,364.80	2,150.80	2,214.00	49.30%	50.70%
2003	9,736.10	1,978.60	7,757.50	20.30%	79.70%	4,565.20	2,193.40	2,371.80	48.00%	52.00%
2004	10,040.40	1,998.70	8,041.80	19.90%	80.10%	4,839.40	2,251.90	2,587.50	46.50%	53.50%
2005	10,474.20	2,001.20	8,473.00	19.10%	80.90%	5,249.70	2,403.90	2,845.90	45.80%	54.20%
2006	10,825.30	2,041.50	8,783.80	18.90%	81.10%	5,565.30	2,446.30	3,119.00	44.00%	56.00%
2007	11,613.90	2,179.00	9,434.90	18.80%	81.20%	5,354.20	2,309.50	3,044.70	43.10%	56.90%
2008	11,954.80	2,142.70	9,812.10	17.90%	82.10%	4,906.50	2,019.40	2,887.10	41.20%	58.80%
2009	11,877.70	1,923.50	9,954.20	16.20%	83.80%	4,003.40	1,529.70	2,473.70	38.20%	61.80%
2010	11,734.90	1,705.80	10,029.10	14.50%	85.50%	3,857.50	1,401.00	2,456.50	36.30%	63.70%
2011	11,524.90	1,468.20	10,056.70	12.70%	87.30%	3,869.30	1,336.00	2,533.30	34.50%	65.50%
2012	11,162.00	1,261.80	9,900.20	11.30%	88.70%	3,411.50	1,133.50	2,277.90	33.20%	66.80%
2013	10,813.60	1,096.50	9,717.10	10.10%	89.90%	3,255.50	1,067.80	2,187.80	32.80%	67.20%
2014	10,857.10	1,029.30	9,827.90	9.50%	90.50%	3,428.70	1,110.40	2,318.30	32.40%	67.60%
2015	11,059.30	987.1	10,072.20	8.90%	91.10%	3,714.20	1,171.20	2,543.00	31.50%	68.50%
2016	11,260.30	962.8	10,297.50	8.50%	91.50%	3,968.00	1,248.90	2,719.10	31.50%	68.50%

Source: National Statistics Institute (INE)

4. The data

The Social Security Administrative Labour Records is an organised set of anonymised micro-data extracted from Social Security administrative records, matched with the Municipal Register to include personal data.

This dataset is formed of a 4% random sample, representative of the total population of people who had any kind of relationship with the Social Security System in a given year, which includes either having a working affiliation or receiving any social security benefit at some time in the reference year, regardless of how long they have been in this situation. The advantage of this sampling method is that it includes people who have short and frequent relationships with the Social Security System in a given year who could be excluded by a sampling process with a fixed date. This can be numerous group: on average, around three million people who have worked at some time in a given year were not affiliated on a given day. This group of people consists mainly of women and young workers with short-term contracts. The MCVL sampling process consequently reduces the bias against these collectives. In particular, our sample includes all individuals who have had a relationship with the Social Security System at least once between 2005 and 2012, because we merge all observations from wave 2005 to 2012. People who are not in the sample are close to inactivity or a similar situation. If a person returns to the labour market, even for one day, then his person will be in the sample again.

The sample provides detailed monthly information about job characteristics such as type of contract, length, sector of activity, working time, monthly earnings, occupational group, as well as other personal information (gender, age, nationality, place of birth, place of residence, household size, etc.). MCVL data for a given year is published in June of the following year. For a given wave, all these variables are provided on a monthly frequency, covering the entire labour history of each individual since 1980.

The random sampling process selects everybody with a personal identification code belonging to some predetermined set, which is the same every year. This type of sampling ensures that people who maintain their relationship with the Social Security System over several years are always sampled. I merge all six waves from 2005 to 2012, and for each individual, I take the information of the most recent wave. With this procedure, I am sure I have information covering the entire labour history of each sampled person who worked or received benefits at any time between 2005 and 2012. Therefore, I can have accurate information about the transition between employment and unemployment.

For my empirical analysis, the main advantage of the MCVL is that it provides a good picture of wages and the historical labour situation of the worker, because the information does not come from a survey and the information used in this study comes from the National Social Security Administration. The disadvantage is that the bias against people with no relationship at all during the whole period is not completely eliminated. This bias is not too relevant, because these people are very close to inactivity.

4.1 Sample selection

I consider only individuals who meet all three conditions: (i) individuals from 30 to 40 years old, (ii) who work full time throughout a given month under the General Social Security Regime (i.e. excluding self-employment) and (iii) for whom I have information about their labour situation before they were 30 years old. The variable "unemployment days before 30 years old" is computed as the total days that the person is unemployed before this age. For instance, a worker with 60 unemployed days before 30 years old, it does not matter whether the worker is only unemployed once for 60 days or whether the worker is unemployed three times for twenty days each time. Regarding this sampling, I have 810,984 individuals from 30 to 40 years old, once the restriction regarding their labour situation before 30 years old is included the sample is reduced to 624,722 individuals all of them born between 1950 and 1981. For this group of individuals, we have the information about their working situation, then I do not consider in the study all the individuals who are unemployed during these ten years, because they are close to the inactivity.

Table 21 shows the time spent on unemployment for these individuals. On average, more than 45% of the individuals were unemployed for more than 3 years. This share is slightly higher for females than males. **Table 22** shows this breakdown by occupational category. The proportion of workers who spent more than three years in unemployment when they were under 30 years old is higher for those with low occupational category[47] (47.1% and 32.2% for workers with high occupational category[48]). Lastly, **Table 23** shows this breakdown by sector of activity. Industry sector shows the highest percentage of young people with unemployment accumulated before the age of 30 less than six months.

[47] See the Appendix A.

[48] I have calculated the accumulated time in unemployment until 30 years taking into account the work experience from 24 years for the individuals with high educative level.

Table 21 *– Time spent unemployed by gender*

Gender	Time unemployed (induviduals)						
	Zero days unemployed before 30 years old	Less than 6 months unemployed before 30 years old	From 6 to 11 months unemployed before 30 years old	From 1 to 2 years unemployed before 30 years old	From 2 to 3 years unemployed before 30 years old	More than 3 years unemployed before 30 years old	Total
Total	19,622	116,668	53,823	81,221	70,968	282,420	624,722
Female	7,071	49,154	23,612	33,914	30,216	125,019	268,986
Male	12,551	67,514	30,211	47,307	40,752	157,401	355,736
	Time unemployed (Distribution)						
Total	3.14%	18.68%	8.62%	13.00%	11.36%	45.21%	100.00%
Female	2.63%	18.27%	8.78%	12.61%	11.23%	46.48%	100.00%
Male	3.53%	18.98%	8.49%	13.30%	11.46%	44.25%	100.00%

Table 22 *– Distribution of the inviduals by time spent unemployed, gender and occupation category:*

Occupational category	Time unemployed (Distribution of induviduals)						
	Zero days unemployed before 30 years old	Less than 6 months unemployed before 30 years old	From 6 to 11 months unemployed before 30 years old	From 1 to 2 years unemployed before 30 years old	From 2 to 3 years unemployed before 30 years old	More than 3 years unemployed before 30 years old	Total
Total	3.14%	18.68%	8.62%	13.00%	11.36%	45.21%	100.00%
From 1 to 3	4.63%	26.83%	10.46%	14.60%	11.27%	32.21%	100.00%
From 4 to 11	2.83%	17.18%	8.45%	12.98%	11.49%	47.06%	100.00%
Female	2.63%	18.27%	8.78%	12.61%	11.23%	46.48%	100.00%
From 1 to 3	3.74%	24.67%	10.90%	15.58%	12.29%	32.83%	100.00%
From 4 to 11	2.32%	16.89%	8.43%	12.40%	11.20%	48.75%	100.00%
Male	3.53%	18.98%	8.49%	13.30%	11.46%	44.25%	100.00%
From 1 to 3	5.34%	28.58%	10.11%	13.82%	10.44%	31.71%	100.00%
From 4 to 11	3.18%	17.39%	8.46%	13.39%	11.70%	45.88%	100.00%

Source: MCVL.

