Growth and the Current Account: Malaysia and Singapore

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**Ahstract**

*A foreign trade model is estimated for two South East Asian countries, selected because they represent two extremes as far as the current account balance is concerned­ Malaysia, deficit, Singapore, surplus. The specification highlights, (a) the simultaneous interdependence of exports and import flows a result of what Krugman {1995} denotes as the slicing up of the production process and, (b) the impact of investment on imports as a result of productivity shocks on the current account. The estimation results point to the instability of the market for foreign exchange. Using an intertemporal framework, a methodology to derive the external long run equilibrium is applied to the estimated model. The implied constraint on domestic growth turns out to be mild. (JEL C53, F41)*

**Introduction**

This paper intends to analyze some new aspects of the specification of international trade equations empirically and derive from them conditions on the long-run sustainability of the current account, and the implied constraints on domestic growth. For that purpose, econometric estimations of foreign trade equations for two South East Asian countries-Malaysia and Singapore-are presented. The two cases have been selected on the grounds of data avail­ ability and because they represent two extremes as far as the current account is concerned­ deficit for Malaysia and surplus for Singapore. The Engel-Granger OLS estimation procedure to estimate long-run equations with trending variables has been implemented, given the moderate available sample size in the sample period.

The specification of the equations departs from the conventional model, which can ex­ plain several empirical facts. Specifically, two aspects are underscored: (a) the simultaneous interdependence of import and export flows; and (b) the direct impact of investment on imports. The first can be understood as a result of what Krugman [1995] denotes as the slicing up of the production function among several countries (especially noticeable in the case of multinational firms) and can partly explain the rise in world trade in recent years. In this framework, imports become an input in the production of exports, so that one can expect a direct dependency of imports on exports (a demand side effect) and of exports on imports (a supply side effect). The direct impact of investment on imports, as a result of a productivity shock, for example, is also highlighted in the specification of the equations. This is a rational effect in an intertemporal setting where a positive productivity shock leads to higher current investment, financed by borrowing from abroad. There is a current account deficit and higher future income that will allow increased consumption and the repayment of the debt incurred in the first period. The productivity shock, in turn, may be well explained as the result of a transfer of technology, brought about by openness to trade and foreign investment (Feenstra et al. [1992]; Grossman et al. [1995]; Markusen [1995]; Pack et al. [1997]; Sjoholm [1997]). The specification of trade equations put forward in this paper can explain some empirical findings that conventional models cannot. Since a large share of imports is made up of inputs for the production of export goods, a depreciation reduces both imports and exports, having only a mild improvement impact on the trade balance. A reduction in foreign investment, on the contrary, directly improves the current account by reducing imports. It is argued, nevertheless, that a moderate slowing down in the domestic growth rate is enough to achieve a sustainable current account equilibrium.

The paper analyzes, in a second step, the long-run sustainability of the current account, and the implied constraints on domestic growth (in the vein of Thirlwall [1979], and McCombie and Thirlwall [1994]). The analysis is performed with increasing complexity and applied to the estimated models for both countries. The full intertemporal approach that imposes long-run equilibrium of the current account is derived and implemented to derive the constraints on domestic growth. On the basis of this analysis, it is concluded that foreign re­ strictions to domestic growth do not seem to be strong for these countries. Sorne implications for exchange rate policy derived from the estimated equations are also discussed (specifically, from the possible instability of the foreign exchange market).

The structure of the paper is as follows. Section two discusses and presents the specification of the model and related questions on the exchange rate. The third section presents the econometric results, based on long-run estimations of cointegrated equations. Section four is devoted to an analysis of the foreign constraint on domestic growth, which is conducted by means of the intertemporal solvency constraint. The fifth section presents the main results, briefly discusses their main implications, and suggests further research. A final appendix provides details of the statistical data.

