What Happened to Asian Exports During the Crisis?

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(This version: June 17, 2003)

Abstract

After the large exchange rate depreciations following the 1997 East Asian crisis, export volumes from East Asian countries responded with a notable lag. Two main explanations for this lag have been proposed: that contraction in domestic credit affected supply of exports; and that "competitive depreciation" by other countries neutralized the effects on demand for exports. This paper considers the plausibility of these two mechanisms using a new monthly database on exports of selected industries. The results indicate that "competitive depreciation" played an important role in the propagation of the East Asian crisis through the trade channel, even at a monthly frequency.

J.E.L. Classification numbers: F1, F14

Key words: Co-integration, Competitive Depreciation, Export Demand and Supply, East Asia.

I. Introduction

During the financial crisis in 1997-98, export revenues of many East Asian countries did not increase in spite of massive depreciation by the afflicted economies.[2] The depreciations led to sharp declines in dollar-denominated export prices with only modest increases in export volumes. The absence of a quick response of exports to depreciation played a key role in prolonging the East Asian crisis and is puzzling from an analytical point of view.

Several plausible factors could underlie the sluggish response of East Asian exports to the huge depreciations following the currency crisis. First, demand for Asian exports may have been price inelastic in the short run. Second, the contraction of credit to the private sector may have limited the supply of exports. Third, demand may have slowed down in response to an exogenous shift in world demand. Finally, demand for exports in a single country could have slowed because of "competitive depreciations" by others. These different hypotheses lead to very different interpretations of the Asian crisis, its propagation mechanisms, and the policy recommendations for recovery. This paper considers these alternative hypotheses. To address this question, a new monthly data set on price and quantity of exports for selected commodity groups is constructed. Using these data, demand and supply for Asian exports are analyzed within a vector co-integration framework of estimation.

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[2] Henceforth Asia will refer to the following six economies in this sample: Hong Kong SAR, Indonesia, Malaysia, Singapore, South Korea, and Thailand. China, Philippines and Taiwan Province of China could not be included in the sample due to lack of data.

The empirical results indicate that the demand for East Asian exports is very sensitive to prices—both own and competitors'—and to world growth rate. The supply prices of exports are generally insensitive to own quantities but very sensitive to nominal exchange rate changes. Typically, a nominal depreciation decreases the U.S dollar denominated export price, thereby increasing the demand for the depreciating country's exports. However, depreciation of every export competitors' currency weakens the positive demand effect of the initial depreciation such that the overall effect is a fall in export prices with a very modest increase in export volumes. In this context, evidence of a correspondence between export supply price and contraction of credit to the private sector is somewhat mixed.

The importance of trade in the transmission of the East Asian crisis has been studied both empirically and theoretically. Empirically, Glick and Rose (1999), Caramazza, Ricci and Salgado (1999) and Van Rijckeghem and Weder (1999) look at market shares in trade for evidence of a contagion effect through the trade channel. These authors conclude that the trade shares are important in explaining the currency crises in general (see, for instance, Glick and Rose (1999)), and the crisis in East Asia in particular.[3] Abeysinghe (1999) use a structural VAR model during 1983-1998 at quarterly frequency to analyze the transmission of recessions across 12 Asian economies through their trade links. Thus,

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[3] However, not all economists agree that trade has played an important role. For instance, Kaminsky and Reinhart (2000) argue that the trade links between East Asian countries are not strong enough to explain the spread of the crisis.

looking at trade shares constitutes an important first step in analyzing the role of trade in crises. However, for explicit comparisons between the alternative explanations behind export slowdown, it becomes necessary to estimate the underlying structural demand and supply equations, which is done in this paper. Moreover, this paper is among the few studies on the East Asian currency crisis that uses a unique database with countries' disaggregated trade data at a monthly frequency.[4] The use of high frequency data permits the analysis of the relative speeds of adjustment of export volumes and prices in response to external shocks. Gerlach and Smets (1995) formalize the idea—in a theoretical model— that strong competition in the external sector can be responsible for the transmission of a currency crisis. This paper is an empirical validation of the same idea in the context of East Asia.