Table 23 *– Distribution of the inviduals by time spent unemployed, gender and sector of activity:*

Sector of activity	Time unemployed (Distribution of induviduals)					
	Zero days unemployed before 30 years old	Less than 6 months unemployed before 30 years old	From 6 to 11 months unemployed before 30 years old	From 1 to 2 years unemployed before 30 years old	From 2 to 3 years unemployed before 30 years old	More than 3 years unemployed before 30 years old
			Total			
Industry	4.32%	22.68%	9.51%	13.83%	11.14%	38.52%
Construction	1.79%	15.14%	7.41%	11.95%	11.12%	52.60%
Service activities	3.15%	19.44%	9.06%	13.45%	11.56%	43.33%
			Female			
Industry	3.64%	22.79%	9.70%	11.80%	9.80%	42.26%
Construction	1.75%	16.70%	7.35%	11.98%	11.00%	51.23%
Service activities	2.75%	19.47%	9.35%	13.32%	11.48%	43.63%
			Male			
Industry	4.59%	22.63%	9.44%	14.65%	11.68%	37.01%
Construction	1.80%	14.89%	7.42%	11.95%	11.14%	52.82%
Service activities	3.48%	19.41%	8.82%	13.57%	11.64%	43.08%

Source: MCVL.

5. Methodology

This paper estimates the long-term effect of youth unemployment. This effect may differ by occupational group and by the interval of time from the unemployment episodes.

The effect of youth unemployment is important due to the consequences in the short term, due to a high rate of unemployment, and also in the long-term impact because the young people today are the leaders of tomorrow. The current youth unemployment means a loss of human capital in the long run and therefore, loss of competitiveness for Spain.

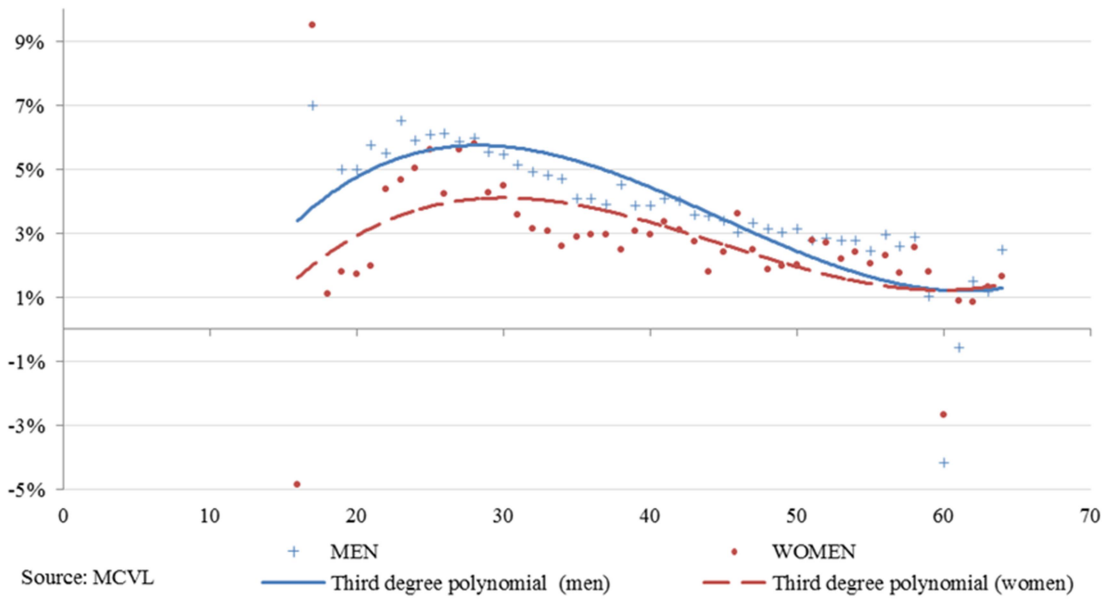
The motivation for the study is to analyse the long-term impact of the current biggest problem in Spain, the effect of the youth unemployment. From a macroeconomic point of view, one would expect the group of young workers to be less affected than other groups, because young workers are at the beginning of their labour career. From a microeconomic perspective, however, the picture may be different, because the effect of the youth unemployment could cause higher probabilities of losing their future jobs and could affect their long term productivity.

The main characteristic of the methodology employed is to use a large individual longitudinal dataset to compare the individual employment probability of workers who have suffered unemployment episodes when they were less than 30 years old with that of workers have not suffered youth unemployment episodes. However, a direct comparison of these two groups can lead to an incorrect conclusion because, even in the absence of these youth unemployment episodes, workers with less experience have more probability of losing their jobs and on the other hand, the permanence of unemployment. Following that idea, the approach used here defines the affected group in terms of permanence in the unemployment situation.

Youth unemployment is defined as the cumulative days of not-working covering the ages 18-30 for low skilled workers and covering the age 24-30 years old for high skilled workers. I have chosen youth unemployment up to 30 years due to greater current access to a university degree or vocational training. These studies are finished around 23-24 years old or so. I consider only the age 24-30 years old for high skilled workers in order to avoid the inclusion of time spent in studies as unemployed episodes, because the students usually work in part time jobs at the same time they are at university. All these aspects increased delays of the entry of young people into the labour market. Also, the part of the steeper learning slope of a worker is up to 30 years old, after that the marginal increase in learning is lower with lower wage increases. This can be seen

in **Figure 14**[49]. This chart shows that the maximum wage increases are seen up to 30-35 years old, descending as the age increases until reaching a minimum for older workers of around 1%. By gender we can see that the increase in women's wages is lower for all age groups except the oldest, where increases are similar to men's. The analysis controls by occupational group, which is equivalent to control by educational level.

Figure 14 - *Increase in real wages by age in the period 2003-2004*



Due to the differences in the income curve, I estimate the youth unemployment in two separate models. One for the workers with low occupational category and another one for those workers with high occupational category in order to define the proper "young period" trying to take into account the differences in their studies.

At the same time, I attempt to identify the non-linear relationship between youth unemployment and the subsequent unemployment episodes, grouping the youth unemployment experience into five categories: zero months, from 1 to 6 months, from 7 to 12 months, from 12 to 24 months, from 24 to 36 months and more than 36 months. I analyse the youth unemployment scar for those with youth unemployment relative to the counterfactual group experiencing no youth unemployment.

[49] This figure was taken from the first chapter. See page 38.

I limit the sample with the workers who were at least 40 years old in 2012 in order to have enough time to capture the long term impact of youth unemployment. Following the approach taken by Gregg (2001), I analyse the youth unemployment effect after 5 years (when they are 35 years old) and after 10 years (when they are 40 years old).The analysis of the unemployment scar at each stage requires a sample constraint at this age and I only consider the workers for whom I have information from 18 years old (or 24 years old for high skilled workers) up to 35 years old or 40 years old, I am not taking into account the workers for whom I only have partial information.

The model is defined as follow:

$$U_{x_i} = \beta_1 U_{30_6} + \beta_2 U_{30_{12}} + \beta_3 U_{30_{24}} + \beta_4 U_{30_{36}} + \beta_5 U_{30_{+36}} + \alpha x_i + \varepsilon_i \quad (1)$$

Where U_{x_i} is the percentage of time spent unemployed from 30 to 35 years old or from 35 to 40 years old, depending on the specification. U_{30_6} is a dummy with two possible values, 1 when the worker had been unemployed less than 6 months before 30 years old and 0 otherwise. $U_{30_{12}}$is a dummy with two possible values, 1 when the worker had been unemployed more than 6, but less than 12 months before 30 years old and 0 otherwise. $U_{30_{24}}$is a dummy with two possible values, 1 when the worker had been unemployed more than 12, but less than 24 months before 30 years old and 0 otherwise. $U_{30_{36}}$is a dummy with two possible values, 1 when the worker had been unemployed more than 24, but less than 36 months before 30 years old and 0 otherwise. $U_{30_{+36}}$ is a dummy with two possible values, 1 when the worker had been unemployed more than 36 months before 30 years old and 0 otherwise. Also I introduce as a control a vector x_i with individual characteristics, including gender[50], nationality, occupational category[51], type of contract[52] and dependants in the family[53]. I have two variables to control for dependants in the family; I include a variable with the number of people less than 6 years old and another variable with the number of people over 65 years old in the family. $\beta_i$is the coefficient of the effect of youth unemployment effect, that is expected to be increasing with the time the worker spent as unemployed. A similar effect cannot be expected for someone who spent less than 6 months unemployed as for someone who spent more than 2 years. Introducing these six dummies I am capturing this non-linear effect.