## Some Preliminary Background

The authors start with the non-standard features of the trade model specification, that is, the direct dependency of imports on investment, and the simultaneity among exports and imports. Imports can depend directly on investment through a positive productivity shock. This will make investment more attractive and will induce firms to increase investment in new capital goods. If the origin of the productivity shock is a technology transfer, the new capital goods that embody the new technology will not be available in the domestic economy, and therefore will have to be imported. The productivity shock, in turn, may have come about by a knowledge transfer, driven by openness to trade and foreign investment. These channels for the knowledge transfer, and therefore for the positive productivity shock, have been emphasized in the literature by several authors (Feenstra et al. [1992]; Grossman et al. [1995]; Markusen [1995]; Pack et al. [1997]; Sjoholm [1997]). From an intertemporal perspective, a similar result can be explained as the outcome of optimizing behavior. Increased productivity allows increased production and income in the future. This allows greater consumption in the current period and borrowing from abroad, that is, a current account worsening through increased imports. Finally, the foreign loan will be repaid next period with the increase in income (see Mauleón et al. [1997] for a formal treatment in the two periods-one sector economy).

A complementary explanation for the strong dependency of imports on investment is the large component of raw materials in imports [Giorgianni et al., 1997]. As the authors point out, substituting investment for total income seriously underestimates this elasticity (and conversely, once investment and exports are included, the remaining components of GDP may not be significant, as it happens in the estimation results reported in the next section). It may also be worth remarking that investment may have an impact on the supply function of exports, as long as it implies a capacity increase [Nyhus et al.,1996]. But it is the foreign demand for exports (not the domestic supply) that is being modeled here, following the mainstream literature in the field of foreign trade flows.

The interaction between exports and imports can be understood, at least to some extent, as a result of what Krugman [1995] denotes as the slicing up of the production process. A typical example is the case of a country with low real wages that imports parts to assemble and exports final products, that is, a country at an intermediate stage of development (see Lipsey [2001] for related work). This is one of the reasons that has given rise to the increase in world trade in recent years, according to Krugman. In this setting, imports are an input in the production of exports, so that one can expect a double effect-imports will depend on exports (a demand side effect) and exports will depend on imports (a supply side effect). The supply side effect on exports has also been underlined in the literature by Krugman [1989b], Muscatelli et al. [1995], Reidel et al. [1995], and Bayoumi [1999], among others. This literature, however, stresses the direct role of domestic output in exports and, therefore, the focus of the present research differs slightly. It is also worth remarking that the intertemporal budget constraints of a nation, domestic and external, by requiring long-run compensation between exports and imports, impose some kind of a time average correlation between both magnitudes (see Jansen [1998] and Levy (1995], for related work).

The remaining variables to be considered follow the standard specification of international trade equations. Exports depend positively on world demand, and a measure of competitiveness, as given by the relative price of foreign to domestic goods. Imports depend positively on domestic demand and negatively on competitiveness. Putting together both effects with the more conventional explanatory variables, the exports and imports equations become:



 (1)

where: *q* denotes competitiveness (foreign prices in domestic units over domestic prices, that is, *e.pw /p, e* being the domestic price of foreign currency; *pw* and pare foreign and domestic prices respectively); *M* = real imports of goods and services (measured in foreign currency

units); *X=* real exports of goods and services (measured in domestic currency units); *yw* =

real world income: and *I* = real domestic investment (see the appendix for a precise empirical

definition).

The authors note that, precisely because of the simultaneity exports-imports, the inter pretation of all coefficients has to be done with care particularly from the point of view of the stability of the foreign exchange market. The Marshall-Lerner condition cannot be defined

as a 1 + /31 > 1, but rather, one has to look at the final effects, as given in the reduced

form model. This framework also allows the interpretation of a result observed in the Asian economies. Depreciation of the currency has not led to an increase in exports as expected, although imports have decreased, thereby improving the current account. In the model, these effects can be explained easily. Depreciation of the currency is offset by the decrease in im­ports, leaving exports roughly unchanged. The decrease in imports can be easily explained as a result of an investment fall.