The paper is organized as follows. Section II presents an overview of the behavior of aggregate East Asian exports during the 1990s. Section III contains the description of the model and data, estimation techniques, and estimation results. Section IV concludes and is followed by two technical appendices.

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[4] Barth and Dinmore (1999) also study the movements of trade prices and aggregate volumes in East Asia during the crisis at monthly frequency. They find that although the export prices of the East Asian countries (Hong Kong SAR, Indonesia, Korea, Singapore, Taiwan province of China and Thailand) fell by 4.8 percent in 1997 and 9.1 percent in 1998, their aggregate export volumes went up by 8.8 percent in 1997 and only 0.7 percent in 1998.

II. Overview of aggregate East Asian Exports

The export performances of the six East Asian countries in this study were remarkable between 1981 and 1995. On average, export revenues grew by 12 percent per annum, with continuous positive year-to-year growth rates, except in 1983 and 1985. Starting in 1995 however, export growth rates declined—exports became virtually stagnant in 1996 and 1997, declined in 1998, and recovered only after the second half of 1999 (Figure 1).[5]

The decrease in export revenues towards the end of the 1990s was primarily led by a decline in export prices.[6] Export prices peaked in 1995 and sagged continuously thereafter, while export volumes continued to grow before the crisis and slowed gradually after September 1997 (Figures 2 and 3). Figure 3 presents the East Asian export data in a price-quantity space, which allows analysis of the actual price-quantity equilibrium points

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[5] In order to control for the seasonality of export revenues, both the actual monthly export revenues and a moving annual average are reported. The decline in exports from the first half of 2001 reflects in part a slowdown in world economic activity starting in 2001.

[6] Several authors have explored the export slowdown at the end of 1995. Fernald and Loungani (1999) show that the Chinese effective devaluation in 1994 did not change the trade shares in the rest of Asia and hence did not cause the Asian crisis. Corsetti, Pesenti and Roubini (1998) suggest that "...the sharp appreciation of the U.S. dollar relative to the Japanese Yen and European currencies since the second half of 1995 led to deteriorating cost-competitiveness in most Asian countries whose currencies were effectively pegged to the dollar." In addition, there was a price war in the electronic sector, which accounted for an important export share in several Asian countries. The weak economic growth in Japan and the over-investment in these countries were the cause of the price war in 1995. This industry is included in this study in recognition of its importance in the development of the crisis. Finally, Chinn (1998) finds that while some Asian currencies, like those of Malaysia, Philippines and Thailand, were overvalued before the crises, while some others, like the Korean won, were not.

over time. Two distinct patterns are observed. In the period 1989 until June 1995 prices

and volumes expanded continuously, with a sharp spike in price during the first semester

of 1995. Thereafter, export prices fell almost continuously with little response in

volumes, especially after June 1997. The last period is the most striking and is the focus

of this analysis.

Figure 4 shows the share of East Asian exports in total world imports increased almost

without interruption between 1987 and 1995, but started declining in 1996. This supports

the view that the export decline was specific to East Asia and cannot be explained by

worldwide demand slowdown, and hence emphasizes the need to focus on this region.[7]

III. The Model and Estimation Methodology and Regression Results

A. Data and Model

The analysis focuses on disaggregated Asian manufacturing exports.[8] Three broad export

groups are considered (chemicals, manufactures and machinery) corresponding to

Standard International Trade Classification (SITC) codes 5, 6, and 7, the sum of which

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[7] Moreover, as shown in Table 1 in the next Section, the share of world import demand for the products that were exported by these countries in total world import demand did not decline during this period, implying that the Asian export decline did not result from a switch of world demand towards other commodities.

