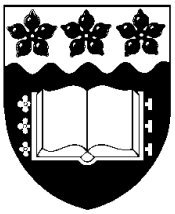

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Abstract

Differentials in the estimate of long run import pass-through is investigated for 9 countries of the Asia-Pacific in conjunction with the estimation of the short run dynamics. This is undertaken using the Johansen procedure, which tests for the possibility of multiple cointegrating vectors and then uses this information to estimate a restricted vector error correction specification. The rank tests indicate that 7 out of the 9 countries had long run cointegrating relationships from which estimates of pass-through could be found. The long run import pass-through responses are significantly diverse, ranging from the perverse case of 109% for Pakistan to 26% for Australia. The short run responses also reveal a relatively slow, albeit statistically significant, adjustment of import prices to alterations in the exchange rate, with most of the adjustment in import prices occurring in the periods after the exchange rate shock.

Keywords: Pass-through, Johansen procedure, cointegrating vectors

1. Introduction

The Asia-Pacific region over the past decade has been the source of substantial gains in economic growth for the world economy through its significant importance in world trade, and the immediate future appears to be following the same trend.[1] This is reflected in its world import and export shares which in 1980 accounted for 16% of world export trade and 15% of world import trade, while just over a decade later in 1993 this grew by over 10% to 27% for export trade and 28% for import trade (IMF International Financial Statistics, various issues).

The significant increase in world trade in this region has brought attention to the importance of exchange rate movements in the member countries and how they transmit adjustments in the price of imported goods. This is an important consideration given the movement in all of the member countries to more flexible exchange rate regimes which in turn implies greater exchange rate volatility. In the case of the countries investigated in this paper, Malaysia moved from a "composite exchange rate" prior to and during 1992 to a managed float thereafter as did Singapore although the turning point was earlier in 1986.[2] Thailand moved from part of a group which included a "heterogenous group of arrangements" in and before 1981 to a pegged currency against the $US between 1981 and 1984, while after 1984 it converted to the more flexible composite currency.[3] The Phillipines, Australia and New Zealand all maintained a managed float until (approximately) 1984 at which point they changed to an independently floating exchange rate. Pakistan and Korea moved from a pegged (against the $US) exchange rate prior to and during 1982 and prior to and during

1979 respectively, after which point they converted to a managed float. Japan employed an independently floating exchange rate over the entire timeframe of investigation of this paper.

The heightened exchange rate volatility which results from the general movement to more flexible exchange rate regimes will in turn have ramifications for the extent of both long run and short run ***pass-through*** which is the interest of this paper. Import pass-through measures the responsiveness of import prices to adjustments in the exchange rate. It is formally defined as the elasticity of domestic currency import prices in response to a change in the domestic currency price of foreign currency. The greater is the extent of import pass-through the more imported inflation is transmitted into a domestic economy as a result of a weaker domestic exchange rate, and hence the greater the opportunity for a response by import volumes to the price change. It follows that the information contained in estimates of import pass-through is imperative for policy makers who have been set the task of controlling import behaviour.

There have been a wide variety of papers written on the pass-through topic, including both strictly theoretical and strictly empirical papers and a combination of both. The theoretical class of papers include Dornbusch, 1987, Dixit, 1989, Feenstra, 1989, Fisher, 1989, Murphy, 1989, Ohno, 1989, and Webber, 1995 just to name a few, while the strictly empirical studies comprise papers by the Bureau of Industry Economics, 1987, Branson, 1989, Feinburg, 1989, Mann, 1989, Athukorala, 1991, and Menon, 1993 which is a handful of studies out of many. The set of both theoretical and empirical papers include Artus and Bismut, 1986, Feinburg, 1986, Feenstra, 1989 and Webber, 1997.[4]

The empirical evidence presented in this paper hopes to capture the long run import pass-through estimates for nine different Asia-Pacific countries, in addition to evaluating the speed of adjustment to that long run equilibrium level of pass-through. The restriction to just nine countries is a result of data limitations. The timeframe of investigation varies from country to country but generally starts from the late 1970's to the early 1990's which are enough observation points to be able to provide accurate estimates of long run responses.

The pre-occupation with the estimates of import pass-through for the Asia-Pacific countries in particular is a result of two underlying reasons; (i) the important growth in trade in the region concomitant with more volatile exchange rate activity stemming from the movement to more deregulated exchange rate markets, as mentioned in earlier paragraphs, and (ii) surprisingly little has been undertaken in the area of ***import*** pass-through in the Asia-Pacific as a ***group***, especially the importance of comparing the import price responses of different members within the group.[5] This is true for long run estimates of import pass-through but is an even more glaring omission from the point of view of estimating the short run dynamics.

Section 2 of this paper provides some brief insight into the fundamental determinants of import pass-through within a simple partial equilibrium framework, section 3 presents the estimation methodology and the long and short run results, while section 4 concludes the paper.