Other aspects worth pointing out are the following: (1) the Feldstein-Horioka [1980] puzzle would be an immediate consequence of the correlation between exports and imports since the current account balance is the difference between domestic investment and savings; and (2) the conventional specification of the equations risks underestimating the size of the exchange rate elasticities-because, for example, the exports exchange rate elasticity (positive) would also pick the imports exchange rate elasticity (negative). Solving for the reduced form model:

 (2)

Other variables could also be easily added to the model and a dynamic specification is already embodied as it has been presented-it is enough to think of the coefficients as unrestricted polynomial lags. The next section presents estimates for both forms of the model (it may be worth noticing that this model adequately fits any other economy at an intermediate stage of development [Mauleón et al., 1996]).

Turning to the second point mentioned at the beginning of this section, that is, questions relating to the exchange rate and the current account. At least part of the problem of the East Asian economies can be easily explained by means of a standard IS-LM-BP model. The framework is one of a small open economy under a fixed exchange rate and imperfect capital mobility. The initial equilibrium is disturbed by an autonomous increase in the inflow of foreign capital. This immediately pushes clown the BP schedule, reflecting the fact that at the current level of the domestic interest rate, the inflow of foreign reserves will increase (or the outflow decrease). Since the exchange rate is fixed, this increased inflow will, in turn, lead to an increase in the domestic money supply that will shift the LM schedule to the right until a new equilibrium is reached. At this new equilibrium: (1) the domestic interest rate will be lower, implying higher domestic investment; and (2) domestic income will increase, which will bring about increased domestic savings. At the same time, this will imply a worsening of the trade balance due to an increase in foreign borrowing. This framework is adequate for short­ term analysis but if the situation persists, the stock of foreign debt will build up, eventually reaching a point where international investors will stop lending to the domestic economy. One interesting question is whether this situation would have corrected itself had the exchange rate been fully flexible from the outset. But before discussing this point, it is required that the Marshall-Lerner stability condition for the foreign reserves market holds. This condition is customarily assumed to be met in practice, and many econometric estimation results seem to support it. Unfortunately, and as it will be seen in the empirical! section of this paper, it is doubtful, at best, that this condition holds in the present case--and there are reasons to accept an outright rejection.

Following Tobin [1963], a current account deficit implies an increase in the amount that foreigners lend to the nation. However, this implies a net increase in the foreign holdings of domestic assets. Once the level of these assets reaches the limit that foreigners wish to hold in their portfolios, they will stop lending anymore to the nation. Therefore, the current account will have to be in equilibrium at that point-which may imply a surplus in the trade balance in order to pay for the interest income on the foreign debt. This idea has been pursued by Branson [1988] and Gagnon [1996], who stress the role of foreign assets in the determination of the exchange rate and find empirical evidence supporting this claim (see Mauleón [1998] for an application). From this equilibrium in the externa! accounts, and once econometric estimates of the trade equations are available, an exchange rate equilibrium can be derived simply by working out the value compatible with the foreign trade balance (see, for example, Williamson [1994] on an equilibrium exchange rate). A more involved and rigorous approach would take account of the intertemporal constraint, that is, that the current account does not necessarily have to be zero at every period in order for the nation to be solvent [Mauleón, 2000; Krugman, 1989a].

**Empirical Results and Discussion**

The data have been taken from the International Monetary Fund publication *International Financial Statistics.* Since a competitiveness measure is only available from 1979 onwards, there was a considerable reduction in the estimation sample period. On the other hand, and since these economies have changed rapidly in recent years, one could suspect that taking the sample far back would yield econometrically unstable results (Appendix 1 gives a detailed account of the data set). Consequently, the estimation methodology has been adapted to the short sample. One technique useful in this setting is the Engle-Granger procedure for estimating long-run equations. Provided all variables involved are equally trending, that is, are integrated of the same order and the residual of the equation is stationary, a static 018 estimation yields very consistent parameter estimates. The variance-covariance matrix can be consistently estimated by the Andrews and Monahan [1992] procedure and it will be robust to autocorrelation and heteroskedasticity. Therefore, this methodology avoids the data-mining problem associated with the specification of complex lag dynamics that require very large samples in order to produce sensible results. All original series involved in the equations can be taken as integrated of order one after applying conventional Dickey-Fuller unit root tests. The long-run equations are also cointegrated, as implied by the absence of a unit root in the residuals. Although it would be hard to give economic meaning to the existence of more than one cointegrating vector among the variables involved in the estimated trade equations, the Johansen tests-trace and rank-do not point to the existence of more than one such vector in any case (see Hamilton {1994] for instance for a detailed exposition on unit roots and cointegration). These results, taken together, provide a sound statistical rationale for the estimated models used as the basis of the economic implications discussed in the following sections.

