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Hsiao Chink Tang[+]

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[+]Economist, Office of Regional Economic Integration, Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines. Tel: +632 632 5637. hctang@adb.org

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Abstract

This question is examined via a standard import specification augmented with differential and time-varying impacts of each component of aggregate demand: consumption, investment, government spending, and exports. Several important variables in explaining import demand such as credit conditions and business and consumer sentiment are also included. A panel fixed-effects model adjusted for cross-sectional dependence is estimated for 11 Asian economies from 1Q91 to 2Q11. The result shows the import intensity of exports is the highest among all variables. Alone, however, it does not contribute to a larger fall in imports. The larger decline in imports will be evident if other components of aggregate demand also fall, particularly investment and consumption. A weakened credit condition will also exacerbate the fall in imports. Business and consumer sentiment, however, does not seem to matter. In crisis periods more nuanced results are evident. For example, fiscal contractions may have worsened the fall in imports during the 1997/98 Asian financial crisis, while the fall in exports also has an additional adverse impact. Business and consumer sentiment seems to have a lagged positive impact during the global financial crisis.

1. Introduction

Crises have a way of focusing the mind on phenomena worthy of investigation and reinvestigation. One such phenomenon is the simultaneous deterioration of global trade and gross domestic product (GDP) after the collapse of Lehman Brothers in late 2008. What we witnessed was a fall in world trade that outpaced the decline in world GDP. And as the latter is now known as "the Great Recession," the former is aptly called "the Great Trade Collapse." A flurry of studies has since investigated the Great Trade Collapse. Baldwin (2009) provides a collection of studies looking at the causes, consequences and prospects of the collapse.

An equally interesting but less studied phenomenon is the observation that imports tend to fall more than exports during crises. Abiad et al. (2011) find that if a particular country is in financial crisis—defined as a banking and/or debt crisis—it takes about 10 years for its imports to recover to trend. With hindsight, the 1997/98 Asian financial crisis did have a marked impact on Asia's imports, although not as long-lasting as Abiad et al. would have predicted. While the Great Trade collapse was sudden and severe, its recovery was nonetheless swift. Still, many Asian economies did experience a sharper deterioration in imports than exports. As such, it would be beneficial to analyze what possibly explains the larger fall in imports than exports in general and during crises in particular.

This paper investigates the question by estimating a panel structural import demand function that captures the differential and time-varying import intensities of each component of aggregate demand: consumption, investment, government expenditure, and exports. In doing so it is able to distinguish how each component of aggregate demand affects imports. From the exports estimate in particular, it will be able to ascertain whether the phenomenon of a sharper fall in imports versus exports is true. In addition, the time-varying nature of the parameter will be able to capture the large and growing import intensity of exports associated with the rapid rise of vertical specialization in the region. This is most salient given the special role Southeast and East Asian economies play in international production linkages with the People's Republic of China (PRC) at the center of global manufacturing hubs.

The specification is also augmented with several variables commonly identified as important explanatory variables for import demand. These are business and consumer confidence, credit conditions, and stocks changes. This paper examines a sample of 11 Asian countries from 1Q91 to 2Q11: five Association of South East Asian Nations (ASEAN) (Indonesia, Malaysia, the Philippines, Singapore and Thailand); the PRC; Hong Kong, China; India; Japan; the Republic of Korea; and Taipei,China. These countries are the most active participants in the region's production networks as well as the region's biggest trading nations. India is included to account for its growing significance in the region's trade.

To preview the results, it is found that exports have an amplification effect on imports. That is when say exports fall, imports will fall as well. Yet the fall in exports alone cannot explain the larger fall in imports, despite being the single most important determinant. This has to come from the decline in other components of aggregate demand, notably

investment and consumption. In fact, a weakened credit condition is also a contributing factor, although changes in stocks and business and consumer sentiment do not seem important. That said, in crisis periods more nuanced impacts of these variables are evident. For example, destocking seems to have weakened the demand for imports during the Asian financial crisis, but not during the recent global financial crisis. And deteriorating business and consumer sentiment seems to have a lagged adverse effect on imports during crises, while changes in credit conditions do not seem to matter.

The rest of the paper is structured as follows. Section 2 presents a short literature review of related studies and some stylized facts of export and import performance focusing on the crisis periods. Section 3 outlines the model and econometric specification. Section 4 discusses the data used and estimation issues. Results are presented in Section 5. Section 6 concludes.

2.   Literature Review and Stylized Facts

Several reasons have been advanced to explain the Great Trade Collapse with the demand factors seemingly more pertinent than the supply factors. Compositional effects that arise because the share of postponables is greater in trade than in GDP appear to be a key demand factor (Levchenko et al. 2009). International production linkages, which are a central feature of modern manufacturing processes, might have more closely synchronized the fall in trade across countries (Freund 2009; Bems et al. 2009; Levchenko et al. 2009; Altomonte and Ottaviano 2009). The "Knightian Uncertainty" or the fear of unknown that prevailed as the world tilted on the verge of financial meltdown and depression kept consumers and producers on the sidelines and reinforced the compositional effects (Caballero 2009; Blanchard 2009). On the supply side fears of a credit crunch, thought to exacerbate trade flows, fortunately did not really materialize (Levchenko et al. 2009; Mora and Powers 2009). The crisis also did not appear to materially threaten a country's production base, which supported the subsequent quick trade recovery. Evidence from selected countries suggest it is the decline in intensive margin—the decline in product varieties sold—that explains the bulk of the adjustment in trade flows, rather than the decline in extensive margin—the decline in the number of traders selling to a market (Bernard et al. 2009; Bricongne et al. 2009). Protectionist measures also increased during the crisis but they covered only a small fraction of trade and as a result did not seem to have any significant impact on overall trade flows (Evenett 2009).