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[50] There is extensive literature which study the differences in employment by gender and nationality. See, for example, Raaum and Røed (2006).

[51] I use the occupational category as a proxy of educational level (see Appendix). Lassibille et al. (2001) show that people with higher education have lower probability of being overeducated and a shorter length of unemployment.

[52] Dolado et al. (2000) found that an increase in the educational attainment of the labour force does not always solve the unemployment problem unless other labour market rigidities (as the contract duality) are reduced.

[53] See Bachmann and Baumgarten (2013).

The subscript x in the U_{x_i}indicated the specification: 35 when the model estimates the impact after 5 years or 40 when the model estimates the impact after 10 years. Finally, $\varepsilon_i$is the error term.

6. Results: Impact of youth unemployment

As described above, this regression analysis allows disentangling the effect of the youth unemployment episodes from the effect of all other factors considered to be relevant in determining the adult unemployment episodes. The factors I considered relevant are gender, nationality, education level, dependent family members or type of contract. I include these factors sequentially to try to isolate the effect of youth unemployment on the unemployment episodes in the adult age.

The description of each additional control variable included in the equation and specified as $x_i$in the equation is explained in Appendix A.

Table 24 shows the results of the regression analysis for the effect on the employment situation between 30-35 years old for low skilled workers. **Table 25** shows the results of the regression analysis for the effect on the employment situation between 36-40 years old for low skilled workers. **Table 26** shows the results of the regression analysis for the effect on the employment situation between 30-35 years old for high skilled workers. **Table 27** shows the results of the regression analysis for the effect on the employment situation between 36-40 years old for high skilled workers .The figures in rows 1 through 19 of **Table 24** and **Table 25** (1 through 13 of **Table 26** and **Table 27**) are the value of the coefficients and the corresponding p-values (in parenthesis) for the explanatory variables included in the model. The coefficient provides the estimates of the magnitude of the effect of the explanatory variable on proportion of time spent unemployed between 30-35 years old or between 36-40 years old. The p-values measure the statistical significance of the coefficients[54].

Each column displays the results of the model. Column 1 shows the results for the base model. In that model I regress only the dependent variable and a set of dummies which cover the time spent unemployed before 30 years old. Then I include sequentially different factors which can affect the proportion of time unemployed. These results are shown from column 2 to 6.

[54] The p-values indicate the statistical significance of the coefficient. Where the p-value is less than 0.1 we can be confident that the true value of the estimated coefficient is not zero and therefore conclude that it is statically significant at the 10% significance level.

All these results suggest that the time spent unemployed before 30 years old has an impact on the probability to suffer future unemployment episodes. This effect is greater as the time unemployed during youth is higher. For instance, in row 1 of **Table 24** we can see that the effect is smaller or zero if the unemployed time in youth is less than 6 months. However, this effect can be much greater if the time spent in unemployment before the age of 30 is more than 3 years. On the other hand, once the control variables are included the effect of youth unemployment, in general, is maintained. For instance, if we look at the results from columns 2 to 6, we see that the other factors that I have included have a significant effect on the unemployment situation of the individual since all are significant. For example, the persistence of unemployment in adulthood is greater for women than for men (around 10%) if we focus on **Table 24** and in general, the unemployment persistence decreases if there are children under 6 or older members in the household. This effect is possibly due to the increase in the search intensity of the individual. Finally, if we look at the results provided in **Table 24** and **Table 26**, we can see that the persistence of unemployment is different for workers with low and high skills. The impact is greater among lower skilled workers. This result suggests that the individual's education plays an important role in the persistence of unemployment. The results of the joint significance test for the variables which measure the time spent as unemployed before 30 years old are shown in Appendix B.

Table 24 *– OLS estimation results for workers with low educational level: Effects of youth unemployment on time spent unemployed aged 30-35 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 30 - 35					
[1]	Less than 6 months unemployed before 30 years old	0.0386***	0.0341***	0.00828***	0.0162***	0.0164***	0.00261
		(0.00243)	(0.00244)	(0.00243)	(0.00235)	(0.00235)	(0.00262)
[2]	From 6 to 11 months unemployed before 30 years old	0.110***	0.105***	0.0834***	0.0853***	0.0855***	0.0426***
		(0.00279)	(0.00280)	(0.00277)	(0.00267)	(0.00267)	(0.00287)
[3]	From 1 to 2 years unemployed before 30 years old	0.150***	0.147***	0.132***	0.131***	0.131***	0.0711***
		(0.00265)	(0.00266)	(0.00263)	(0.00253)	(0.00253)	(0.00275)
[4]	From 2 to 3 years unemployed before 30 years old	0.200***	0.197***	0.187***	0.182***	0.182***	0.103***
		(0.00275)	(0.00275)	(0.00272)	(0.00262)	(0.00262)	(0.00284)
[5]	More than 3 years unemployed before 30 years old	0.356***	0.351***	0.355***	0.324***	0.325***	0.195***
		(0.00235)	(0.00236)	(0.00235)	(0.00228)	(0.00229)	(0.00262)
[6]	Male dummy		-0.0870***	-0.0891***	-0.0954***	-0.0954***	-0.0816***
			(0.00110)	(0.00109)	(0.00111)	(0.00111)	(0.00109)
[7]	Spanish nationality			-0.219***	-0.181***	-0.181***	-0.182***
				(0.00166)	(0.00167)	(0.00167)	(0.00167)
[8]	Ocuppational category: Group 5 dummy				0.0165***	0.0165***	0.00926***
					(0.00261)	(0.00261)	(0.00239)
[9]	Ocuppational category: Group 6 dummy				0.0366***	0.0365***	0.00397
					(0.00328)	(0.00328)	(0.00300)
[10]	Ocuppational category: Group 7 dummy				0.0769***	0.0770***	0.0346***
					(0.00270)	(0.00270)	(0.00248)
[11]	Ocuppational category: Group 8 dummy				0.0953***	0.0953***	0.0242***
					(0.00252)	(0.00252)	(0.00235)
[12]	Ocuppational category: Group 9 dummy				0.144***	0.144***	0.0633***
					(0.00267)	(0.00267)	(0.00251)
[13]	Ocuppational category: Group 10 dummy				0.288***	0.288***	0.147***
					(0.00260)	(0.00260)	(0.00249)
[15]	Ocuppational category: Group 11 dummy				0.558***	0.557***	0.342***
					(0.00384)	(0.00384)	(0.0133)
[16]	Other family members, 0-6 years old					-0.00198**	0.00222***
						(0.000769)	(0.000750)
[17]	Other family members, over 65 years old					-0.00398***	0.0126***
						(0.00150)	(0.00139)
[18]	Temporary contract dummy						0.305***
							(0.00120)
[19]	Constant	0.178***	0.236***	0.440***	0.296***	0.297***	0.247***
		(0.00219)	(0.00233)	(0.00281)	(0.00360)	(0.00361)	(0.00365)
[20]	Observations	481.672	481.672	481.655	481.655	481.655	372.752
[21]	R-squared	0.113	0.125	0.154	0.227	0.227	0.356