2. Partial Equilibrium Model of Import Pass-through

Let us assume a simple world in which there exists two countries, country D (for domestic) and F (for foreign), which conduct barrier free trade in some representative good m. We assume (for expositional simplicity) that m is not produced in D and so must be imported from F. It follows that D's demand for m is also its import demand. Assume the following simple market setting:

$$Q^s = Q^s(P_F) \tag{1}$$

$$Q^d = Q^d(P_D, P_F) \tag{2}$$

where Q^s is the quantity of m supplied to market by foreign suppliers, P_F is the foreign currency price received by foreign suppliers, and Q^d is the market demand for m which is a function of the D and F currency price of m, (P_D and P_F respectively).

Assume a competitive world m-market for simplicity.[6] The market supply function is, therefore, the horizontal summation of the upward sloping marginal cost functions of price-taking firms in F. The market demand function is the aggregation of the Marshallian demand functions derived from the utility maximisation problems of consumers in F and D.[7] The utility functions of such consumers are assumed to be homothetic, strictly quasiconcave functions with interior solutions, so that each consumer's demand function represents a unique solution and that solution maximises utility. Market demand is a function of both the D and F currency price of m since both D and F consumers pay for m in their respective currencies, with $\frac{\partial Q^d}{\partial P_i} < 0$ (i = D, F).

Assume that contracts describing trade in m are denominated in F's currency.[8] It follows that:

$$P_D = E.P_F \tag{3}$$

where E is the domestic currency price of foreign currency. Totally differentiating the market equilibrium condition ((1) = (2)) gives:

$$\frac{\partial Q^s}{\partial P_F}.dP_F = \frac{\partial Q^d}{\partial P_D}.dP_D \tag{4}$$

From (3), the differential dP_D is:

$$dP_D = E.dP_F + dE.P_F \tag{5}$$

Combining (4) and (5) and re-arranging for $\frac{\partial P_D}{\partial E}.\frac{E}{P_D}$ yields the degree of good m (bilateral) import pass-through between D and F (δ_F):

$$\delta_F = \frac{\varepsilon_{sF} - \varepsilon_{dF}}{\varepsilon_{sF} - \varepsilon_{dF} - \varepsilon_{dD}} \tag{6}$$

where $\varepsilon_{dF} \equiv \frac{\partial Q^d}{\partial P_F}.\frac{P_F}{Q}$ is the foreign demand elasticity, $\varepsilon_{dD} \equiv \frac{\partial Q^d}{\partial P_D}.\frac{P_D}{Q}$ is the domestic demand elasticity, and $\varepsilon_{sF} \equiv \frac{\partial Q^s}{\partial P_F}.\frac{P_F}{Q}$ is the foreign supply elasticity. The most important point to come from (6) is that since the extent of import pass-through is contingent upon demand and supply elasticities, then we should expect that countries with different compositions of trade will exhibit different aggregate pass-through outcomes. This follows from the fact that dissimilar products are likely to possess different demand and supply elasticities.

The standard case for a large country is partial import pass-through, $\delta_F \in (0,1)$, which occurs in the case of a downward sloping demand curve and an upward sloping supply curve in P^F/Q space. In the limiting small country case, $\varepsilon_{Dd} \rightarrow 0$, pass-through is complete, $\delta_F \rightarrow 1$. This follows from the fact that a shock to the importing country's exchange rate has negligible impact on market demand and hence P_F. It follows that we are likely to find in our empirical results that countries which are considered to be price-makers in world trade will exhibit lower aggregate import pass-through compared to countries which are more likely to be considered price-takers.

3. Empirical Methodology

The long and short run estimates of import pass-through are found using the Johansen, 1988 procedure. This procedure first involves determining how many long run relationships exist between the variables of the model, p_{Dt}, e_t, p_{Ft}, PED, and SD, where p_D, e, and p_F are as defined in section 2 (lower case letters represent variables in natural logarithms), SD is a vector of centred deterministic seasonal dummies, and PED refers to a centred pegged exchange rate dummy that is used for countries with exchange rates that were pegged against the $US at any stage.[9] This information is obtained through the evaluation of the rank of $\mathbf{P}$ in the vector error correction representation:

$$\Delta \mathbf{Z}_t = \sum_{i=1}^{k} \Gamma_i \Delta Z_{t-k} + \mathbf{P}\mathbf{Z}_{t-1} + \boldsymbol{\mu} + \boldsymbol{\Upsilon}_1 \mathbf{SD} + \boldsymbol{\Upsilon}_2 \mathrm{PED} + \boldsymbol{\varepsilon}_t \qquad (7)$$

where $\mathbf{Z} = \begin{bmatrix} p_D \\ p_F \\ e \end{bmatrix}$, $\boldsymbol{\mu}$ is an intercept term and the $\boldsymbol{\varepsilon}_t$ are *niid* $(0,\boldsymbol{\Sigma})$. Once the number of cointegrating vectors, r, is established, if any, then we are in a position to estimate the vector