Studies that examine the relative performance of imports and exports are few. The key finding from Abiad et al. (2011) covering 153 advanced, developing, and emerging economies provides an intuitively simple reason for why imports fall more than exports: if a crisis happens in an importing country, then the importing country will buy less. (They also find that if a crisis happens in the exporting country, not the importing country, then the importing country's imports will not be significantly affected). What matters are the destinations where the goods and services are heading. The authors also conjecture why imports fall more during crises, although they do not directly test them. Tariffs do not seem important as the average rates do not vary much after crises, although antidumping measures tend to increase but decline subsequently. Exchange rate

volatility, however, may be important in the short-run as it tends to rise markedly during a crisis.

Anderton and Tewolde (2011) find that exports are the most important component of aggregate demand driving imports, followed by investment, consumption, and government spending. Their study is closest to this paper. The authors estimate the same structural import demand function that separates the different components of aggregate demand on 29 Organization for Economic Cooperation and Development (OECD) nations from 1Q95 to 1Q09. Business confidence and credit conditions also play a significant but much smaller role in determining import demand. During the crisis period of 4Q08 to 1Q09, however, only stock changes have an additional significant adverse impact on imports.[1]

Unlike Anderton and Tewolde (2011), Bernard et al. (2009), who study the trade margins of United States (US) firms find that international supply chains tend to be better insulated against economic shocks. They find US trade with related party firms fare better than with arm's length firms. Based on the latest US Census Bureau's Longitudinal Firm Trade Transactions database, which covers the period of 1992 to 2005, they find that US exports to related party firms in Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand fell by 4% from 1996 to 1998, while to arm's length firms exports fell more by 26%.[2] Also, the number of US arm's length firms exporting to these countries fell more sharply than the US related party firms exporting to the same countries (–16% versus –7%). More stark is the improvement in the intensive margin of US related party exports of 9% over the same period versus a deterioration of US arm's length exports of –8%. Equally stark is the strength of the intensive margin in US imports from Asian related party firms, which rose 26% versus the decline from Asian arm's length party of –1%. All this implies that US multinationals may have adjusted their strategies to favor related party firms in production chains and that the bulk of the burden of adjustment fell on arm's length firms.

Asia's remarkable trade trajectory with the world is unmistakable (Figures 1 and 2). It has only been seriously punctuated twice, once during the 1997/98 Asian financial crisis and again during the 2008/09 global financial crisis. (There was also a blip following the bursting of the US tech bubble in 2001). During these two crisis periods, import volumes fell more than export volumes in most economies. Hong Kong, China and the PRC were the exceptions in 2008/09 because of the massive PRC fiscal stimulus program. Japan was another exception, with its imports, which were already low, falling less than exports. In 1997/98, the PRC was well insulated from the contagions of the Asian financial crisis.[3] The fall in imports during the Asian financial crisis in the most affected

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[1] Each of the independent variable is interacted with the crisis dummy, but only the interactive dummy of crisis and stock changes is significant. The rest of the interactive crisis dummies are not significant, although each independent variable remains statistically significant except credit conditions. See Column 3, Table 2 of Anderton and Tewolde (2011).

[2] On the other hand, US imports from Asia, with related-party trade growing faster than arm's length trade, continued to rise during this period. Since US exports to (imports from) Asia are equivalent to Asian imports from (exports to) the US, this and the preceding findings reinforce the key finding of Abiad et al. (2011), that is, the collapse of Asian domestic demand explains the fall in its imports during the Asian financial crisis.

[3] India is an outlier in both crisis periods—its exports fell more than imports.

countries (Indonesia, the Republic of Korea, Malaysia, and Thailand) was much larger than the fall in imports in these same countries during the global financial crisis. This is in line with Abiad et al.'s (2011) key finding that a homegrown crisis has a more severe impact on a country's imports.

It does take some time for imports to recover to pre-crisis levels, but it does not take as long as the 10 years that Abiad et al. (2011) found.[4] In the case of the Asian financial crisis, Indonesian imports took 7 years to recover, while other countries' imports recovered in 1–2 years. The latter group includes both the most and less crisis-affected countries. For example, the Republic of Korea took only 1 year, while the Philippines and Singapore took 2 years. Hence, it is not always true that imports in the most crisis-affected countries recover slower than in the less affected ones. In contrast, on the export side, the countries that were most affected by the Asian financial crisis, with the exception of Thailand, continued to see an expansion in exports. In the case of the global financial crisis, while imports generally fell more than exports, both imports and exports quickly recovered within a year from the trough in 2009.[5]

3. Econometric Specification

The econometric specification is based on the standard import demand equation where imports are expressed as a function of income or aggregate demand, and relative import prices as a measure of competiveness. It is, however, further augmented with several variables of interests. As per Anderton and Tewolde (2011), the following specification is estimated

$$\Delta \ln m_{j,t} = k + \sum_i \alpha_{1i} \lambda_i \Delta \ln add_{ij,t} + \alpha_2 \Delta \ln mp_{j,t} + \alpha_3 s_{j,t} + \alpha_4 \Delta \ln l_{j,t} + \alpha_5 \Delta \ln sp_{j,t} + \varepsilon_{j,t}; \qquad (1)$$

where $\Delta \ln m_{j,t}$ is the change in the log of real imports and services of country j; $\Delta \ln add_{ij,t}$, the change in the log of each component of the aggregate demand, i, viz. consumption (c), investment (i), government spending (g) and exports of goods and services (x); $\Delta \ln mp_{j,t}$, the change in the log of relative import prices; $s_{j,t}$, is the change in stocks; $\Delta \ln l_{j,t}$, the change in the log of credit conditions proxied by total lending; $\Delta \ln sp_{j,t}$, the change in the log of business and consumer sentiment proxied by share market index; k, the constant term; and $\varepsilon_{j,t}$, the error term. λ_i is the six-quarter moving average weight/share of each component of aggregate demand to aggregate demand.[6] It is derived from the Taylor series expansion of aggregate demand (Anderton and Desai 1988):

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[4] The time to recovery is calculated as the time it takes to move from the trough of the crisis to the level that surpasses the pre-crisis level.