Robust standard errors in parenthesis. The statistical significance of the coefficients are also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 25 - *OLS estimation results for workers with low educational level: Effects of youth unemployment on time spent unemployed aged 36-40 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 36 - 40					
[1]	Less than 6 months unemployed before 30 years old	0.0449***	0.0405***	0.0192***	0.0216***	0.0217***	0.0167***
		(0.00346)	(0.00346)	(0.00341)	(0.00327)	(0.00327)	(0.00326)
[2]	From 6 to 11 months unemployed before 30 years old	0.0728***	0.0673***	0.0532***	0.0512***	0.0513***	0.0233***
		(0.00385)	(0.00386)	(0.00379)	(0.00364)	(0.00364)	(0.00355)
[3]	From 1 to 2 years unemployed before 30 years old	0.0863***	0.0848***	0.0786***	0.0725***	0.0726***	0.0345***
		(0.00365)	(0.00364)	(0.00359)	(0.00344)	(0.00344)	(0.00339)
[4]	From 2 to 3 years unemployed before 30 years old	0.121***	0.119***	0.119***	0.107***	0.108***	0.0522***
		(0.00373)	(0.00373)	(0.00369)	(0.00354)	(0.00354)	(0.00348)
[5]	More than 3 years unemployed before 30 years old	0.220***	0.215***	0.221***	0.184***	0.184***	0.0958***
		(0.00327)	(0.00327)	(0.00323)	(0.00312)	(0.00312)	(0.00316)
[6]	Male dummy		-0.0958***	-0.0978***	-0.100***	-0.1000***	-0.0853***
			(0.00142)	(0.00140)	(0.00145)	(0.00145)	(0.00134)
[7]	Spanish nationality			-0.243***	-0.207***	-0.207***	-0.206***
				(0.00279)	(0.00273)	(0.00273)	(0.00262)
[8]	Ocuppational category: Group 5 dummy				0.0232***	0.0233***	0.0102***
					(0.00311)	(0.00311)	(0.00274)
[9]	Ocuppational category: Group 6 dummy				0.00882**	0.00889**	-0.0229***
					(0.00379)	(0.00379)	(0.00331)
[10]	Ocuppational category: Group 7 dummy				0.0966***	0.0967***	0.0391***
					(0.00333)	(0.00333)	(0.00297)
[11]	Ocuppational category: Group 8 dummy				0.120***	0.120***	0.0318***
					(0.00296)	(0.00297)	(0.00266)
[12]	Ocuppational category: Group 9 dummy				0.165***	0.165***	0.0705***
					(0.00325)	(0.00326)	(0.00293)
[13]	Ocuppational category: Group 10 dummy				0.321***	0.321***	0.154***
					(0.00312)	(0.00312)	(0.00290)
[15]	Ocuppational category: Group 11 dummy				0.645***	0.645***	0.232***
					(0.00549)	(0.00550)	(0.0181)
[16]	Other family members, 0-6 years old					-7.13e-05	0.0125***
						(0.00111)	(0.00103)
[17]	Other family members, over 65 years old					-0.00227	0.0118***
						(0.00157)	(0.00141)
[18]	Temporary contract dummy						0.345***
							(0.00142)
[19]	Constant	0.249***	0.314***	0.544***	0.392***	0.392***	0.317***
		(0.00310)	(0.00326)	(0.00418)	(0.00490)	(0.00491)	(0.00468)
[20]	Observations	350.135	350.135	350.124	350.124	350.124	291.647
[21]	R-squared	0.037	0.049	0.072	0.149	0.149	0.321

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 26 - *OLS estimation results for workers with high educational level: Effects of youth unemployment on time spent unemployed aged 30-35 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 30 - 35					
[1]	Less than 6 months unemployed before 30 years old	0.0132***	0.0131***	0.0112***	0.0142***	0.0138***	0.0116***
		(0.00329)	(0.00329)	(0.00326)	(0.00327)	(0.00328)	(0.00312)
[2]	From 6 to 11 months unemployed before 30 years old	0.0835***	0.0830***	0.0845***	0.0887***	0.0880***	0.0583***
		(0.00410)	(0.00411)	(0.00406)	(0.00408)	(0.00407)	(0.00386)
[3]	From 1 to 2 years unemployed before 30 years old	0.141***	0.140***	0.143***	0.148***	0.146***	0.0953***
		(0.00397)	(0.00397)	(0.00394)	(0.00395)	(0.00395)	(0.00376)
[4]	From 2 to 3 years unemployed before 30 years old	0.210***	0.209***	0.212***	0.217***	0.215***	0.145***
		(0.00443)	(0.00443)	(0.00440)	(0.00440)	(0.00440)	(0.00425)
[5]	More than 3 years unemployed before 30 years old	0.340***	0.340***	0.344***	0.348***	0.345***	0.247***
		(0.00395)	(0.00395)	(0.00393)	(0.00393)	(0.00394)	(0.00393)
[6]	Male dummy		-0.00563***	-0.00592***	-0.0157***	-0.0164***	-0.00814***
			(0.00206)	(0.00204)	(0.00209)	(0.00209)	(0.00199)
[7]	Spanish nationality			-0.182***	-0.177***	-0.175***	-0.181***
				(0.00486)	(0.00485)	(0.00484)	(0.00486)
[8]	Ocuppational category: Group 2 dummy				-0.0231***	-0.0236***	-0.0135***
					(0.00237)	(0.00236)	(0.00226)
[9]	Ocuppational category: Group 3 dummy				0.0400***	0.0393***	0.0670***
					(0.00259)	(0.00259)	(0.00249)
[10]	Other family members, 0-6 years old					-0.0214***	-0.0150***
						(0.00133)	(0.00125)
[11]	Other family members, over 65 years old					0.0122***	0.0136***
						(0.00296)	(0.00277)
[12]	Temporary contract dummy						0.236***
							(0.00239)
[13]	Constant	0.139***	0.142***	0.312***	0.306***	0.316***	0.233***
		(0.00294)	(0.00319)	(0.00561)	(0.00575)	(0.00578)	(0.00579)
[14]	Observations	107.778	107.778	107.775	107.775	107.775	94.141
[15]	R-squared	0.124	0.124	0.138	0.143	0.145	0.243

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 27 - *OLS estimation results for workers with high educational level: Effects of youth unemployment on time spent unemployed aged 36-40 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 36 - 40					
[1]	Less than 6 months unemployed before 30 years old	0.00856**	0.00877**	0.00793*	0.0105**	0.0116***	0.0117***
		(0.00433)	(0.00433)	(0.00429)	(0.00430)	(0.00429)	(0.00396)
[2]	From 6 to 11 months unemployed before 30 years old	0.0433***	0.0440***	0.0447***	0.0492***	0.0497***	0.0259***
		(0.00514)	(0.00514)	(0.00510)	(0.00510)	(0.00510)	(0.00465)
[3]	From 1 to 2 years unemployed before 30 years old	0.0893***	0.0901***	0.0912***	0.0962***	0.0967***	0.0540***
		(0.00503)	(0.00503)	(0.00499)	(0.00500)	(0.00499)	(0.00461)
[4]	From 2 to 3 years unemployed before 30 years old	0.135***	0.135***	0.137***	0.142***	0.141***	0.0752***
		(0.00553)	(0.00553)	(0.00550)	(0.00550)	(0.00549)	(0.00505)
[5]	More than 3 years unemployed before 30 years old	0.215***	0.216***	0.219***	0.223***	0.222***	0.127***
		(0.00493)	(0.00494)	(0.00491)	(0.00491)	(0.00490)	(0.00462)
[6]	Male dummy		0.0103***	0.0107***	-0.00171	-0.000694	0.00327
			(0.00252)	(0.00250)	(0.00258)	(0.00258)	(0.00236)
[7]	Spanish nationality			-0.178***	-0.173***	-0.173***	-0.176***
				(0.00703)	(0.00701)	(0.00700)	(0.00684)
[8]	Ocuppational category: Group 2 dummy				-0.0450***	-0.0470***	-0.0263***
					(0.00293)	(0.00293)	(0.00268)
[9]	Ocuppational category: Group 3 dummy				0.0242***	0.0216***	0.0545***
					(0.00305)	(0.00306)	(0.00281)
[10]	Other family members, 0-6 years old					-0.0240***	-0.0105***
						(0.00168)	(0.00154)
[11]	Other family members, over 65 years old					0.0239***	0.0233***
						(0.00323)	(0.00293)
[12]	Temporary contract dummy						0.292***
							(0.00311)
[13]	Constant	0.175***	0.169***	0.337***	0.344***	0.353***	0.252***
		(0.00386)	(0.00418)	(0.00799)	(0.00814)	(0.00817)	(0.00792)
[14]	Observations	87.535	87.535	87.532	87.532	87.532	78.786
[15]	R-squared	0.046	0.046	0.056	0.061	0.064	0.190

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

7. Robustness Checks

7.1 Censoring correction method

The dependent variable used in this study is the percentage of time spent unemployed from 30 to 35 years old or from 35 to 40 years old. A large proportion of the observations are zero (around 25%) in the estimated sample, so I have to take this factor into account from the results because the Ordinary Least Square regression (OLS) results could be biased due to this aspect. The problem is that the OLS regression fails to account for the quantitative difference between the observations with the zero and the rest. All individuals with zero unemployment will not have the same likelihood to suffer the problem of unemployment even if the unemployment was a more common situation in Spain. As a robustness check, I have used the Tobit model, also called Censored Regression Model, to take this zero limit into account in the estimation sample. The Tobit model is designed to estimate the linear relationships between variables when there is either left (as in this case) or right censoring in the dependent variable. Censoring from the left takes place when some observations take on the value of the threshold, so that the true value might be equal to the threshold, but it might also be higher. In this case the threshold is zero.