error correction model with the rank restriction imposed. This will generate the long run parameter estimates, $\mathbf{b}$ together with estimates of the short run dynamics, $\mathbf{a}$, whose product yields $\mathbf{P} = \mathbf{a}\,\mathbf{b}'$. If only 1 cointegrating vector is found then economic theory tells us that the normalisation should be on the domestic currency import price term, with long run vector given by:

$$p_{Dt} = \delta_0 + \delta_1 e_t + \delta_2 p_{Ft} + \varepsilon_t \qquad (8)$$

from which an estimate of long run pass-through is obtained as the coefficient on the exchange rate term, δ_1.[10] If two or more cointegrating vectors are found then economic theory and sensibility of signs will dictate from which vector our estimate of long run import pass-through will come.

If an equilibrium import pass-through relationship is found to exist, then the adjustment to this equilibrium tells us about short run import pass-through, and is found from the following vector in the VEC representation (7):

$$\Delta p_{Dt} = \mu_0 + \Psi_1 SD + \Psi_2 PED + \alpha_1[P_{Dt-1} - \delta_0 - \delta_1 e_{t-1} - \delta_2 p_{Ft-1}] + \sum_{i=1}^{k} \Gamma_{1i} \Delta e_{t-i} + \sum_{i=1}^{k} \Gamma_{2i} \Delta p_{Dt-i} + \sum_{i=1}^{k} \Gamma_{3i} \Delta p_{Ft-i} + \omega_t$$

The parameter which describes the short run dynamics of adjustment in the import price in response to the exchange rate change (as well as changes in the foreign currency price) is

the coefficient estimate $\hat{\alpha}_1$. The information contained in the estimates of the short run dynamics is relevant only if there exists 1 or more cointegral relationships in (7).[11]

The nine Asia-Pacific countries for which specification (7) is estimated are presented in Table 1 in addition to the relevant time frames involved.[12]

Table 1 inserted at this point

Prior to estimating specification (7), however, we must first determine the time series properties of the variables. In order to be feasible for a cointegrating relationship, hence permitting the existence of an error correction representation, we require that the variables have similar time series properties.[13] This is found by first determining whether the variable in question is deterministic or stochastic stationary/non-stationary, and if stochastic non-stationary then we need to assess the order of integration, I(d). The size of d is established by considering the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) tests, and the Perron (P), 1989 test for a unit root when there exists the possibility of a structural break in the series. The optimal lag length in the ADF and Perron tests are found by consulting the Sims, 1980 Adjusted Likelihood Ratio statistic. The truncation lag length in the Phillips-Perron test is found by using the highest significant lag order from the autocorrelation function or the partial autocorrelation function for the first difference series.

The results of the unit root tests for the exchange rate and import unit value variables are given below in Table 2.[14] All variables were found to be stochastic non-stationary and so only the relevant ADF, PP and P statistics are reported for reasons of brevity. For the world price variable, which is common to all countries, the ADF statistic is -2.460, the PP statistic

is -2.904 and the P statistic is -1.42 for the levels test, while in first differences ADF = -4.839, PP = -6.149 and P = -16.87 thus implying that p_F is I(1) (integrated of order 1).[15]

Table 2 to be inserted at this point

The unit root tests indicate that all of the variables are I(1) except in the case of Malaysia and Thailand where the PP, ADF and P tests are in conflict. For Malaysia the ADF test indicates p_D and e are higher orders of integration than I(1) while the PP and P tests find that they are I(1). In the case of Thailand, the p_D term is I(1) according to the P and PP tests but a higher order of integration by the ADF test. These results may be reflected in the cointegration tests to follow. The Johansen Trace test statistics for the number of long run cointegrating vectors are presented in Table 3.

Table 3 inserted at this point

Table 3 implies that just 7 countries give rise to long run cointegrating vectors. The countries that fail are Thailand and Malaysia, with both results perhaps a reflection of the ambiguity contained within the unit root test results. In the 7 countries in which long run relationships were found to be evident, 2 (Japan and Pakistan) were found to have 2 long run cointegrating vectors, with the remaining 5 countries exhibiting just 1 long run relationship. In the case of Japan and Pakistan, the long run relationship from which our estimates of pass-through were obtained was selected based on theoretically sensible signs and magnitude of coefficients.

The coefficient estimates of the long run vector (8) for our 7 countries are presented in Table 4 with intercepts and coefficient estimates associated with dummy variables suppressed for expositional simplicity. Estimates of the degree of long run pass-through are given in Table 4

in the second column. The most popular outcome is that of partial import pass-through (6 cases out of 7) which is the standard outcome presented in section 2, ($\delta \in (0, 1)$), while just one estimate of import pass-through (for Pakistan) is perverse of the form $\delta \in (1, +\infty)$. All estimates are significant at the 5% level (where the critical value is approximately 3.84), with the exception of New Zealand. The estimates range from 109% for Pakistan to 26% for Australia with 5 out of the 7 estimates in the high pass-through range, above 40%.