[5] Japan's imports and exports have not recovered within 1 year, neither have the imports of Thailand and the exports of Malaysia. Japan and Thailand's slow import recovery are likely due to their much weaker domestic conditions. Note that the above analyses were also done using trade values, yet the stylized facts remained largely true.

[6] This follows Anderton and Tewolde (2011) who contend that the six-month moving average is sufficiently long to reduce the volatility of the quarter-to-quarter fluctuations as well as to capture the recent movements in the component share.

$$\Delta \ln \sum add_i = \sum_i \left(\frac{add_i}{\sum_i add_i} \right) \Delta \ln add_i;$$

where λ_i is the term in bracket and $\Delta \ln \sum add_i$ comes from the standard import demand function after separating each component of the aggregate demand:

$$\Delta \ln m_{j,t} = k + \alpha_1 \Delta \ln \sum_i add_{ij,t} + \alpha_2 \Delta \ln mp_{j,t}.$$

Note changes in stocks which are derived from aggregate demand are included as a separate variable in order to analyze how stocking or destocking affects imports. Besides, changes in stocks frequently have negative values, which cannot be logged. As a priori, a positive sign is expected from each right-hand side variable of Equation 1, except relative import prices, which should be negatively signed.

4.   Data and Estimation Issues

Data on each component of aggregate demand comprise expenditures collected from the national accounts found in CEIC. These are in real and constant values. Relative import price is defined as the import deflator over GDP deflator. Since these variables are not seasonally adjusted, they are de-seasonalized using X12. Share price index refers to the main stock market index in each country. Credit conditions refer to depository institutions' claims on the private sector at end-quarter, which is total lending to the private sector. This and the share price index are obtained mostly from the International Monetary Fund's *International Financial Statistics* (IFS). Data unavailable from CEIC and IFS are supplemented by national sources and from Oxford Economics and Bloomberg. Data are collected for the PRC; Hong Kong, China; India; Indonesia; Japan; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. The estimation period is from 1Q91 to 2Q11, although earlier data are collected for countries with available information. For greater details on data description, sources, and transformations, please refer to Appendix I.

All variables are transformed to natural logarithm except changes in stocks. A battery of panel unit root tests is performed to ascertain whether the variables are stationary. At levels, the Im-Pesaran-Shin (IPS) test, the Fisher Augmented Dickey-Fuller (ADF), and Fisher Phillips-Perron (PP) tests generally show that most variables are non-stationary (Table 1).[7] (The null hypothesis of non-stationary is seldom rejected in favor of the alternative that some or at least one panel is stationary). One clear exception is changes in stocks, which are stationary. There is also some evidence that the share price index is stationary. Yet, intuitively, share price is typically non-stationary. It goes through periods of rising and falling interrupted by occasional bouts of wide swings. When the tests are carried out at first differences, the results show all variables are stationary at the 1% level. Hence, subsequent estimations will use variables at first differences, except changes in stock, which remain at levels.

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[7]   These three tests are chosen because they can run on an unbalanced panel.

The panel fixed-effects (FE) model with robust standard errors that account for cross-sectional dependence between panels (Driscoll and Kraay 1998) is estimated. Pesaran's (2004) cross sectional independence test suggests cross-panel correlation is a problem.[8] In the standard panel FE model, cross-sectional independence is assumed. Standard errors calculated from the common techniques such as ordinary least squares, White (robust to autocorrelation) or Williams/Rogers (robust to heteroskedasticity and autocorrelation) are biased. Hence, statistical inferences based on such standard errors are invalid.[9] Driscoll and Kraay (1998) standard errors, however, are heteroskedasticity and autocorrelation robust to both spatial and temporal dependence.

To examine the effects during crises, a crisis dummy for the Asian financial crisis and another for the global financial crisis are created. Specifically, the focus is at the downturn period of the crisis, that is, the period between the pre-crisis peak to the trough of the crisis. This is in contrast to the recovery period, which is from the trough to the level that surpasses the pre-crisis peak. From the import pattern of each country, the downturn period in the Asian financial crisis is identified as 4Q97 to 4Q98, and in the global financial crisis from 3Q08 to 1Q09. Hence, the dummy AFC takes a value of one during the former period and zero otherwise. The same applies for the dummy GFC for the latter period.

5.   Results

5.1   Comparison of Different Estimators

Results of the preferred estimator, panel FE with Driscoll and Kraay standard errors are found in column 4 of Table 2. The first three columns present results of other estimators that also serve as robustness checks. Column 1 shows the results of pooled ordinary least squares (OLS). As expected, its standard errors tend to be smaller, producing more favorable statistical inferences than the preferred estimator. For example, the coefficient of government spending is statistically significant in contrast to the insignificant result in column four. That said, the estimated parameters of the pooled OLS are fairly close to the preferred estimator. Column 2 is the pooled mean group estimator of Pesaran, Shin, and Smith (1999). Its key strength is in estimating non-stationary heterogeneous panels of large N and large T.[10] In essence, it applies an error correction type model to the panel data, whereby the intercept, short-run coefficients, and error variances are allowed to differ across groups, but the long-run coefficients are constrained to be same across the groups. Its results, however, are quite different from other estimators; the coefficients of the component aggregate demand exceed 1, with that of government spending being the largest. More troubling is the wrong sign of loan

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[8]   The test is performed after estimating Equation (1). It rejects the null of cross sectional independence at the 1% level. The absolute correlation between residuals is 0.18.