Results using the Tobit model show the same conclusions as I have explained in the previous section. The results are shown in **Table 28**, **Table 29**, **Table 30** and **Table 31** in the next pages.

Table 28 *– Tobit estimation results for workers with low educational level: Effects of youth unemployment on time spent unemployed aged 30-35 years old.*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 30 - 35					
[1]	Less than 6 months unemployed before 30 years old	0.0265***	0.0215***	-0.0117***	-0.00214	-0.00154	-0.00598
		(0.00339)	(0.00339)	(0.00338)	(0.00325)	(0.00325)	(0.00418)
[2]	From 6 to 11 months unemployed before 30 years old	0.118***	0.112***	0.0836***	0.0854***	0.0861***	0.0512***
		(0.00379)	(0.00379)	(0.00374)	(0.00360)	(0.00360)	(0.00445)
[3]	From 1 to 2 years unemployed before 30 years old	0.162***	0.159***	0.139***	0.137***	0.137***	0.0855***
		(0.00359)	(0.00359)	(0.00355)	(0.00341)	(0.00341)	(0.00428)
[4]	From 2 to 3 years unemployed before 30 years old	0.227***	0.223***	0.210***	0.203***	0.203***	0.132***
		(0.00365)	(0.00365)	(0.00361)	(0.00347)	(0.00347)	(0.00434)
[5]	More than 3 years unemployed before 30 years old	0.414***	0.407***	0.411***	0.373***	0.373***	0.249***
		(0.00319)	(0.00319)	(0.00317)	(0.00307)	(0.00308)	(0.00408)
[6]	Male dummy		-0.0954***	-0.0981***	-0.109***	-0.109***	-0.0988***
			(0.00131)	(0.00129)	(0.00132)	(0.00132)	(0.00134)
[7]	Spanish nationality			-0.266***	-0.220***	-0.219***	-0.226***
				(0.00188)	(0.00188)	(0.00188)	(0.00190)
[8]	Ocuppational category: Group 5 dummy				0.0256***	0.0256***	0.0182***
					(0.00355)	(0.00355)	(0.00341)
[9]	Ocuppational category: Group 6 dummy				0.0659***	0.0658***	0.0285***
					(0.00425)	(0.00425)	(0.00406)
[10]	Ocuppational category: Group 7 dummy				0.101***	0.101***	0.0519***
					(0.00359)	(0.00359)	(0.00345)
[11]	Ocuppational category: Group 8 dummy				0.136***	0.136***	0.0470***
					(0.00338)	(0.00338)	(0.00329)
[12]	Ocuppational category: Group 9 dummy				0.186***	0.186***	0.0891***
					(0.00352)	(0.00352)	(0.00344)
[13]	Ocuppational category: Group 10 dummy				0.347***	0.347***	0.178***
					(0.00340)	(0.00340)	(0.00335)
[15]	Ocuppational category: Group 11 dummy				0.639***	0.638***	0.401***
					(0.00456)	(0.00456)	(0.0158)
[16]	Other family members, 0-6 years old					-0.00481***	0.00175*
						(0.000925)	(0.000932)
[17]	Other family members, over 65 years old					-0.0104***	0.0106***
						(0.00182)	(0.00171)
[18]	Temporary contract dummy						0.381***
							(0.00135)
[19]	Constant	0.0992***	0.164***	0.413***	0.233***	0.235***	0.152***
		(0.00305)	(0.00320)	(0.00364)	(0.00474)	(0.00475)	(0.00529)
[20]	Observations	481.672	481.672	481.655	481.655	481.655	372.752
[21]	Pseudo R2	0.0860	0.0937	0.1187	0.1796	0.1797	0.3307
[22]	Left censored observation	88586	88586	88584	88584	88584	82680
[23]	Uncensored observations	393086	393086	393071	393071	393071	393072

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 29 – *Tobit estimation results for workers with low educational level: Effects of youth unemployment on time spent unemployed aged 36-40 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 36 - 40					
[1]	Less than 6 months unemployed before 30 years old	0.0394***	0.0342***	0.00564	0.00782*	0.00856*	0.0102**
		(0.00487)	(0.00487)	(0.00480)	(0.00461)	(0.00461)	(0.00519)
[2]	From 6 to 11 months unemployed before 30 years old	0.0797***	0.0730***	0.0539***	0.0493***	0.0501***	0.0240***
		(0.00538)	(0.00537)	(0.00528)	(0.00508)	(0.00508)	(0.00556)
[3]	From 1 to 2 years unemployed before 30 years old	0.0933***	0.0909***	0.0822***	0.0718***	0.0729***	0.0355***
		(0.00510)	(0.00508)	(0.00501)	(0.00481)	(0.00481)	(0.00533)
[4]	From 2 to 3 years unemployed before 30 years old	0.145***	0.141***	0.141***	0.122***	0.123***	0.0665***
		(0.00516)	(0.00514)	(0.00508)	(0.00487)	(0.00488)	(0.00540)
[5]	More than 3 years unemployed before 30 years old	0.280***	0.273***	0.281***	0.227***	0.228***	0.133***
		(0.00453)	(0.00453)	(0.00448)	(0.00432)	(0.00433)	(0.00498)
[6]	Male dummy		-0.114***	-0.116***	-0.125***	-0.125***	-0.113***
			(0.00181)	(0.00179)	(0.00185)	(0.00185)	(0.00177)
[7]	Spanish nationality			-0.305***	-0.257***	-0.257***	-0.256***
				(0.00333)	(0.00324)	(0.00324)	(0.00313)
[8]	Ocuppational category: Group 5 dummy				0.0353***	0.0354***	0.0188***
					(0.00475)	(0.00475)	(0.00440)
[9]	Ocuppational category: Group 6 dummy				0.0415***	0.0410***	-0.00272
					(0.00559)	(0.00560)	(0.00510)
[10]	Ocuppational category: Group 7 dummy				0.141***	0.141***	0.0645***
					(0.00490)	(0.00490)	(0.00455)
[11]	Ocuppational category: Group 8 dummy				0.192***	0.192***	0.0720***
					(0.00446)	(0.00446)	(0.00417)
[12]	Ocuppational category: Group 9 dummy				0.239***	0.239***	0.115***
					(0.00474)	(0.00475)	(0.00445)
[13]	Ocuppational category: Group 10 dummy				0.425***	0.425***	0.205***
					(0.00452)	(0.00453)	(0.00430)
[15]	Ocuppational category: Group 11 dummy				0.772***	0.771***	0.306***
					(0.00681)	(0.00681)	(0.0232)
[16]	Other family members, 0-6 years old					-0.00758***	0.00984***
						(0.00146)	(0.00139)
[17]	Other family members, over 65 years old					-0.00727***	0.0110***
						(0.00205)	(0.00186)
[18]	Temporary contract dummy						0.460***
							(0.00168)
[19]	Constant	0.140***	0.217***	0.507***	0.297***	0.300***	0.195***
		(0.00436)	(0.00454)	(0.00550)	(0.00677)	(0.00679)	(0.00692)
[20]	Observations	350135	350.135	350.124	350.124	350.124	291.647
[21]	Pseudo R2	0.0258	0.0328	0.0476	0.1006	0.1007	0.2623
[22]	Left censored observation	87442	87442	87439	87439	87439	84190
[23]	Uncensored observations	262693	262693	262685	262685	262685	207457