Table 4 inserted at this point

The wide range of long run import pass-through estimates may be accounted for by the diversity of the structures of the economies, the differing importance of types of goods in the pattern of import trade, the size of the economies, and the magnitude and permanency of adjustments to the exchange rate. Let us now elaborate on each of these explanations.

In section 2, we described the degree of long run import pass-through as a function of import demand and supply elasticities. Given that different classes of goods will presumably have different types of both demand and supply elasticities then we should expect a variety of import pass-through results as the 7 countries demonstrate a reasonably wide variety of pattern of import behaviour, particularly for the low-numbered classes of the SITC. Table 5 below gives some insight into the importing patterns of our seven Asia-Pacific countries.

Table 5 inserted at this point

In all of the countries examined except for Japan, the import of machinery and transport equipment dominates the import behaviour of those countries (to a lesser extent for the Phillipines, however), with all showing that the import of such products contributes 20% and above to total imports (and if the Phillipines is excluded this result becomes approximately

30% and above). Additionally, it appears that category 6, manufacturing goods classified chiefly by material, has similar import behaviour across the different countries, ranging from 12.5% to 18.9%. Most of the differential in import behaviour stems from the import of categories 0 through to 5 in the SITC, which includes predominantly commodity-type items and intermediate products which are likely to be processed further in the development of other products with higher value-added. It appears as though a potential factor in explaining the wide-variety of long run import pass-through outcomes in our sample is the different behaviour exhibited by the countries in the import of low value-added commodity items and intermediate products.

In order to be more specific about the effects of the different import behaviour on long run pass-through we require specific information about the elasticities of demand and supply for the SITC items 1 through to 5, in addition to the different commodities within these categories. Space constraints prevent this paper from pursuing such information. However, one can imagine that these items are characteristically diverse, ranging from chemical products to cooking items such as fats and oils, to complimentary motor vehicle products such as petroleum and various motor vehicle oils, food products and tobacco. By virtue of the diverse range of items one would expect a wide range of demand and supply elasticities, and thus it is therefore not unreasonable to expect that countries which purchase such items in different magnitudes will respond in different ways to exogenous shocks to the exchange rate.

In section 2 we also indicated that the size of the country is important in determining the extent of import pass-though. The greater the size of the economy, then the greater the influence that this economy will have on the import market, hence implying a long run pass-through result which is likely to deviate from unity (the complete case). Conversely, a relatively small economy is likely to have little impact on the world price of imports and so is prepared to accept the world price, implying higher (near complete) pass-through.

In practise it is difficult to determine how large is large and what is too small? What indicators do we use for largeness? We cannot use the size of the population since a country may have an extremely large population but only a small component of the population may spend on imports, which is presumably the case in highly populated developing countries (Phillipines and Pakistan in our sample appear to be good examples). Thus, a better proxy of the influence of countries on import markets is the proportion of total import expenditure of a country to total world import expenditure.[16] This is indicated in Table 6 along with the ranking of the long run import pass-through results from our sample of countries (for instance, a rank of 1 is given to Pakistan since it's long run import pass-through estimate is the highest).

Table 6 inserted at this point

We would expect an inverse relationship between import shares and long run pass-through ranking by virtue of the fact that a small import share is a reflection of a country's "smallness" which in turn implies higher pass-through. In Table 6 we find that this is certainly the case for the countries with pass-through ranking 1 through to

2 (Pakistan and the Phillipines), and to a lesser extent Singapore which is ranked 3, who contribute on average to less than 2.5% of total world imports and have pass-through in excess of 77%. The observations that destroy this interesting result is that of the remaining three small countries, Australia, New Zealand and Korea whom exhibit long run pass-through behaviour which is less than 40% (approximately) even though their average world import shares are 1.3%, 0.3% and 1.6% respectively.

The theoretical pass-through models developed by Krugman, 1987, Froot and Klemperer, 1989 and Ohno, 1990 emphasise the importance of the time-length of exchange rate adjustments in affecting the degree of pass-through. More specifically, they argue that one would expect an importer who perceives an exchange rate shock to be transitory will not be inclined to adjust the contract price but would rather 'ride-out' the exchange rate 'storm', waiting until the exchange rate returns to its perceived fundamental value at that point in time. Conversely, in the case of a permanent exchange rate shock the importer will need to adjust its contract price so that the profit time path is less 'bumpy' and this adjustment in the contract price is more permanent. Thus, what these models predict is that in the case of countries with exchange rate movements which are more transitory, and this is reflected in exchange rate movements which are more frequent but the magnitude is much smaller, there is likely to be higher pass-through because importers tend to leave the contract price alone. In the case of exchange rate movements which are perceived to be more permanent, reflected in exchange rates which change less frequently but by larger magnitudes, there

tends to be more adjustment in the contract price and hence a greater likelihood of incomplete pass-through.