[9]   The panel FE model with Rogers standard errors was also estimated; interestingly the statistical inferences remained qualitative the same. The results are not presented but can be obtained from the author.

[10]   Estimation was directly done with variables at levels via maximum likelihood. In contrast to large N, small T panel where the standard FE or random effects (RE) model ignored the time series properties of the data.

estimate, which is statistically significant. Also, although insignificant, the coefficient of relative import prices is positive instead of negative.

A common ad hoc way to account for potential endogeneity is to lag the explanatory variables by one period (Cerra and Saxena 2008). This is done using the preferred estimator in column 3. The results, however, also differ from other estimators. In particular, the coefficient of consumption is the largest and greater than 1, while that of exports is the smallest at 0.48. This does not quite conform to the reality of most Asian economies, which are exports focused. In addition, the estimator has the lowest fit among the group—its R^2 is only 15%. An alternative but more complex way to address potential endogeneity is to use the Arellano and Bond (1991) and Arellano and Bover (1995) generalized method-of-moment estimators. But these estimators are designed for large N, small T panels (Roodman 2006),[11] unlike the panel of small N, large T used in this paper. Hence, it is not applied here.

5.2   Preferred Estimator and Crisis Periods

In column 4 the estimated coefficients of the preferred estimator prior to imposing the crisis dummies all have the right sign and are statistically significant. (Only government spending, changes in stocks, and share prices are statistically insignificant). Most notable is that exports have the highest import-intensity among the components of aggregate demand, followed by investment and consumption. High import-intensity in investment is also expected as capital goods are often imported to boost productive capacity. Lending is also found to be a positive determinant of imports, but not for business and consumer sentiment as proxied by share prices.

Column 5 of Table 2 presents the results of the preferred estimator with the inclusion of the *AFC* and *GFC* downturn dummies. When these are included, exports still show the highest import-intensity followed by investment. Both are statistically significant, although this is not the case for consumption and government spending. Relative import prices remain negative and statistically significant, while lending to the private sector remains positive and significant. In interactive terms, the Asian financial crisis dummy has a significant impact on government spending followed by exports and changes in stocks. (The *g×AFC*, *x×AFC,* and *s×AFC* coefficients are statistically significant). This implies fiscal contractions implemented during the onset of the Asian financial crisis would have reduced imports more than otherwise been the case. At the same time, the weak export performance during this period would have also reduced imports even as domestic demand collapsed.[12] Likewise, the process of destocking during this downturn period would have also further depressed import demand. In contrast, these phenomena were rarely seen during the downturn period of the global financial crisis. Only in the case of the *GFC* crisis dummy interacting with relative import prices was the coefficient significant. This suggests that price increases (decreases) during this period lead to a smaller (larger) fall in imports.[13]

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11   For example, the problem arises as the number of instruments in difference and system generalized method of moments (GMM) becomes too unwieldy as T increases.

12   This refers to the early period of the crisis when exports in many economies did fall.

13   The net effect is still negative (–0.2606+0.1799), though it is smaller than the impact outside the global financial crisis period, which is –0.2606.

Surprisingly, share prices tend to have a significant negative impact on imports in both crisis periods. This seems counterintuitive at first glance, but is likely to reflect the natural sentiment of businesses and consumers as they remain cautious in the midst of great uncertainty. This sentiment would be most pronounced in the early part of the crisis, as the crisis dummies here measure, when businesses and consumers have little idea of when the situation might improve. Therefore, in the face of already severely bleak economic and unemployment prospects, their spending would not be likely to recover as quickly as any upswing in share prices. In fact, there is some evidence to support this more restrained or lagged impact of business and consumer sentiment on imports. When the model is run with one-period lagged share prices, instead of contemporaneous share prices, all else remains unchanged, the crisis interactive dummy of GFC becomes positive and significant, while that of AFC is still negative but insignificant.[14]

5.3   Economic Interpretation

To provide economic interpretation to the results in Table 2, the actual component elasticities of aggregate demand are calculated and presented in Table 3. Column 1 repeats the estimates of each component of aggregate demand (α_{1i}) as found in column 4 of Table 2. Columns 2–4 show the component share of aggregate demand (λ_i) at different time periods: the beginning of the sample, the end of the sample, and the average of the whole sample. The last three columns are the component elasticity obtained by multiplying each component estimate (α_{1i}) from column 1 with the corresponding component share of aggregate demand (λ_i) at the different time periods.

A few points stand out. First, the share of exports in aggregate demand has grown most noticeably over the period while the share of the other components has fallen. It grew from 28% in 1991 to 41% in 2011. In the OECD countries, this share grew from 25% in 1996 to 35% in 2008 (Anderton and Tewolde 2011). This increase underlines the growing importance of trade in a country's output, particularly in Asia. Also, given that international production sharing represents the key driver of rapid trade expansion in Asia, more so than in North America and Europe (Athukorola 2010), the high and rising share of exports in Asia highlights the greater role vertical specialization plays in determining the demand for imports in Asia.