[8] Muscatelli, Stevenson and Montagna (1994) provide evidence of the increasing importance of manufacturing exports (relative to traditional or primary exports) in Southeast Asia in the 1990s.

represent over 70 percent of exports for Korea, Malaysia, and Singapore, and 60 percent

for Thailand. In addition to these three broad categories, three other specific industries

(vehicles, clothing and semiconductors), corresponding to SITC codes 78, 84, and 776,

respectively, are also considered.[9] These sub-industries have played important roles in

Asian trade.[10] Clothing, being labor-intensive, has traditionally been a very important

export product for developing countries at the initial stages of industrialization, making

this sector an interesting case for studying the effects of depreciation. The semiconductor

industry is relatively new but it is already very important in most of East Asia. It is

characterized by large initial investment, reliance on large volumes to cover the initial

outlays, and a very high rate of technological innovation, making it a highly cyclical and

sensitive to price competition.[11] The road vehicle industry is also very important for the

development strategy of Korea and Indonesia. The original sources of all the data are

described in detail in Appendix I.

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[9] For Korea and Thailand, data on road vehicles (SITC 78) could not be retrieved. Instead we included data on passenger cars (SITC 7812).

[10] For similar reasons Fernald, et al. (1999) focused on semiconductors and clothing in their study of Chinese exports.

[11] For a description of the highly competitive nature of the semiconductor industry see Macher, Mowery, and Hodges (1999). This industry includes several products, e.g., integrated circuits and memory devises. Memory devises are highly standardized and competition is mainly through price and timely delivery. The external market for memory devises had three characteristic phases—the U.S dominated this market prior to 1985, Japan dominated it between 1985 and 1990, and since 1990, the Newly Industrialized Economies have been increasing their market shares.

Table 1 reports the share of particular commodity exports as a percentage of total exports. Manufactures and machinery items constitute a significant proportion of total exports for all the sample countries. Among machinery items, semiconductors account for a large proportion of exports for Korea, Malaysia and Singapore. However, these shares did not change much between the pre-crisis (1995) and post-crisis (1998) periods. Table 1 also confirms that the total world demand for the specific commodities exported by the Asian countries did not decline during 1995 and 1998, implying that the export decline was specific to Asia and not a result of a switch in composition of world import demand.

The aggregate data hide important heterogeneity in composition and destination of exports. Tables 2 through 4 report the percentage of commodity-specific exports that each Asian country exports to its five Asian competitors (Table 2), to the United States (Table 3) and to Japan (Table 4). Table 2 indicates that these countries engaged in substantial intra-Asian trade. After the crisis, the share of Asian trade declined for almost all commodity groups. The share of many of these commodities to the United States (Table 4) and Japan (Table 5) also declined after the crisis implying that the depreciations did not lead to a significant increase in the foreign demand for the Asian exports.

The sample data set is not readily available in any existing database at a monthly frequency. The database has been constructed from the original national sources. Unfortunately, for many commodity groups in the sample, only data on export revenues are available—i.e., the data are not disaggregated in to export prices and volumes for each commodity analyzed in the paper. Therefore, aggregate price data for the relevant

8

industries are used to deflate revenues and obtain export volumes. Country and industry-specific competitors' price indices are constructed as weighted sums. Weights are constructed as the market shares of each Asian competitor in the total Asian market by particular industry. The construction of the data set is described in Appendix I.

We estimate a standard reduced form long-run equation of demand for exports specified as follows (in logarithmic form):[12]

$$X_{ijt} = \alpha_{ij}^c + \alpha_{ij}^{op} P_{ijt} + \alpha_{ij}^{cp} P_{ijt}^c + \alpha_{ij}^y Y_t^w + v_{ijt}^d, \tag{1}$$

where,

α_{ij}^c = Constant term in the demand equation.

X_{ijt} = Volume of the i-th commodity exported by the j-th country at time t.

P_{ijt} = Export price of i-th commodity (in dollars) exported by the j-th country at time t.

P_{ijt}^c = Competitors' export price for commodity i as faced by country j at time t.

Y_t^w = World real import demand at time t.

v_{ijt}^d = Residual term in the demand regression.