The main empirical results are presented next (see equation (1) for a definition of the variables involved, and Appendix 2, for a comprehensive set of diagnostic tests).

*Singapore*

*Structural model*

*Log(Xt)* = -4.6 + .87log(qt) + .83log(Mt) +.83log(Yt) *+et*

(8.1) (10.1) (12.9) (6.1)

*s.e.* = *.029;D.W* = *l.6;T* = 1979/1994

*Log(Mt)* = -.22 - .58log(qt) + .64log(Xt) + .44log(It) +é :U

(.22) (3.4) (8.4) (2.7)

*s.e.* = *.038;D.W* = *l.3;T* = 1979/1994

*Reduced form*

*Log(Xt)* -9.5 +.89log(qt) + .88log(It) +1.6log(Yw) + *ut*

(6.4) (3.4) (4.1) (6.1)

*s.e.* = .07; *D.W* = 1.5; *T* = 1979/1994

# Log(Mt)

-6.1 .06log(qt) + l.llog(It) +.86log( w) +*UhMt*

(4.0) (.2) (5.0) (3.2)

*s.e. .074;D.W* = 1.5; *T* = 1979/1994

*Malaysia*

*Structural model*

# Log(Xt)

-5.2 + .63log(qt) + .52log(Mt) + l.4log( w) + *e t*

(1.6) (2.9) (7.2) (4.0)

*s.e.* = *.065;D.W* = *l.0;T* = 1979/1994

*Log(Mt)* = 2.5 - .24log(qt) +.35log(Xt) +.79log(It) + *e:Wt*

(2.9) (2.2) (5.7) (16.0)

*s.e.* .03; *D.W* = 1.7; *T* = 1979/1994

*Reduced form*

*Log(Xt)* = -4.8+.62log(qt) +.48log(It) +1.8log(Yw) + *u t*

(1.2) (2.3) (5.5) (4.4)

*s.e.* = .079; *D.W* = 1.2; *T* 1979/1994

*Log(Mt)* = 1.2 - .003 log(qt) + .96 log(lt) +.57log( w) + *u:Wt*

(.61) (.02) (21.2) (2.7)

*s.e.* = *.04;D.W* = *l.9;T* = 1979/1994

(3)

The first striking result is that the sum of the exchange rate elasticities in the reduced form model is less than 1, implying a rejection of the M-L condition, and the instability of the foreign exchange market (similar results supporting the low exchange rate elasticity of foreign trade are reported in Hsing [1996] and Wilson [2001]). Therefore, it is not possible to obtain a long-run equilibrium value for the exchange rate by imposing a balanced current account. However, this is done in one or in several periods. Perhaps the way to understand this result is that in the very long-run, one should expect Purchasing Power Parity to hold and from that condition an equilibrium value for the exchange rate could be derived. But at the same time, this result lends support to the policy of pegging the exchange rate to some anchor, for example, the U.S. dollar. On these grounds, therefore, it is highly questionable that a flexible exchange rate should yield equilibrium in the foreign market.

**External Constraints on Domestic Growth**

If the exchange rate is taken as given, and it is wished to impose external equilibrium in the form of current account balance, this imposes restrictions on domestic growth (the analysis that follows is in the vein of Thirlwall [1979], and McCombie and Thirlwall [1994]). The full intertemporal approach could be applied for that purpose, but a quick way to gauge this restriction is, simply, to consider the ratio of exports to imports, that is (the notation follows sections two and three),

 (4)

(Note that it is obtained from the reduced form estimates. The notation follows (2)). If, for example, it is wished to keep this ratio constant, and assuming that GDP growth can be made equal to domestic investment growth (valid assumption provided savings is a constant proportion of income), the following restriction results:

*g* [(b3 - *a3)/(a2* - *b2)].gw* (5)

where *g* and *gw* denote domestic and foreign growth, respectively. Putting the estimates of