Second, hardly surprisingly, the component elasticity of exports rose from 0.48% in 1991 to 0.71% in 2011. This means a one unit (percent) increase in exports increases imports by 0.71 unit (percent) in 2011. While this does not mean that imports tend to increase (decrease) more than the increase (decrease) in exports, as it is anecdotally observed, it still implies that both exports and imports move in the same direction. Exports, by implication of international production linkages, can cushion or worsen imports depending on exports' final demand. Because of this effect, increased vertical specialization is said to have closely synchronized trade contraction among countries during the global financial crisis.

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[14]   It should not be a surprise that the interactive AFC dummy with share prices is negative. In this case, the cautious wait-and-see attitude would have lasted even longer considering the deep and protracted impact of the Asian financial crisis. Separately, the lagged share price (without interacting with any crisis dummies) remains insignificant in this estimation.

Third, notwithstanding the above, it is still true that imports tend to change more than exports, especially when the elasticity of imports with respect to total aggregate demand is considered. While it is true that a one unit change in exports does not lead to more than one unit change in imports, but one unit change in aggregate demand does. (The average elasticity of imports with respect to total aggregate demand is 1.26. This has grown larger over time). Therefore, in times of crisis, when all components of aggregate demand tend to move in the same direction, imports will fall more than exports. In addition, credit conditions may have worsened leading to a further decline in imports.

6.   Conclusion

This paper attempts to shed some light on the observed phenomenon that imports tend to fall more than exports, especially during crises. To do this, a standard import demand equation with several modifications is estimated. A key feature is the separation of the differential and time-varying impact of aggregate demand broken into its expenditure components of consumption, investment, government spending, and exports. Another augmentation is the inclusion of several variables typically hypothesized to have important influence on imports. These are credit conditions, which facilitate trading activity, and business and consumer sentiment, which proxies for private sector spending. In terms of the estimation method, a panel FE model that accounts for cross-sectional dependence is employed. The standard panel FE model assumes cross-sectional independence and as such produces standard errors that are biased leading to invalid statistical inferences. The paper also tries several other estimators, one in particular that attempts to account for potential endogeneity. However, in this and other estimators, the results do not always conform to a priori. An unbalanced panel of 11 Asian economies—the PRC; Hong Kong, China; India; Indonesia; Japan; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand—is estimated from 1Q91 to 2Q11.

Given that international production linkages have become an intrinsic feature of trade in the region, one would expect this to be borne out in the results. This paper lends support to this observation, at least indirectly. First, the share of exports in aggregate demand is the only component that has grown over the sample period to become the largest. Second and more important is the positive relationship found between exports and imports. This is key because it implies that as long as the demand for exports remains strong, even as domestic demand weakens, any adverse impact on imports resulting from the latter will be cushioned. On the other hand, if domestic demand and external demand weaken at the same time, then the impact on imports will be more severe. While the fall in exports will lead to a concomitant fall in imports, it is unlikely to be strong enough to cause imports to fall more than exports. What it takes is the decline in other components of the aggregate demand such as investment and consumption, which happens most notably during crisis periods. Import prices and credit conditions are also found to have a positive and negative influence on imports respectively. Changes in stocks and share prices that gauge business and consumer sentiment do not seem to be important.

Focusing on the downturn period of the Asian financial crisis and global financial crisis reveal some interesting results. Fiscal contractions implemented during the early part of

the Asian financial crisis would have exacerbated imports more than otherwise been the case. Also, the fall in exports in most countries and the destocking process during this period would have worsened the fall in imports. In contrast, none of these phenomena was evident during the downturn period of the global financial crisis. For one, most countries pursued an expansionary fiscal policy early on. In addition, perhaps the greater prevalence of international production linkages with just-in-time inventory systems alleviated the effects of changes in stocks. Somewhat counterintuitive is the negative impact of share prices on imports during both crisis periods. Yet, this seems to have been due to the lagged or wait-and-see attitude of businesses and consumers during the early part of the crisis.

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Table 1: Panel Unit Roots Tests

	m	*c*	*i*	*g*	*x*	*mp*	*s*	*l*	*sp*
Levels									
IPS	0.7829	3.4753	-0.0338	1.5053	1.3074	-1.3597***	-9.9802*	0.8788	-1.6227***
IPS¹	-1.4777***	-0.6430	-1.3573***	-1.3238***	-2.7263*	-1.4681***	-8.8349*	0.2657	-2.8897*
ADF	1.3749	1.2793	0.2222	1.9487	1.6599	0.2460	-4.4363*	1.4459	-0.6984
ADF¹	-0.4178	-0.0023	-0.8397	0.4742	0.0313	0.6609	-3.2545*	0.4018	-1.6547**
ADF²	-3.9651*	-2.0124**	-4.7952*	-3.2255*	-3.7029*	-4.6980*	-8.3721*	-3.5538*	-5.5283*
PP	1.0128	0.3449	0.4878	1.4207	1.5703	-1.2539	-14.4906*	-1.6458**	-0.8811
PP¹	-1.0681	-1.0106	-0.3252	-6.1730*	-1.8547**	-1.6352***	-14.1459*	0.5501	-1.2144
First Differences									
IPS	-19.3860*	-24.4698*	-18.7938*	-25.7741*	-20.6735*	-17.9082*	-9.9802*	-6.4761*	-18.6210*
IPS¹	-20.2342*	-25.8259*	-18.6271*	-28.0190*	-20.2965*	-18.3543*	-8.8349*	-6.1684*	-17.8382*
ADF	-11.4340*	-8.4652*	-8.7047*	-10.3427*	-12.4426*	-10.9934*	-4.4363*	-4.3906*	-11.3735*
ADF¹	-9.7682*	-8.4787*	-6.7731*	-8.9501*	-10.9010*	-10.2621*	-3.2545*	-2.5540*	-9.4910*
ADF²	-13.6952*	-11.4573*	-11.6502*	-12.8545*	-14.4690*	-13.3323*	-8.3721*	-8.4207*	-13.7059*
PP	-21.4389*	-23.3199*	-22.4948*	-26.5055*	-22.2582*	-22.5331*	-14.4906*	-19.4182*	-20.2255*
PP¹	-19.9116*	-22.4590*	-21.2259*	-26.3158*	-20.8503*	-21.8257*	-14.1459*	-18.9491*	-18.5782*