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[12] See Goldstein and Khan (1985) for a discussion on specifications of trade equations. Note that although in principle own and competitors' prices should enter the demand equation as ratio (standard assumption of price homogeneity), we enter them separately because P_{ijt}^c is only a close but not precise proxy for competitors' price.

Based on standard economic theory, an increase in own price should decrease, while an increase in competitors' price or world demand should increase the demand for own exports (i.e., $\alpha_{ij}^{op} < 0$ and $\alpha_{ij}^{cp}, \alpha_{ij}^{y} > 0$).

The reduced form long run (inverted) supply equation is given by:

$$P_{ijt} = \beta_{ij}^{c} + \beta_{ij}^{v} X_{ijt} + \beta_{ij}^{e} E_{jt} + \beta_{ij}^{dc} DC_{jt} + \beta_{ij}^{w} I_{jt} + v_{ijt}^{s}, \tag{2}$$

where,

β_{ij}^{c} = Constant term in the supply equation.

E_{jt} = Nominal exchange rate in country j at time t.

DC_{jt} = Credit to the private sector in country j at time t.

I_{jt} = Domestic input price in country j at time t

v_{ijt}^{s} = residual in the supply regression.

The export supply curve is expected to have a non-negative slope $(\beta_{ij}^{v} \geq 0)$. A nominal depreciation should reduce the export supply price expressed in dollars $(\beta_{ij}^{e} < 0)$, although the extent of price decline depends on the pass through elasticity.[13] An increase in private sector credit is expected to facilitate export supply, thereby reducing its

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[13] The empirical literature on whether nominal devaluation results in real devaluation are quite comprehensive. See Reinhart (1995) and the references therein.

price ($\beta_{ij}^{dc} < 0$).[14] Finally, an increase in domestic input price is expected manifes in an

increase in the export price ($\beta_{ij}^{w} > 0$).

B. Time Series Properties and Single Equation Approach

As a first step the stationarity of the data series are evaluated. The Augmented Dickey-

Fuller (1979), and Phillips-Perron (1988) tests are both used to check for the presence of

unit roots in the variables used in estimation.[15] For each of the six series in every country,

the existence of unit roots cannot be rejected by at least one of the two tests, and

sometimes by both at the 1 percent level of significance. For the same variables, however,

the existence of a unit root in the first difference is always rejected, indicating that the

variable series are integrated of order one (I(1)).[16]

Next, the individual export demand and supply equations are tested for the existence of

cointegration, using residual-based Augmented Dickey Fuller tests given in Engle and

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[14] The sign of the coefficient on private sector credit also tests the possibility that a credit crunch could have slowed down export supply during the crisis. While some authors (e.g., Ghosh and Ghosh (1999), and Ferri and Kang (1999)) have analyzed the impact of a credit crunch on the entire economy, we focus on its effect on specific exports.

[15] The Bayesian Information Criterion is used to determine the optimal lag length.

[16] Notable exceptions are: export volume of manufactures and clothing in Hong Kong SAR, chemicals and semiconductors in Indonesia; manufactures and clothing in Korea; vehicles and clothing in Malaysia and chemicals and miscellaneous manufactures in Singapore. These series appeared to be trend-stationary.

Yoo (1987).[17] Given that the sample residuals exhibit AR(1), the long run co-integration

relationships are estimated using generalized least squares (with the Cochrane Orcutt

methodology). Time trends are also used in the regression, but not restricted to be a part

of the co-integrated relationships. The results confirm the existence of co-integration for

most commodities at the 5 percent level of significance. The demand curves generally

confirm the standard negative relationship of export volume with own price and positive

relationship with competitors' price and world demand (Table 5).[18] The individual export

supply equations estimated indicate a flat supply curve in most cases, although the export

price coefficients are sometimes negative (Table 6). While the export supply price has a

positive and significant relationship with domestic input price and negative and

significant relationship with the nominal exchange rate, the coefficient of private credit

entering the supply equation is generally insignificantly different from zero.