This set of hypotheses is also supported by the pass-through modellers who set up stochastic models. In a situation where the exchange rate is extremely volatile, a risk averse importer will tend to shield itself from the exchange rate uncertainty by hedging against the exchange rate (that is, fixing the domestic currency price that he or she receives). Thus, one would expect that for risk averse importers who deal with home exchange rates which change frequently (act in a volatile way) then pass-through will be more complete than would be the case had the exchange rate adjustments occur more slowly and in greater magnitude.[17] As a proxy for exchange rate volatility, Table 7 indicates the average percentage change (in absolute terms) in the various bilateral exchange rates for our seven countries over the period of observation relevant to each country.

Table 7 inserted at this point

The results of Table 7 shed no new light on the reason behind the differences in the extent of long run pass-through. The exchange rate which appears to be the least volatile is the Pakistani Rupee, however, Pakistan import pass-through is the greatest out of our sample.[18] This indicates that either Pakistan's pass-through result is perculiar or a significant majority of Pakistani importers are risk-seekers. Similarly, one of the most volatile exchange rates, New Zealand, is associated with a country that exhibits relatively low import pass-through implying, once again, a peculiar result or the existence of wide-spread risk-seeking behaviour. The remaining results are intermediate and so do not add too much in terms of explaining the differentials in pass-through outcomes.

In conclusion, it is fair to say that it is extremely difficult to pin-point any one reason for the wide disparity in the long run pass-through results. This is most likely a function of the high level of aggregation of the study which, by definition, prevents us from applying a more rich analysis of the situation by using our understanding of the microeconomic factors which affect pass-through, such as market share, the effects of different protectionist regimes, transfer pricing practises and the internalising of multinational transactions, and the impact of imported inputs and exchange rate arbitrage, just to name a few.

The estimates of the short run adjustment coefficients, α, in the import price error correction equations for the 7 countries are given in Table 8.

Table 8 to be inserted at this point

The estimates of the error correction terms indicate the significance (at the 5% level) of 6 from 7 short run responses to the exchange rate, the exception being Japan which is significant at the 10% level. All estimates are, suprisingly, within the same narrow band, ranging from 0.126 for Korea to 0.35 for Pakistan, indicating a relatively slow adjustment to equilibrium. In the case of Pakistan, for example, 35% of the long run exchange rate response (which is 109%) flows into changes in import prices in the same period as the exchange rate changes, with the remaining 74% occurring thereafter. What are the possible explanations for these slow response times?

The low short run pass-through results imply that exporters prefer to keep pass-through low initially while gradually passing-through more of the exchange rate adjustments as time goes

by. One of the possible reasons for such a strategy is to maintain future market share, (see Froot and Klemperer, 1989 and Ohno, 1990). Rather than foreign firms passing-through a large percentage of a depreciation in the same period as the exchange rate change, and thus losing much of its market share in that period, the firm may decide to stagger price increases, or indeed refrain from increasing their price, in order to prevent a significant reduction in its market share.

Let us now describe some other potential reasons for pass-through dynamics which may shed some more light on the short run pass-through results.

A non-contemporaneous relationship between the exchange rate and the import price may arise due to shipping lags in the export of internationally traded raw materials, intermediate goods and finished products (Phillips, 1991). The exchange rate which enters the decision making processes of importing firms is that at the time of ordering imported products. However, the price at which imported finished products are sold and the cost of imported intermediate goods and raw materials, are evaluated typically at the point of recepit of the goods. It follows that if there is a significant shipping period then the price and costs of the imported items are conditional upon the exchange rate level which exists at some distant point in the past.

The price-exchange rate lag may be a response to capacity constraints within foreign or domestic firms. Krugman, 1987 believes that growth in the demand for a particular

tradeable item, induced by favourable exchange rate movements, may not be met by current production. Decisions related to investing in capacity enhancing equipment are necessary, and this process may take place over a considerable period of time.

Lags may evolve from the nature of consumers decisions (again see Krugman, 1987). If the exchange rate changes, and domestic consumers were considering purchasing an imported product, then those consumers must decide upon whether the imported variety is now a more feasible option compared to the set of domestic alternatives, implying significant search time is involved.

Non-contemporaneous movements may also result from determining whether to enter or exit a domestic industry (see Baldwin, 1988 and Dixit, 1989). If an adjustment in the exchange rate provides the extra impetus for a potential entrant to enter an industry, then the time involved in order to establish itself in the market may be enormous. The firm must invest time in searching for an appropriate location for its place of production, it must take time to promote and advertise its product, including developing a suitable campaign, and, of course, it must determine who its competitors are and invest resources into establishing whether the operation will be feasible if it enters the foreign market.