Note: All variables are in natural logarithm except changes in stocks. *m* refers to imports; *c*, consumption; *i*, investment; *g*, government expenditure; *x*, exports; *mp*, relative import prices; *s*, changes in stocks; *l*, loans; and *sp*, share price index. The sample period starts from 1Q91 or later depending on availability. All unit root tests include individual effects with or without a linear time trend or a drift term as indicated by superscript 1 and 2, respectively. Automatic lag structure of up to four lags is chosen based on Akaike Information Crietrion in the Im-Pesaran-Shin (IPS) tests and set to four lags in the Fisher Augmented Dickey-Fuller (ADF) and Fisher Phillips-Perron (PP) tests. The test statistics for the IPS test is W-t-bar; and Fisher ADF and the Fisher PP tests is inverse normal Z. *, **, and *** refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Imports Equation: Estimation Results

|	Pooled OLS	Pooled Mean Group	FE with Lagged Variables	FE	FE with Crisis Dummies
c	0.9148*	1.1152*	1.3480*	0.8864**	0.4308
g	0.7279***	1.3959*	0.7911	0.6745	0.4169
i	1.3840*	1.2684*	0.3963***	1.3804*	1.2912*
x	1.6751*	1.1515*	0.4850**	1.7158*	1.4044*
mp	-0.2273*	0.04874	0.0215	-0.2348*	-0.2606*
s	7.90e-10	-1.39e-09	-9.40e-10	9.26e-10	4.22e-10
l	0.1196*	-0.0996*	0.0578	0.1273*	0.1271**
sp	0.0048	0.1070*	0.0846**	0.0051	0.0121
$c{\times}AFC$					0.6480
$c{\times}GFC$					-0.4007
$g{\times}AFC$					2.3407**
$g{\times}GFC$					0.9181
$i{\times}AFC$					-0.0756
$i{\times}GFC$					1.6882
$x{\times}AFC$					0.6467*
$x{\times}GFC$					0.3175
$mp{\times}AFC$					-0.0494
$mp{\times}GFC$					0.1799***
$s{\times}AFC$					8.40e-09*
$s{\times}GFC$					-1.05e-09
$l{\times}AFC$					-0.0578
$l{\times}GFC$					-0.0136
$sp{\times}AFC$					-0.0439**
$sp{\times}GFC$					-0.1824**
AFC					-0.0106
GFC					-0.0511
k	-0.0040	-0.1923	0.0052	-0.0043	0.0023
R^2	0.4975	n.a.	0.1523	0.4949	0.5274
Root MSE	0.0409	0.0010	0.0530	0.0408	0.0400
No. of obs.	826	822	822	826	826

Note: All variables are in natural logarithm except changes in stocks. Estimations are based an unbalanced panel of 11 Asian economies from 1Q91 to 2Q11. Column 1 refers to the pooled ordinary least squares (OLS) estimation with unadjusted standard errors. Column 2 refers to pooled mean estimator of Pesaran, Shin, and Smith (1999). The reported coefficients are the long-run relationships. Column 3 refers to the panel fixed-effects (FE) model with Driscoll and Kraay standard errors and one-period lagged explanatory variables. Columns 4 and 5 are the panel FE model with Driscoll and Kraay standard errors with contemporaneous explanatory variables, the latter includes crisis dummies. The dependent variable is imports, m, while the independent variables are consumption, c; government expenditure, g; investment, i; exports, x; relative import prices, mp; changes in stocks, s; total loans to the private sector, l; share prices, sp; AFC, the Asian financial crisis dummy; GFC, the global financial crisis dummy; and the constant term, k. R^2 for panel FE models are within R^2. Root mean square errors (MSE) are the regression's standard errors. For panel FE estimations, they are the standard deviation of the idiosyncratic error, $\varepsilon_{i,}$. *, **, and *** refer to statistical significance at the 1%, 5%, and 10% levels, respectively. n.a. refers to not applicable.

Table 3: Weighted and Component Elasticities

	Weighted Elasticity, α_{1i}	Component Share of Agg. Demand, λ_i			Component Elasticity, $\lambda \alpha_{1i}$		
		Start Period, 1991:1	End Period, 2011:2	Average	Start Period, 1991:1	End Period, 2011:2	Average
c	0.8864	0.4155	0.3497	0.3779	0.37	0.31	0.34
g	0.6745	0.1082	0.0750	0.0831	0.07	0.05	0.06
i	1.3804	0.1957	0.1620	0.1799	0.27	0.22	0.25
x	1.7158	0.2806	0.4133	0.3591	0.48	0.71	0.62
Total					1.19	1.29	1.26

Note: The weighted elasticity is obtained from column 4 of Table 2. λ_i is the unweighted average of each component share of the aggregate demand of all countries at the different periods. Given the nature of the unbalanced panel, the start period average λ comprises only seven countries. $\lambda \alpha_{1i}$ is the multiplication of the two terms at the different periods. Total component elasticity is the sum of individual component elasticities.