The results for the individual long run demand equations are summarized as follows—(i)

own price elasticity is negative and significant but generally less than 1; (ii) competitors'

price elasticity is positive and significant and generally greater than 1;[19] and (iii) world

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[17] The details of this methodology, including the critical values for the significance of co-integration, are given in Maddala and Kim (1999). Note that although the sample has a considerable number of observations for most countries, they span for a total of 11years only. This span can be too short for a "long–run" relationship in exports. Hence, the power of these tests would generally be low.

[18] The exception is the case of Hong Kong, which indicates a negatively sloping demand curve.

[19] Compared with these results, Muscatelli and others (1996) found, for a sample of Asian countries, that the long run elasticity of export demand with respect to own price relative

demand elasticity is usually greater than 1 and significant. The results for the long run

supply equations are—(i) the supply price is relatively inelastic to quantity; (ii) the pass

through elasticity between nominal exchange rate and export supply price is negative and

significant; (iii) there is a positive and significant relationship between domestic input

price and export price, and (iv) the effect of private credit on export price is insignificant.

In addition, the individual long run equations are used for the following robustness tests

and sensitivity analyses—(i) the existence of price homogeneity in the demand equation;

and (ii) a structural break test in both equations. The hypothesis of price homogeneity in

the demand equations is generally rejected. The few cases in which this hypothesis is not

rejected are when price indices are defined imprecisely (due to lack of data on actual

prices). With some exceptions (e.g., Indonesia), results do not reveal structural breaks.[20]

The above results reveal a poor fit in some of the individual long run relationships—the

estimated demand and supply curves have perverse slopes in some cases (e.g., Hong

Kong's export demand curves, and Indonesia and Malaysia's export supply curves). This

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to competitors' price is generally much greater than 1. Noting that estimation of the export commodities in this study is done at a more disaggregated level, own price and competitors' price are allowed to enter the demand equation independently, although price homogeneity is tested as a robustness check (see below).

[20] The Chow predictive test (Greene 1997, Chapter 7) is used to check for the possibility of a structural break in demand or supply in July 1997, when the financial crisis started, and in December 1997, when Korea devalued. Andrew's (1993) method of testing for a structural break (when the break point is unknown) is also used, restricting the breakpoint to be between July 1997 and December 1997. The results indicate no structural break in demand or supply functions.

could be owing to the fact that the estimations suffer from relatively small sample sizes.

Mark and Sul (1999) have shown that there are sizeable gains in pooling the data. Kao

and Chiang (2000) have compared different estimation techniques for panel data in

presence of co-integration and have found that Dynamic Generalized Least Square

(DGLS) outperforms both OLS and fully modified OLS.[21] This supports the use of a

panel estimation to analyze the above export demand and supply relationships, which is

done in the next Section.

C. Empirical Results: Panel Approach

Based on the confirmation of the existence of cointegration in a majority of the demand

and supply equations, the long-run demand and supply are estimated in levels in a panel

context, using the Dynamic Generalized Least Squares methodology of Stock and Watson

(1989) as described in Campbell and Perron (1991). This methodology corrects for: (i)

serial correlation (as discussed above, the sample residuals exhibit AR(1)) using

Generalized Least Squares (GLS); and (ii) endogeneity of the regressors by including lags

and leads of changes in the explanatory variables. The long-run specification for the

demand equation is:

[21] See Lane and Milesi-Ferretti (2000) for an application of panel Dynamic Ordinary
Least Square (DOLS).

$$X_{ijt} = \alpha_{ij}^c + \alpha_{ij}^{op} P_{ijt} + \alpha_{ij}^{cp} P_{ijt}^c + \alpha_{ij}^y Y_t^w + d_{ij}^{op}(L)\Delta P_{ijt} + e_{ij}^{op}(L^{-1})\Delta P_{ijt} + d_{ij}^{cp}(L)\Delta P_{ijt}^c$$

$$+ e_{ij}^{cp}(L^{-1})\Delta P_{ijt}^c + d_{ij}^y(L)\Delta Y_t^w + e_{ij}^y(L^{-1})\Delta Y_t^w + \sum_{s=1}^{11} \lambda_{ijs} M_s + v_{ijt}^d, \tag{3}$$

where,

M_s = monthly dummies that control for seasonal effects.