(3) into this expression yields a crude but quick way to assess the limits to domestic growth imposed by the current account and by foreign growth. In this case, the result is not too unfavorable, though. For both countries, the result obtained is that *g≈ 2.4gw,* which implies substantial room for faster growth. No doubt this is just a crude measure that would have to be modified to take account of initial conditions, namely, the current account deficit of Malaysia and the surplus of Singapore. This can be done in a more formal but much more involved way, taking account of the intertemporal external constraint [Mauleón, 2000]. In essence, what this restriction does is to ensure intertemporal solvency by requiring the current discounted value of all future trade balance surpluses (deficits) to be at least (most) equal to the current value of the accumulated foreign debt (assets) [Cohen, 1985]. It can be shown [Mauleón, 2000] that an analytical solution for this condition can be obtained in a closed form by placing the estimated export and import equations into the appropriate expression for the current discounted value. One arrives at an expression relating domestic and foreign growth rates that depends on the values of the estimated parameters for both exports and imports equations. The real interest rate is *pw,* the initial value of the foreign

debt-to-GDP ratio is fio, the specified horizon for the fulfillment of the solvency condition is *H,* and the final value of the outstanding foreign debt in case it is not zero, *c/>H-* This expression defines an implicit function for domestic growth as a function of the remaining variables and parameters, written as follows:

 (6)

In practice, this expression for *g* will not be immediately available in a closed form, but rather, it will have to be solved numerically-a straightforward grid being the quickest approach in most instances. One immediate application of this equation is to the study of domestic growth limitations under several alternative assumptions. Selected results for the case of Malaysia are presented in Table l. The main results in the table are summarized next. The impact of the horizon, *H,* is strong especially for small values and dies off quickly, becoming nearly flat for periods beyond, say, 20 or 30 years. Letting the final debt to be equal

to the starting value, that is, *(/>0* = *q:iH,* has an equivalent effect to letting *H* grow. Several values for the real interest rate, *pw,* were tried without hardly any impact on the main results.

By far, the strongest impact is attributable to foreign growth, *gw,* as one would in principle

expect. To gain further insights, a somewhat more systematic simulation was conducted. Given the previous results, fixed values were chosen for the following parameters: *<Po* = .4, *c/>H* = O, *pw* = .05. The value set for *<Po* implies a foreign debt-to-GDP ratio of 40 percent,

which was taken from the World Bank 1997 report on global development finance after adding a 20 percent depreciation of the currency. The main results confirm the simulations presented in Table 1, and suggest that a simple, *albeit ad hoc,* relationship could account for (6) in spite of the fact that its shape is unknown (apart from being nonlinear). Two simple rules can be obtained by running regressions based on the simulations results:



*g* ≈ -0.021 + 2.82gw (7)

The fit of the first was around 70 percent and that of the second almost perfect for large values of H-say beyond 30. A quite interesting result is that the crude measure proposed in (5) - *g* ≈ 2.4 *gw, d*oes a reasonable job at capturing the essentials of the relationship. As before, this is a valuable result on the grounds of its simplicity.

TABLE 1

External Solvency and Domestic Growth

Malaysia

(A) *pw* = .05,*"(=0,rp0* = *rpH* = .04

H(years) *gw* (percent) g(percent)

5

10

5

10

30,90

2

2

3

3

2

(B) *pw* = .05,*'Y=* O, *rpo* = .4,*<Po* = O

3.5

4.5

7.0

7.7

5.1

H(years) *gw* (percent) g(percent)

5 2

10 2

5 3

10 3

90,120 2

-3.4

2.8

o.o

5.9

5.1

This section has reported results based on simulations of the full intertemporal solvency constraint, with the estimated parameters of the Malaysian foreign trade equations. One important conclusion obtained has been that, however complex it may look, this procedure leads to meaningful results which can be simplified in an approximated analytical expression. As for domestic growth limitations, it has been shown that they come primarily from the foreign growth rate and from the requirement that the foreign debt be repaid in a short period. Given the coefficient of 2.8 that multiplies externa} growth in (7), one is led to conclude that, provided foreign loans are renewed, and only accrued interest income is collected by foreign investors, and given just a moderate world real growth, the current account does not pose any serious limitation to domestic growth. The fact that a crude approach (see (5)) yields a similar conclusion, only reinforces its soundness.