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 30 *– Tobit estimation results for workers with high educational level: Effects of youth unemployment on time spent unemployed aged 30-35 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 30 - 35					
[1]	Less than 6 months unemployed before 30 years old	0.0344***	0.0341***	0.0315***	0.0340***	0.0336***	0.0434***
		(0.00544)	(0.00544)	(0.00539)	(0.00539)	(0.00539)	(0.00563)
[2]	From 6 to 11 months unemployed before 30 years old	0.142***	0.141***	0.143***	0.147***	0.146***	0.123***
		(0.00624)	(0.00625)	(0.00619)	(0.00619)	(0.00618)	(0.00635)
[3]	From 1 to 2 years unemployed before 30 years old	0.216***	0.215***	0.218***	0.222***	0.220***	0.172***
		(0.00597)	(0.00598)	(0.00593)	(0.00593)	(0.00592)	(0.00612)
[4]	From 2 to 3 years unemployed before 30 years old	0.302***	0.301***	0.305***	0.309***	0.306***	0.236***
		(0.00631)	(0.00631)	(0.00626)	(0.00626)	(0.00626)	(0.00648)
[5]	More than 3 years unemployed before 30 years old	0.457***	0.456***	0.461***	0.465***	0.461***	0.357***
		(0.00570)	(0.00571)	(0.00567)	(0.00567)	(0.00567)	(0.00603)
[6]	Male dummy		-0.00784***	-0.00823***	-0.0180***	-0.0192***	-0.0101***
			(0.00267)	(0.00265)	(0.00271)	(0.00271)	(0.00265)
[7]	Spanish nationality			-0.227***	-0.221***	-0.218***	-0.231***
				(0.00573)	(0.00572)	(0.00571)	(0.00573)
[8]	Ocuppational category: Group 2 dummy				-0.0277***	-0.0283***	-0.0184***
					(0.00306)	(0.00306)	(0.00298)
[9]	Ocuppational category: Group 3 dummy				0.0337***	0.0327***	0.0691***
					(0.00338)	(0.00337)	(0.00336)
[10]	Other family members, 0-6 years old					-0.0277***	-0.0180***
						(0.00178)	(0.00173)
[11]	Other family members, over 65 years old					0.00830**	0.0103***
						(0.00381)	(0.00356)
[12]	Temporary contract dummy						0.316***
							(0.00282)
[13]	Constant	1.92e-05	0.00491	0.217***	0.215***	0.228***	0.105***
		(0.00493)	(0.00519)	(0.00746)	(0.00762)	(0.00766)	(0.00791)
[14]	Observations	107.778	107.778	107.775	107.775	107.775	94.141
[15]	Pseudo R2	0.1003	0.1003	0.1119	0.1140	0.1157	0.2212
[16]	Left censored observation	28185	28185	28185	28185	28185	27209
[17]	Uncensored observations	79593	79593	79590	79590	79590	66932

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 31 *– Tobit estimation results for workers with high educational level: Effects of youth unemployment on time spent unemployed aged 36-40 years old*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 36 - 40					
[1]	Less than 6 months unemployed before 30 years old	0.00965	0.00981	0.00850	0.0114	0.0138*	0.0218***
		(0.00745)	(0.00745)	(0.00738)	(0.00737)	(0.00736)	(0.00733)
[2]	From 6 to 11 months unemployed before 30 years old	0.0765***	0.0770***	0.0782***	0.0836***	0.0850***	0.0590***
		(0.00851)	(0.00851)	(0.00845)	(0.00844)	(0.00843)	(0.00825)
[3]	From 1 to 2 years unemployed before 30 years old	0.148***	0.148***	0.150***	0.155***	0.157***	0.103***
		(0.00815)	(0.00816)	(0.00810)	(0.00808)	(0.00807)	(0.00798)
[4]	From 2 to 3 years unemployed before 30 years old	0.212***	0.213***	0.215***	0.220***	0.221***	0.135***
		(0.00863)	(0.00864)	(0.00859)	(0.00857)	(0.00856)	(0.00841)
[5]	More than 3 years unemployed before 30 years old	0.328***	0.328***	0.332***	0.336***	0.336***	0.212***
		(0.00770)	(0.00771)	(0.00766)	(0.00765)	(0.00764)	(0.00770)
[6]	Male dummy		0.00691*	0.00749**	-0.00846**	-0.00756*	-0.00193
			(0.00377)	(0.00375)	(0.00387)	(0.00387)	(0.00365)
[7]	Spanish nationality			-0.245***	-0.240***	-0.239***	-0.246***
				(0.00924)	(0.00922)	(0.00919)	(0.00899)
[8]	Ocuppational category: Group 2 dummy				-0.0654***	-0.0689***	-0.0416***
					(0.00444)	(0.00444)	(0.00416)
[9]	Ocuppational category: Group 3 dummy				0.0197***	0.0149***	0.0635***
					(0.00455)	(0.00456)	(0.00438)
[10]	Other family members, 0-6 years old					-0.0433***	-0.0213***
						(0.00262)	(0.00247)
[11]	Other family members, over 65 years old					0.0274***	0.0257***
						(0.00467)	(0.00424)
[12]	Temporary contract dummy						0.433***
							(0.00388)
[13]	Constant	-0.0122*	-0.0167**	0.217***	0.231***	0.249***	0.102***
		(0.00664)	(0.00706)	(0.0113)	(0.0115)	(0.0116)	(0.0114)
[14]	Observations	87.535	87.535	87.532	87.532	87.532	78.786
[15]	Pseudo R2	0.0324	0.0324	0.0382	0.0407	0.0431	0.1446
[16]	Left censored observation	32467	32467	32466	32466	32466	31771
[17]	Uncensored observations	55068	55068	55066	55066	55066	47015

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

7.2 Controlling by cohort

Some people are always more prone to be unemployed because of the economic cycle. In other words, they finish their studies in a moment in which the economic cycle is in a recession or crisis, and then their probability of finding a job is lower than individuals who finish their studies with an economic expansion.There is ample literature that studies the short and long term effect of graduating in time of economic recession. For instance, Oreopoulos et al. (2006) find that young graduates entering the labour market in a recession suffer significant initial earnings losses that, on average, eventually fade after 8 to 10 years.

As a consequence, I have added the year of birth (cohort) as an additional control variable to analyse this effect.

Results using the cohort as an additional control variable are show in the next tables (**Table 32 - 35**) and the conclusions are the same as I have explained in the previous section.