Figure 1: ASEAN-5 Export and Import Volumes, and Real GDP
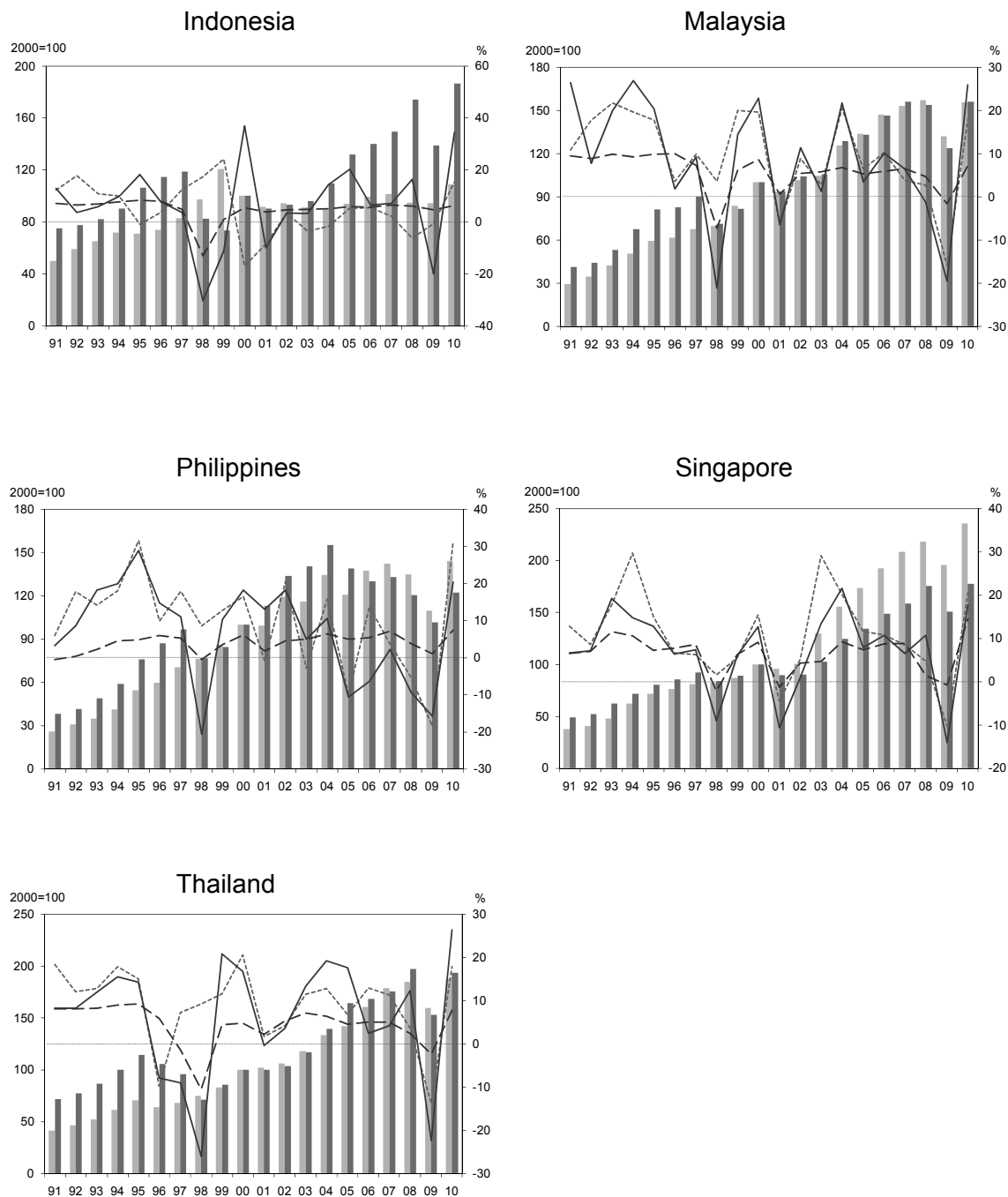
LHS (Volume): ▬ Export ▬ Import RHS (Growth): ------ Export ── Import – – – Real GDP

Note: Data are total export and import volumes of each country with the world. ASEAN refers to Association of Southeast Asian Nations, and GDP, gross domestic product.
Source: World Bank, World Development Indicators (accessed October 2011).