4 Conclusion

This paper has attempted to estimate the extent of long and short run import pass-through for nine countries of the Asia-Pacific. We found that in seven of the nine countries we were able to find feasible long run estimates of import pass-through, with the remaining two countries unable to give rise to a long run cointegrating regression. For the countries where long run import pass-through specifications were obtained, there was found to be a wide variety of estimates ranging from as large as 109% in the case of Pakistan to just 26% in the case of Australia. Six out of the seven estimates were found to be that of partial pass-through, which is the standard result, implying that foreign exporters and domestic importers are sharing the effects of the adjustment in the exchange rate. Despite obtaining rigorous estimates of the long run degree of import pass-through, we found the wide differentials in the estimates difficult to explain based purely on factors such as the pattern of imports (which is a reflection of import demand and supply elasticities), the size of the importing country, and the volatility of the exchange rate. The inability to offer a reasonable explanation for the variety of long run estimates was deemed to be a response to the high degree of aggregation, which prevents an examination of important microeconomic determinants of pass-through.

The estimate of the short run dynamics was found to be relatively slow, with most of the adjustment to the long run level of pass-through occurring after the exchange rate adjustment rather than in the same period. Factors such as market share, capacity constraints, consumer

search costs, and shipping lags were reasons forwarded for the lag in the exchange rate-import price relationship.

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Data Appendix

P^D, Import Unit Values

International Monetary Fund, International Financial Statistics - various issues. The import unit value variables are denominated in the relevant country's currency.

P^F, Export Unit Values

International Monetary Fund, International Financial Statistics - various issues. The world price variable is denominated in $US.

E, Bilateral Exchange Rate

International Monetary Fund, International Financial Statistics - various issues. This is the bilateral exchange rate between the relevant country and the $US. The reason we use the $US bilateral exchange rate is because the world price is denominated in $US.

Footnotes

1. Although the Asia-Pacific region, strictly speaking, can include countries from both Asia, Oceania, and the Americas, this paper includes just the Oceanic and Asian countries.

2. A composite currency is defined by the IMF Bulletin International Financial Statistics as a currency that is pegged to various "baskets" of currencies of the home country's.

3. The IMF categorisation of exchange rate arrangements prior to 1981 did not include a distinction between the "floating" varieties, for instance, it did not distinguish between a free float and a managed float.

4. For a more extensive review of the literature consult Webber (1994b), chapter 3 or Menon (1995).

5. However, there have been a number of import pass-through studies for isolated members of the Asia-Pacific. See Webber and Menon Ibid.

6. This assumption is necessary if we are to suppress the complications associated with inter-firm rivalry which is relevant for describing pass-through at the firm level, but not for a general exposition which assumes a representative good. In addition, it avoids the unnecessary burden of endogenising the currency denomination of trade contracts which, if introduced here, would mask the issues of most concern in this paper. For further insight into these issues, however, consult Mann (1989) or Webber (1994b) chapter 3.

7. A more specific case of the market demand function is the horizontal summation of the demand curves of consumers in D and F; $Q_D^d(P_D) + Q_F^d(P_F)$. The problem with using such a demand specification is that it is not useful in describing how far a shock to the domestic exchange rate shifts the market demand curve when the home country is large compared to when it is small.

8. The currency which is used to denominate trade contracts is not important in evaluating the degree of pass-through in the large country case, but it is important when the importing country is small.

9. The data appendix describes the source of the data.

10. Specification (8) is also that which has been employed for examination of purchasing power parity. If the long run pass-through coefficient is not significantly different from unity then this is evidence of purchasing power parity or complete pass-through.

11. For the equation in (7) that describes the change in domestic currency import prices, there will be 1 short run coefficient estimate for each long run cointegrating vector that is found.

12. Some of the main countries omitted due to data limitations include India, China (including Taiwan), Sri Lanka, Vietnam, Bangladesh, Laos, Burma, Borneo, Cambodia and the Polynesian (Tonga, Samoa, Tahiti), Melanesian (Fiji, Vanuatu, New Caledonia), and Micronesian (comprising islands of Truk, Yap, Ponape and Kosrae) countries.

13. Not all variables included in the error correction framework need to be I(1). In order to find cointegration between non-stationary variables all that is required is two of the variables to be I(1).

14. Information pertaining to the optimal lag length selected and the relevant test statistic are omitted for reasons of brevity but are available from the author upon request.

15. The endnotes of Table 2 contain the critical values.

16. An even better proxy is the proportion ot total import quantities of a country to total world import volumes. This removes the biasing effect of countries which spend mostly on imports with high value added compared to countries which spend predominantly on imports with low value-added. Data limitations for every country over the sample period prevented this author from pursuing the quantity proxy.

17. Of course, in the case of risk-seeking agents the opposite will be true. See Mann (1989).

18. The Rupee was the least volatile by virtue of the fact that it was pegged against the $US from the earliest stage (June 1982) out of any of the pegged exchange rates.