Table 32 - *OLS estimation results for workers with low educational level: Effects of youth unemployment on time spent unemployed aged 30-35 years old with cohort fixed effect:*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 30 - 35					
[1]	Less than 6 months unemployed before 30 years old	0.0872***	0.0888***	0.0806***	0.0686***	0.0687***	0.00945***
		(0.00276)	(0.00277)	(0.00274)	(0.00265)	(0.00265)	(0.00280)
[2]	From 6 to 11 months unemployed before 30 years old	0.162***	0.163***	0.163***	0.143***	0.143***	0.0476***
		(0.00312)	(0.00312)	(0.00307)	(0.00298)	(0.00298)	(0.00307)
[3]	From 1 to 2 years unemployed before 30 years old	0.211***	0.216***	0.228***	0.201***	0.201***	0.0769***
		(0.00302)	(0.00301)	(0.00296)	(0.00288)	(0.00288)	(0.00297)
[4]	From 2 to 3 years unemployed before 30 years old	0.264***	0.269***	0.289***	0.257***	0.257***	0.109***
		(0.00311)	(0.00310)	(0.00306)	(0.00297)	(0.00297)	(0.00306)
[5]	More than 3 years unemployed before 30 years old	0.433***	0.436***	0.471***	0.412***	0.412***	0.207***
		(0.00279)	(0.00279)	(0.00277)	(0.00272)	(0.00272)	(0.00286)
[6]	Male dummy		-0.0940***	-0.0996***	-0.102***	-0.102***	-0.0805***
			(0.00109)	(0.00107)	(0.00110)	(0.00110)	(0.00109)
[7]	Spanish nationality			-0.259***	-0.212***	-0.213***	-0.158***
				(0.00174)	(0.00174)	(0.00174)	(0.00168)
[8]	Ocuppational category: Group 5 dummy				0.0139***	0.0138***	0.00848***
					(0.00259)	(0.00259)	(0.00240)
[9]	Ocuppational category: Group 6 dummy				0.0211***	0.0210***	0.00371
					(0.00326)	(0.00326)	(0.00300)
[10]	Ocuppational category: Group 7 dummy				0.0745***	0.0743***	0.0331***
					(0.00268)	(0.00268)	(0.00248)
[11]	Ocuppational category: Group 8 dummy				0.0861***	0.0860***	0.0247***
					(0.00250)	(0.00250)	(0.00235)
[12]	Ocuppational category: Group 9 dummy				0.129***	0.129***	0.0621***
					(0.00265)	(0.00265)	(0.00251)
[13]	Ocuppational category: Group 10 dummy				0.275***	0.275***	0.145***
					(0.00258)	(0.00258)	(0.00249)
[15]	Ocuppational category: Group 11 dummy				0.475***	0.475***	0.330***
					(0.00389)	(0.00389)	(0.0129)
[16]	Other family members, 0-6 years old					0.00256***	0.00475***
						(0.000762)	(0.000747)
[17]	Other family members, over 65 years old					0.0101***	0.00810***
						(0.00149)	(0.00138)
[18]	Temporary contract dummy						0.304***
							(0.00119)
[19]	Constant		0.245***	0.318***	0.581***	0.412***	0.412***
			(0.00405)	(0.00417)	(0.00455)	(0.00488)	(0.00489)
[20]	Observations		481,672	481,672	481,655	481,655	481,655
[21]	R-squared		0.138	0.151	0.188	0.250	0.250
[22]	Cohort Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 33 - *OLS estimation results for workers with low educational level: Effects of youth unemployment on time spent unemployed aged 36-40 years old with cohort fixed effect:*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 36 - 40					
[1]	Less than 6 months unemployed before 30 years old	0.0550***	0.0569***	0.0492***	0.0396***	0.0396***	0.00196
		(0.00377)	(0.00377)	(0.00372)	(0.00360)	(0.00360)	(0.00347)
[2]	From 6 to 11 months unemployed before 30 years old	0.0850***	0.0867***	0.0885***	0.0726***	0.0727***	0.00823**
		(0.00422)	(0.00422)	(0.00415)	(0.00402)	(0.00402)	(0.00380)
[3]	From 1 to 2 years unemployed before 30 years old	0.109***	0.116***	0.129***	0.106***	0.106***	0.0142***
		(0.00407)	(0.00406)	(0.00401)	(0.00388)	(0.00388)	(0.00368)
[4]	From 2 to 3 years unemployed before 30 years old	0.147***	0.154***	0.175***	0.145***	0.145***	0.0319***
		(0.00417)	(0.00416)	(0.00411)	(0.00399)	(0.00399)	(0.00378)
[5]	More than 3 years unemployed before 30 years old	0.260***	0.264***	0.293***	0.235***	0.235***	0.0764***
		(0.00380)	(0.00380)	(0.00376)	(0.00368)	(0.00368)	(0.00351)
[6]	Male dummy		-0.100***	-0.105***	-0.104***	-0.104***	-0.0813***
			(0.00141)	(0.00140)	(0.00144)	(0.00144)	(0.00133)
[7]	Spanish nationality			-0.265***	-0.221***	-0.222***	-0.168***
				(0.00288)	(0.00280)	(0.00281)	(0.00261)
[8]	Ocuppational category: Group 5 dummy				0.0219***	0.0218***	0.00667**
					(0.00310)	(0.00310)	(0.00273)
[9]	Ocuppational category: Group 6 dummy				0.00232	0.00252	-0.0171***
					(0.00378)	(0.00378)	(0.00330)
[10]	Ocuppational category: Group 7 dummy				0.0954***	0.0953***	0.0348***
					(0.00331)	(0.00332)	(0.00295)
[11]	Ocuppational category: Group 8 dummy				0.113***	0.113***	0.0316***
					(0.00295)	(0.00295)	(0.00265)
[12]	Ocuppational category: Group 9 dummy				0.156***	0.156***	0.0686***
					(0.00324)	(0.00325)	(0.00291)
[13]	Ocuppational category: Group 10 dummy				0.313***	0.313***	0.152***
					(0.00311)	(0.00311)	(0.00289)
[15]	Ocuppational category: Group 11 dummy				0.594***	0.594***	0.237***
					(0.00550)	(0.00550)	(0.0178)
[16]	Other family members, 0-6 years old					0.00549***	0.00411***
						(0.00112)	(0.00103)
[17]	Other family members, over 65 years old					0.00564***	0.00430***
						(0.00156)	(0.00139)
[18]	Temporary contract dummy						0.341***
							(0.00142)
[19]	Constant	0.272***	0.350***	0.618***	0.445***	0.445***	0.281***
		(0.00496)	(0.00510)	(0.00586)	(0.00613)	(0.00613)	(0.00629)
[20]	Observations	350,135	350,135	350,124	350,124	350,124	291,647
[21]	R-squared	0.053	0.066	0.091	0.162	0.162	0.335
[22]	Cohort Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 34 - *OLS estimation results for workers with high educational level: Effects of youth unemployment on time spent unemployed aged 30-35 years old with cohort fixed effect:*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 30 - 35					
[1]	Less than 6 months unemployed before 30 years old	0.0282***	0.0281***	0.0278***	0.0311***	0.0303***	0.0162***
		(0.00338)	(0.00338)	(0.00333)	(0.00335)	(0.00335)	(0.00315)
[2]	From 6 to 11 months unemployed before 30 years old	0.0981***	0.0975***	0.101***	0.105***	0.104***	0.0635***
		(0.00420)	(0.00420)	(0.00415)	(0.00416)	(0.00416)	(0.00390)
[3]	From 1 to 2 years unemployed before 30 years old	0.159***	0.159***	0.164***	0.169***	0.167***	0.102***
		(0.00406)	(0.00406)	(0.00401)	(0.00403)	(0.00402)	(0.00380)
[4]	From 2 to 3 years unemployed before 30 years old	0.229***	0.229***	0.234***	0.239***	0.237***	0.152***
		(0.00450)	(0.00450)	(0.00445)	(0.00446)	(0.00446)	(0.00428)
[5]	More than 3 years unemployed before 30 years old	0.364***	0.363***	0.370***	0.375***	0.371***	0.257***
		(0.00404)	(0.00404)	(0.00401)	(0.00401)	(0.00402)	(0.00396)
[6]	Male dummy		-0.0101***	-0.0117***	-0.0216***	-0.0225***	-0.00701***
			(0.00206)	(0.00204)	(0.00208)	(0.00208)	(0.00199)
[7]	Spanish nationality			-0.191***	-0.185***	-0.185***	-0.179***
				(0.00488)	(0.00487)	(0.00486)	(0.00483)
[8]	Ocuppational category: Group 2 dummy				-0.0253***	-0.0256***	-0.0154***
					(0.00235)	(0.00235)	(0.00225)
[9]	Ocuppational category: Group 3 dummy				0.0396***	0.0388***	0.0693***
					(0.00257)	(0.00256)	(0.00248)
[10]	Other family members, 0-6 years old					-0.0203***	-0.0127***
						(0.00133)	(0.00126)
[11]	Other family members, over 65 years old					0.0193***	0.0110***
						(0.00297)	(0.00278)
[12]	Temporary contract dummy						0.237***
							(0.00239)
[16]	Constant	0.229***	0.236***	0.426***	0.423***	0.430***	0.326***
		(0.00854)	(0.00867)	(0.00995)	(0.00998)	(0.00999)	(0.0116)
[17]	Observations	107,778	107,778	107,775	107,775	107,775	94,141
[18]	R-squared	0.137	0.137	0.152	0.157	0.159	0.251
[19]	Cohort Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

Table 35 - *OLS estimation results for workers with high educational level: Effects of youth unemployment on time spent unemployed aged 36-40 years old with cohort fixed effect:*