Figure 2: Other Asian Countries' Export and Import Volumes, and Real GDP

China, People's Republic of

Hong Kong, China

India

Japan

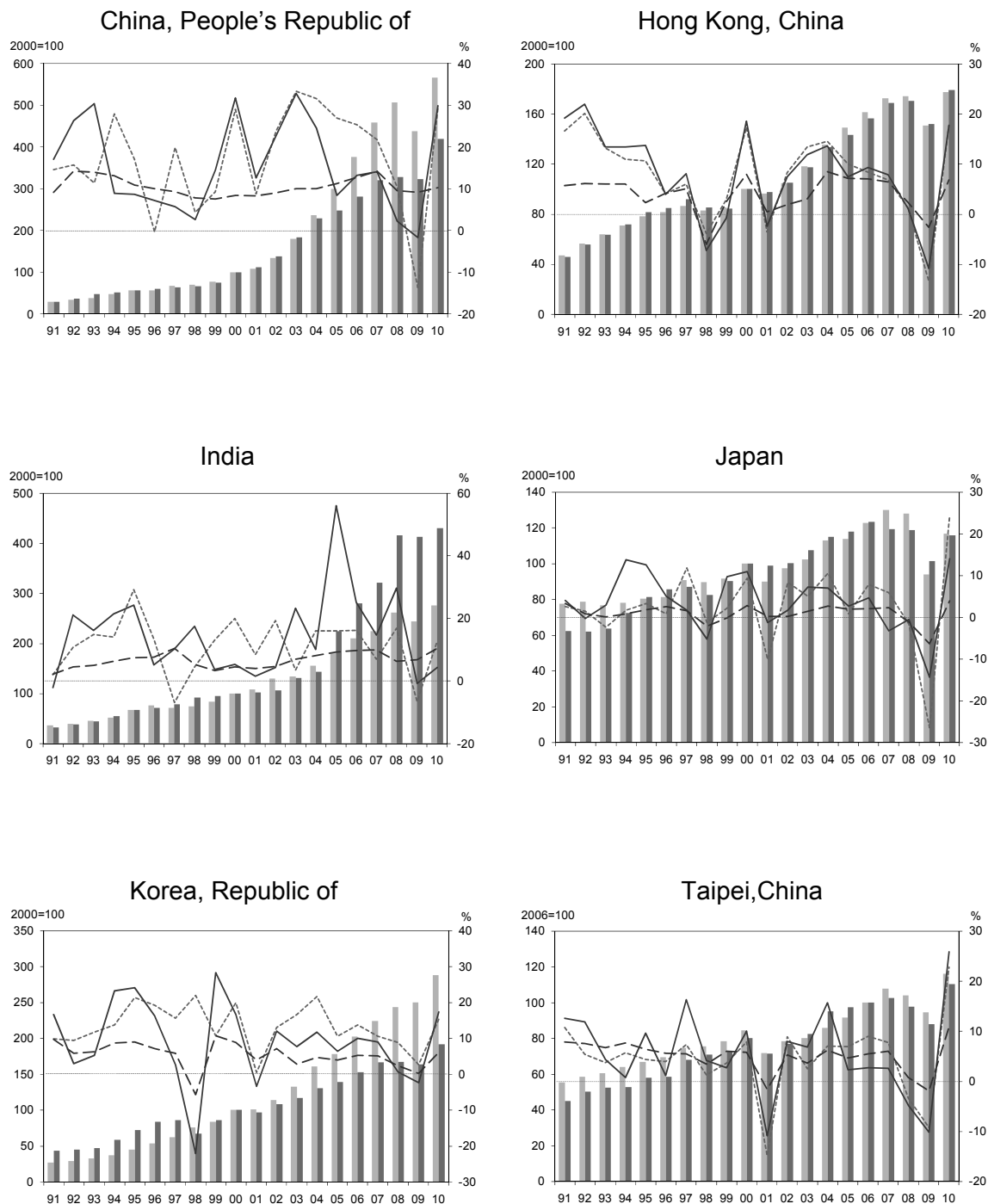Korea, Republic of

Taipei,China

LHS (Volume): ▬ Export   ▬ Import   RHS (Growth): --------- Export   ——— Import   – – – Real GDP

Note: Data are total export and import volumes of each country with the world. GDP refers to gross domestic product.
Source: World Bank, World Development Indicators (accessed October 2010) and Taipei,China National Statistics Office, *Statistical Yearbook*.

Appendix I

Data Description, Sources, and Transformations

Country	Nominal GDP, Nominal Imports of Goods and Services, Real GDP, and Real GDP Components	Claims on Private Sector	Share Price Index
China, People's Rep. of	1980:1–2011:2	1985:4–2011:2	1990:4–2011:2
Hong Kong, China	1973:1–2011:2	1990:4–2011:2	1990:1–2011:3
India	1996:2–2011:2	1957:1–2011:2	1975:1–2011:2
Indonesia	1993:1–2011:2	1980:1–2011:2	1990:1–2011:3
Japan	1980:1–2011:2	1957:1–2011:1	1975:1–2011:2
Korea, Rep. of	1970:1–2011:2	1957:1–2011:2	1978:1–2011:2
Malaysia	1991:1–2011:2	1957:1–2011:2	1980:1–2011:2
Philippines	1981:1–2011:2	1987:1–2011:2	1978:1–2011:1
Singapore	1975:1–2011:2	1966:1–2011:2	1985:1–2011:2
Taipei,China	1961:1–2011:2	1975:1–2011:2	1990:1–2011:3
Thailand	1993:1–2011:2	1957:1–2011:2	1990:1–2011:3

Nominal GDP and nominal imports of goods and services are used to calculate the GDP deflator and import deflator. Specifically, the ratio of the nominal GDP to real GDP is the GDP deflator, while the ratio of the nominal imports to real imports is the imports deflator. In turn, real import price is taken to be the ratio of the import deflator to the GDP deflator. All raw data from the first column are sourced from CEIC, except for the People's Republic of China, which are from Oxford Economics. They are in local currency. To ensure they have the same unit currencies, they are expressed in millions of US$. For some countries in order to have a long time series that is based on the new base year, the growth rates from the older series are used to extend the new series to as far back as possible. This is done for India, Indonesia, Malaysia, and the Philippines. The data used in estimations are seasonally adjusted using X12.

Claims on the private sector of other depository banks (also known as deposit money banks or banking institutions) are items 22D from the IMF's *International Financial Statistics* (IFS). The same data for Taipei,China are sourced from its central bank. Again, to have the longest series the growth rates of the older series are used to extend the new series to as far back as possible. This is done for Indonesia, Japan, Malaysia, the Philippines, and Thailand.

Data on share price index are from the IFS, except for Hong Kong, China; Indonesia; Taipei,China; and Thailand; which are from Bloomberg. Since the IFS data are expressed as an index of 100 at year 2005, the monthly data from Bloomberg are also converted to an index with the same base year. Also, since the quarterly data from IFS are monthly averages, except for Singapore, the same is applied to the monthly data from Bloomberg.

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