Tables

Table 1

Countries Employed and Sample Timeframe

COUNTRY	SAMPLE TIMEFRAME
Korea	1978.1 to 1994.2
Pakistan	1978.1 to 1994.4
Thailand[a]	1978.1 to 1987.3
Phillipines	1978.1 to 1990.4
Malaysia[a]	1978.1 to 1987.3
Australia	1978.1 to 1994.4
Japan	1978.1 to 1994.4
Singapore	1978.1 to 1994.4
New Zealand	1978.1 to 1994.4

[a]Thailand and Malaysian timeframes are short because the IMF no longer published quarterly import unit values after the third quarter of 1987.

Table 2

Testing* for the Time Series Properties of the Data

COUNTRY	LEVELS**		FIRST DIFFERENCES	
	e	p_D	Δe	Δp_D
Korea				
ADF	-2.225	-3.526	-3.920	-4.562
PP	-1.395	-2.037	-5.957	-5.324
P	-2.466	-1.877	-6.310	-10.074
Pakistan				
ADF	-2.565	-2.532	-4.768	-8.953
PP	-2.472	-1.427	-6.447	-8.813
P	-1.820	-2.470	-3.860	-4.360
Thailand				
ADF	-1.575	-1.238	-3.816	-3.958
PP	-1.682	-1.247	-6.854	-7.540
P	-2.670	-2.002	-3.816	-5.253
Malaysia				
ADF	-0.986	-1.689	-2.353	-2.301
PP	-3.171	-1.191	-5.684	-3.828
P	-2.301	-2.463	-3.513	-5.974
Phillipines				
ADF	-0.1271	-0.3779	-6.336	-6.893
PP	-0.203	-1.388	-13.146	-13.405
P	-2.295	-2.346	-4.157	-4.824
Australia				
ADF	-1.466	-1.767	-5.243	-6.188
PP	-1.538	-1.814	-6.629	-7.531
P	-2.421	-1.576	-4.694	-7.426
Japan				
ADF	-0.9463	-0.9288	-4.475	-5.918
PP	-1.291	-2.417	-5.433	-7.110
P	-1.707	-2.280	-4.320	-6.850
New Zealand				
ADF	-1.292	-2.675	-5.080	-5.679
PP	-1.332	-2.703	-6.875	-7.234
P	-2.274	-1.337	-7.931	-6.953
Singapore				
ADF	-1.417	-1.202	-8.243	-5.102
PP	-2.248	-3.173	-8.400	-5.733
P	-2.787	-3.128	-4.972	-5.173

*The specification from which the deterministic/stochastic tests and the ADF statistics are obtained is $\Delta y_t = \alpha_0 + \alpha_1 t + \alpha_2 y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + \varpi_t$ where t is a time trend. The stochastic/deterministic tests are "F-type" tests as they are tests of joint hypotheses. The first tests whether $\alpha_0=\alpha_1=\alpha_2=0$ and the second tests whether $\alpha_1=\alpha_2=0$. The ADF statistic is the ratio of the estimate of α_2 divided by its standard error. The PP test estimates the same specification but sets the lag k at zero. The test statistic is then transformed in order to remove the effects of misspecification/serial correlation by applying a non-parametric correction factor. For more details refer to Perron (1988, Table 1, pp 308-309). The first difference test involves estimating

the specification $\Delta^2 y_t = \alpha_0 \Delta y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta^2 y_{t-i} + u_t$ with a similar testing procedure as in levels.

**The critical values are approximately -3.50 at the 5% level and -4.15 at the 1% level for the ADF and PP tests, while -3.76 and -4.39 respectively for all relevant Perron structural break tests. The point(s) of structural break were deemed to be the point(s) at which there was a change of exchange rate regime for the exchange rate series', and/or the oil price shock periods in the late 1970's for the other series', or other points deemed to be important through an observation of the graph of the series.

Table 3
Rank Test Statistics for Cointegrating Vectors[a]

COUNTRY	Trace Statistic[b]	Number of Cointegrating Vectors
Korea		
H_0: r=0	38.71[c*]	1
H_0: r=1	12.62	
H_0: r=2	2.62	
Pakistan		
H_0: r=0	61.27*	2
H_0: r=1	24.57*	
H_0: r=2	7.38	
Thailand		
H_0: r=0	31.97	0
H_0: r=1	16.58	
H_0: r=2	2.05	
Phillipines		
H_0: r=0	42.59*	1
H_0: r=1	15.29	
H_0: r=2	2.61	
Malaysia		
H_0: r=0	30.90	0
H_0: r=1	12.91	
H_0: r=2	4.07	
Australia		
H_0: r=0	39.88*	1
H_0: r=1	16.88	
H_0: r=2	3.71	
Japan		
H_0: r=0	49.17*	2
H_0: r=1	24.18*	
H_0: r=2	6.55	
Singapore		
H_0: r=0	35.89*	1
H_0: r=1	7.47	
H_0: r=2	2.39	
New Zealand		
H_0: r=0	42.94*	1
H_0: r=1	19.48	
H_0: r=2	3.14	