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by deppendant families	Controlling by type of contract
Row	Dependent variable	Proportion of time spent unemployed between 36 - 40					
[1]	Less than 6 months unemployed before 30 years old	0.0113**	0.0113**	0.0117***	0.0145***	0.0148***	0.00850**
		(0.00448)	(0.00448)	(0.00444)	(0.00444)	(0.00444)	(0.00404)
[2]	From 6 to 11 months unemployed before 30 years old	0.0461***	0.0465***	0.0483***	0.0532***	0.0530***	0.0266***
		(0.00533)	(0.00533)	(0.00529)	(0.00529)	(0.00528)	(0.00475)
[3]	From 1 to 2 years unemployed before 30 years old	0.0944***	0.0949***	0.0975***	0.103***	0.102***	0.0519***
		(0.00522)	(0.00522)	(0.00518)	(0.00518)	(0.00518)	(0.00471)
[4]	From 2 to 3 years unemployed before 30 years old	0.141***	0.142***	0.145***	0.150***	0.149***	0.0734***
		(0.00571)	(0.00572)	(0.00568)	(0.00568)	(0.00567)	(0.00515)
[5]	More than 3 years unemployed before 30 years old	0.227***	0.227***	0.232***	0.236***	0.234***	0.128***
		(0.00515)	(0.00516)	(0.00512)	(0.00512)	(0.00511)	(0.00474)
[6]	Male dummy		0.00915***	0.00891***	-0.00390	-0.00259	0.00676***
			(0.00252)	(0.00250)	(0.00258)	(0.00258)	(0.00235)
[7]	Spanish nationality			-0.180***	-0.175***	-0.175***	-0.165***
				(0.00700)	(0.00699)	(0.00697)	(0.00670)
[8]	Ocuppational category: Group 2 dummy				-0.0461***	-0.0478***	-0.0257***
					(0.00293)	(0.00293)	(0.00267)
[9]	Ocuppational category: Group 3 dummy				0.0257***	0.0235***	0.0564***
					(0.00304)	(0.00305)	(0.00279)
[10]	Other family members, 0-6 years old					-0.0215***	-0.0153***
						(0.00171)	(0.00156)
[11]	Other family members, over 65 years old					0.0255***	0.0152***
						(0.00325)	(0.00293)
[12]	Temporary contract dummy						0.288***
							(0.00310)
[16]	Constant	0.225***	0.218***	0.395***	0.403***	0.407***	0.274***
		(0.00890)	(0.00906)	(0.0114)	(0.0115)	(0.0114)	(0.0116)
[17]	Observations	87,535	87,535	87,532	87,532	87,532	78,786
[18]	R-squared	0.052	0.052	0.062	0.068	0.070	0.201
[19]	Cohort Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parenthesis. The statistical significance of the coefficients is also indicated by the asterisks besides the coefficient. Coefficients without an asterisk are not statistically significant, which means they are not estimated with sufficient precision to be certain that the true value of the coefficient is not zero. *** Significant at 1% level. ** Significant at 2% level * Significant at10 % level.

8. Discussion

Individuals who experience unemployment before 30 years old suffer another unemployment experience when they are prime age adults. This persistence in unemployment has not been previously studied for the Spanish case, but the results are in line with the previous studies done for the UK and US economy as Gregg (2001), Stevens (1997) or Arulampalam et al. (2000) among others.

The data suggest that individuals who spent an extra 6 month unemployed before 30 go on another unemployment experience during their adult labour life. There are a number of observable characteristics which increase the probability of experiencing another unemployment episode. However, more than half of the inter-temporal correlation in unemployment experience cannot be explained by these factors. So, those hit by youth unemployment, from any background, carry persistent effects from their past until at least age 40. The magnitude is that conditional on background characteristics, an extra six months' youth unemployment (pre- 30) leads to an extra 10% of time spent in unemployment over the age of 30 years old. The effect for women is 10%higher than for men workers. Other factors such as nationality, occupational category, family members below 6 or over 65 years old or type of contract also have an impact on the probability to be unemployed over the age of 30 years old.

Regarding possible extensions of this preliminary study, there is an additional possible reason why unemployment falls disproportionately on the same individuals both as youths and prime age adults. The persistence of unemployment can differ among areas or regions. For example, Andalusia or Extremadura are regions with higher structural unemployment.

In spite of this there are more factors which can influence the probability of suffering more episodes of unemployment like living in a depressed local labour market, coming from a disadvantaged family background and a range of individual ability and behavioural normally unobserved in labour market data, the evidence of this study about scarring offers a strong justification for early intervention to prevent long-term youth unemployment. The long-term youth unemployment has a negative effect on economic growth and productivity. From a macroeconomic point of view, there is a risk of loss of talent and skills since a great amount of university graduates are unable to find a job and to put their knowledge and capabilities into producing innovation and contributing to economic growth. Moreover, having a large share of the young workforce unemployed, not only leads to reduced productivity and gross domestic product but also increases the economic costs for the state, since there is more money to be paid

on social benefits and less money coming in from taxes. From a microeconomic point of view, prolonged unemployment at a young age can have broader harmful effects on one's career. The International Monetary Fund explains in "Scarred Generation" notes how prolonged joblessness for young people can cause skills erosion and negatively impact an individual's level of occupational attainment. The beginning of one's career is also a crucial time to establish connections, so a spell of unemployment early on can harm a young person's ability to build and maintain valuable networks. There can even be psychological effects from youth unemployment. It can create a distrust of socioeconomic and political systems and harm an individual's overall level of happiness.

Appendix A

I describe below each additional control variable included in the equation and specified as $x_i$in the equation:

Male dummy is a dummy variable that takes the value of one if the worker is male and zero if the worker is female. This variable captures, on average, the difference between genders.

Spanish nationality is a dummy variable that takes the value of one if the worker is Spanish and zero otherwise. This variable captures, on average, the difference between nationals and other nationalities of workers.

Group 'x' is a dummy variable that takes the value of one if the worker is employed as group 'x' and zero otherwise. See below the table which identify each occupational category.

Table 36 *– Occupational category*

Group in the Social Security	Occupational category
1	Engineers and University Graduates or Senior management personnel.
2	Engineering Technicians, Experts and Assistants with a University Degree.
3	Administrative and Workshop Managers.
4	Unqualified Assistants.
5	Administrative Officials.
6	Subordinates.
7	Administrative Assistants.
8	First and second degree skilled workers.
9	Third degree skilled Workers and Specialists.
10	Unskilled Labourers
11	Workers under 18 years of age, regardless of their occupational classification.

Source: Social Security Administrative Register.

Other family members 0-6 years old is a variable that indicates the number of members in the household under 6 years old. This variable captures the effect of having children in the household. Several studies have shown that the situation at home can play a major role in the search intensity when an individual is unemployed[55].

Other family members 65 years old is a variable that indicates the number of members in the household over 65 years old. This variable captures the effect of having older family members in the household.

[55] See Bachmann and Baumgarten (2013).

Temporary contract is a dummy that takes the value of one if the worker has a temporary contract and zero otherwise. This variable captures, on average, the difference between temporary and permanent workers.

Appendix B

This table shows the results of the test of joint significance for the variables which measure the time spent unemployed before 30 years old:

		(1)	(2)	(3)	(4)	(5)	(6)
		Base	Controlling by gender	Controling by nationality	Controling by occupational category	Controling by dependant families	Controlling by type of contract
Low skills	Specification	Proportion of time spent unemployed between 30 - 35					
	F - statistic	14031.47	13912.21	16472.54	13121.21	13114.73	4500
	p - value	0.00	0.00	0.00	0.00	0.00	0.00
	Specification	Proportion of time spent unemployed between 36 - 40					
	F - statistic	2747.32	2702.83	3437.47	2267.34	2265.15	648.02
	p - value	0.00	0.00	0.00	0.00	0.00	0.00
High skills	Specification	Proportion of time spent unemployed between 30 - 35					
	F - statistic	2863.08	2846.83	3000.95	3058.69	2988.76	1411.73
	p - value	0.00	0.00	0.00	0.00	0.00	0.00
	Specification	Proportion of time spent unemployed between 36 - 40					
	F - statistic	780.45	783.54	817.68	839.79	828.38	275.62
	p - value	0.00	0.00	0.00	0.00	0.00	0.00

Note: Test of joint significance for the variables which measure the time spent as unemployed before 30 years old.

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