## Summary and Conclusions

At the time the South East Asian crisis erupted, it was expected that the depreciation of the exchange rate of those countries would lead to an improvement of their current accounts. However, the depreciation improved the current account by reducing imports but not so much by an increase in exports. Part of the problem was attributed to the fact that this depreciation increased the price of imports, a large part of which were inputs in the production of exports.

These effects cannot be explained in a standard specification of the foreign trade equations for imports and exports. By contrast, the model presented in this paper directly addresses the interdependency between exports and imports and, in this way, can explain the previous facts. The decrease in imports would be a result of the investment fall brought about by a reduction in foreign savings-that is, a reduction in foreign credit. As for exports, while the depreciation would imply a positive boost, the reduction in imports would offset it, the net result being uncertain beforehand. In this way, the model presented in this paper can explain the previous facts, whereas conventional models cannot. One interesting implication is that a flexible exchange rate <does not seem to be a solution to the problem of current account equilibrium. The exchange rate equilibrium value would have to be found following other criteria, possibly the Purchasing Power Parity principle.

*k3* for growth limitations from the point of view of current account equilibrium, a new methodology has been proposed that allows the derivation of the maximum domestic growth rate compatible with externa! equilibrium. This condition is derived from the full implementation of the intertemporal solvency condition, which basically implies taking into account the ability of the country to repay its outstanding foreign debt by generating future trade surpluses. Since it depends on the specific values of the trade equations, the analysis has been conducted based on the estimated trade models. Although the functional relationship between domestic and world growth is not linear, and only defined in implicit form, it has also been shown that a highly simplified and explicit and yet quite accurate expression, can be derived. On the basis of this analysis, it is possible to conclude that foreign restrictions to domestic growth do not seem to be strong for these countries, although addressing the requirement of current account balance, or intertemporal solvency, would require a growth correction, that is, a reduction, for highly indebted countries.

It is still unclear if the origin of the crisis can be traced to the pegging of the currencies to the U.S. dollar and the subsequent appreciation of this currency that would have resulted in external trade gaps [Girardin, 1998]. From the analysis in the third section of this paper, it can be concluded that these countries do not stand to gain much by a depreciation either (a similar conclusion is attained by Zhang [1996] for the Chinese case). Neither does real world growth seem to pose a serious limitation to a domestic growth rate that ensures externa! solvency. A tentative conclusion may be reached by assuming that current account difficulties may have triggered the crisis but that it spread to the rest of the economy and to other countries because of other reasons. These could include the withdrawing of foreign credit and investments, to some extent unjustified on economic grounds, and internal structural problems, namely, overinvesting, and weak legal and market systems. The resumption of domestic growth, following the substantial world growth rate and the renewed foreign investment, only reinforces these conclusions. Finally, the methodology presented here to specify foreign trade equations, and to analyze the externa! equilibrium, is applicable to other economies.

APPENDIX

*The Data and Definition of the Variables.*

The data have been taken from the International Monetary Fund publication and *International Financial Statistics.* The variables are defined as follows for both Malaysia, and Singapore:

*P* =domestic GDP deflator {1990=100).

*q* = real effective exchange rate (an increase means a depreciation).

*X\** = Exports of goods and services measured in nominal domestic currency units

(millions of Ringgit, Malaysia, and millions of Singapore dollars, Singapore).

*X= X\*/ P* (real exports of goods and services).

*M\** =Imports of goods and services measured in nominal domestic currency units (millions of Ringgit, Malaysia, and millions of Singapore dollars, Singapore).

*M* = *M\* /(q.p)* (real imports of goods and services in foreign currency units).

*I\** = Gross Fixed Capital Formation measured in nominal domestic currency units

(millions of Ringgit, Malaysia, and millions of Singapore dollars, Singapore).

*I* = *I\** / *P* (real Gross Fixed Capital Formation).