[a]The test statistics are based on the estimation of the error correction mechanism (7) with the only deterministic components being the constant terms in the cointegrating relations. This assumption about the deterministic components is based on the argument that a graphical view of the series' and the unit root tests, as well as the nature of the variables themselves, do not justify inclusion of quadratic or linear deterministic trends. The sensitivity of the rank tests to different lag lengths is investigated, in conjunction with graphical views of the residuals from the estimated error correction mechanism. The rank statistics published in Table 3 are those which are relatively insensitive to the lag length selected whilst also originating from an estimated specification that appears to have stationary errors.

[b]The test statistic is based on an LR ratio test and is given by $-T \sum_{i=r+1}^{p}(1-\hat{\lambda}_i)$, where T is the number of observations, p is the number of variables in $\mathbf{Z}_t$, and $\hat{\lambda}_i$ is the ith eigenvalue solved

from a particular eigenvalue problem, the details of which can be found on page 7 of Hansen and Juselius (1995).

[C]Critical values come from Osterwald-Lenum (1992). At the 5% level they are 34.795 for the test of at most 3 cointegrating vectors, 19.993 for the test of at most 2 cointegrating vectors, and 9.133 for at most 1 cointegrating vector.

[*]Statistically significant at the 5% level.

Table 4
Coefficient Estimates from the Import Price Normalised Long Run Vector

COUNTRY	COEFFICIENT ON e	COEFFICIENT ON p_F
Korea	0.403 (9.85)[a]	1.373 (18.46)
Pakistan	1.086 (17.89)	0.961 (1.71)
Phillipines	0.896 (4.05)	0.645 (0.70)
Australia	0.263 (8.16)	0.926 (1.78)
Japan	0.448 (4.89)	0.931 (2.92)
Singapore	0.771 (12.48)	0.439 (4.63)
New Zealand	0.359 (2.13)	1.707 (0.17)

[a]Numbers in parentheses are the chi-square test statistics for the single restriction of $\beta_i = 0$ in a particular cointegrating vector. The 5% and 1% critical values are 3.84 and 6.63 respectively.

Table 5
Import Patterns for the Asia-Pacific Countries[a]

SITC Section	Australia	Japan	Singapore	Phillipines	New Zealand	Korea	Pakistan
0 = Food and Live Animals	4%	14.6%	5.3%	8%	4.9%	4.5%	6.9%
1 = Beverages and Tobacco	0.9%	1.2%	0.8%	1%	1%	0.17%	0.03%
2 = Crude materials except fuels	3.6%	14.9%	3.4%	5%	3.6%	15%	7.3%
3 = Mineral fuels	4%	20.7%	14%	13%	8.7%	11.6%	16.2%
4 = Animal and vegetable oils	0.3%	0.2%	1.1%	0.2%	0.4%	0.34%	8%
5 = Chemicals	10.9%	8%	6.6%	13%	11.8%	12%	15.8%
6 = Manufactured goods classified by material	17.2%	14.7%	14.7%	15%	18.9%	15.4%	12.5%
7 = Machinery and Transport Equipment	42.1%	13%	43.4%	20%	39.4%	35.2%	29.5%
8 = Misc. Manufactures	14%	10.3%	9.1%	2%	9.9%	5.6%	3.4%
9 = Misc. Others	3%	2.3%	1.5%	21%	1.4%	0.27%	0.3%

[a]The import behaviour figures are the average import shares between 1980 and 1993 for each country.
Source: Statistical Yearbook for Asia and the South Pacific - United Nations, various issues.

Table 6
World Import Shares

Country	World Import Share[a]	Long run Pass-through Ranking
Pakistan	0.3%	1
Phillipines	0.4%	2
Singapore	1.6%	3
Japan	6.8%	4
Korea	1.8%	5
New Zealand	0.3%	6
Australia	1.3%	7

[a]The world import shares are based on the average world import shares between 1980 and 1993. *Source*: IMF, International Financial Statistics - various issues.

Table 7
Proxy For Volatility in Exchange rates

Country	Average % Change in the Exchange Rate	Long Run Pass-through Ranking
Pakistan	1.54%	1
Phillipines	2.52%	2
Singapore	1.91%	3
Japan	5.48%	4
Korea	2.53%	5
New Zealand	5.1%	6
Australia	3.19%	7

Table 8
Estimates of the Short Run Adjustment Coefficients in the Import Price Error Correction Specifications

Country	Australia	Japan	Singapore	New Zealand	Korea	Phillipines	Pakistan
Alpha estimate	0.255	0.225	0.225	0.146	0.126	0.180	0.350
Absolute t-value	3.465	1.913	2.920	4.073	4.663	3.935	3.582