*Y* = GDP Volume 1990 prices (millions of Ringgit, Malaysia, and millions of Singapore dollars, Singapore).

World demand, *yw,* has been defined as a weighted average of the GDPs of each country's main trading partners. More specifically, *yw* for Malaysia has been defined as follows:

*yw* = *Yus•0.36* +*Ys-0.35* + YJ•0.22 +*YuK•0.07*

where *Yus, Ys, YJ,* and *YuK,* are the GDP in 1990 prices and U.S. dollars of the U.S.A., Singapore, Japan, and the U.K. respectively (these four countries account for almost 80 per­ cent of the Malaysian foreign trade. The weights are scaled to sum unity and are taken from the International Monetary Fund publication *Direction of Trade Statistics* [1990]). World demand for Singapore has been defined similarly as:

*yw* = *Yus* \* 0.325 +*YM1•0.34* + Yr0.14 + YrH•O.l +*YuK•0.045* +*YNth•0.05*

where *Yus, YM1, YJ, Yrh,* YuK, and *YNth,* are the GDP in 1990 prices in U.S. dollars of the U.S.A., Malaysia, Japan, Thailand, the U.K., and the Netherlands, respectively (these six countries account for approximately 60 percent of the Singaporean foreign trade).

*Statistical Diagnostic Tests.*

The following diagnostic tests are reported below. For every estimated equation in section three: *BP;* the Breusch-Pagan heteroskedasticity test; *Arch(l);* the Engle conditional heteroskedasticity test for *arch(I)effects; AR(I),* a Lagrange test for first order autocorrelation; *DF,* the Dickey-Fuller cointegration test for the residuals; *Chow(2),* a Chow stability test for the last two observations; *F(lags),* an F test for the joint significance of one lag of all

variables in the relevant equation. *BP, ARCH(I),* and AR(l), are asymptotically distributed as a x2 (1), with a 5 percent significance value of 3.84; *Chow(2)* is distributed as an F(2,14) with a 5 percent significance value of 3.68; *F(lags)* is distributed as an F(4,15) with a 5 percent significance value of 3.06.

Overall, the diagnostics broadly support the specification presented. In a few cases though, they detect some problem, but on careful inspection of the empirical results it emerges that it is

due to some observations that could be characterized as outliers (the estimated parameters and their associated t-ratios are not substantially affected in these cases). However, and due to the small sample size and the danger of overfitting, it was decided not to account for them with dummy variables. Regarding cointegration, the *D.W* and *AR(l)* tests do not detect any significant fust order autocorrelation, let alone a unit root. Besides, it is well known that cointegration tests lack power in small samples, so that we conclude that the estimated equations are cointegrated.

*Singapore*

*Structural model*

Exports: *BP=l.44; ARCH(l)=l.98;* AR(l)=0.l; *DF=2.7; Chow(2)=6.0; F(lags)=l.4*

Imports: *BP=l.42; ARCH(l)=0.03;* AR(l)=l.8; *DF=2.6; Chow(2)=0.28; F(lags)=8.3*

*Reduced form*

Exports: *BP=l.39; ARCH(l)=0.005;* AR(l)=0.328; *DF=2.8; Chow(2)=3.6; F(lags)=l.2*

Imports: *BP=0.01;* ARCH(l)=0.223; AR(l)=0.47; *DF=3.l;* Chow(2)=l.21; *F(lags)=4.8*

*Malaysia*

*Structural model*

Exports: *BP=l.57; ARCH(1)=2.68;* AR(1)=2.46; *DF=2.9; Chow(2)=3.68; F(lags)=2.42*

Imports: *BP=0.06; ARCH(l)=l.65;* AR(l)=0.36; *DF=3.1; Chow(2)=1.44; F(lags)=l.81*

*Reduced form*

Exports: *BP=2.3; ARCH(l)=l.03;* AR(l)=l.21; *DF=3.l; Chow(2)=3.2; F(lags)=l.89*

Imports: *BP=2.2; ARCH(l)=0.62;* AR(l)=0.03; *DF=4.0; Chow(2)=0.24; F(lags)=2.05*

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