$d_{ij}^Z(L) = \sum_k d_{ijk}^Z L^Z$ and $e_{ij}^Z(L^{-1}) = \sum_k e_{ijk}^Z L^{-k}$ for $Z = op, cp, y$ corresponding to the variables

own price, competitors' price and world demand respectively and L is the lag operator

while L^{-1} is the lead operator.[22]

The long-run specification for the supply equation is:

$$P_{ijt} = \beta_{ij}^c + \beta_{ij}^v X_{ijt} + \beta_{ij}^e E_{jt} + \beta_{ij}^{dc} DC_{jt} + \beta_{ij}^w I_{jt} + f_{ij}^v(L)\Delta X_{ijt} + g_{ij}^v(L^{-1})\Delta X_{ijt}$$

$$+ f_{ij}^e(L)\Delta E_{it} + g_{ij}^e(L^{-1})\Delta E_{jt} + f_{ij}^{dc}(L)\Delta DC_{jt} + g_{ij}^{dc}(L^{-1})\Delta DC_{jt} + \tag{4}$$

$$+ f_{ij}^w(L)\Delta I_{jt} + g_{ij}^w(L^{-1})\Delta I_{jt} + \sum_{s=1}^{11} \mu_{ijs} M_s + v_{ijt}^s,$$

where, $f_{ij}^Z(L) = \sum_k f_{ijk}^Z L^k$ and $g_{ij}^Z(L^{-1}) = \sum_k g_{ijk}^Z L^{-k}$ for $Z = v, e, dc, w$ corresponding to export

volume, nominal exchange rate, private credit, and input price respectively. Again, the

optimum number of leads and lags are chosen as in the demand regression.

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[22] The integer k denotes the number of lags (or leads) and is chosen in the following manner. Starting with a reasonable upper bound of k, on estimation, if the variable (with the highest possible lag) is significant, then k is chosen to be the upper bound. If the variable is not significant, the lag length is reduced further until the last included lag is significant in the estimation. A similar method is used to choose the optimum lead length.

The specifications for short-run demand and supply are:

$$\Delta X_{ijt} = \gamma_{ij}^{c} + \gamma_{ij}^{d} ED_{ijt-1} + \gamma_{ij}^{s} ES_{ijt-1} + \gamma_{ij}^{op}(L)\Delta P_{ijt} + \gamma_{ij}^{cp}(L)\Delta P_{ijt}^{c} + \gamma_{ij}^{y}(L)\Delta Y_{t}^{w}$$
$$+ \sum_{k}^{11} \eta_{ijk}^{d} M_{k} + \eta_{ijt}^{d}, \tag{5}$$

$$\Delta P_{ijt} = \delta_{ij}^{c} + \delta_{ij}^{d} ED_{ijt-1} + \delta_{ij}^{s} ES_{ijt-1} + \delta_{ij}^{v}(L)\Delta X_{ijt} + \delta_{ij}^{dc}(L)\Delta DC_{it} + \delta_{ij}^{e}(L)\Delta E_{t}$$
$$+ \delta_{ij}^{w}(L)\Delta I_{ijt} + \sum_{k}^{11} \eta_{ijk}^{s} M_{k} + \eta_{ijt}^{s}. \tag{6}$$

The terms ED_{ijt-1} and ES_{ijt-1} are the one period lagged error correction terms from the

long run demand and supply regressions where,

$$ED_{ijt} = X_{ijt} - \alpha_{ij}^{c} - \alpha_{ij}^{op} P_{ijt} - \alpha_{ij}^{cp} P_{ijt}^{c} - \alpha_{ij}^{y} Y_{t}^{w} \tag{7}$$

$$ES_{ijt} = P_{ijt} - \beta_{ij}^{c} - \beta_{ij}^{v} X_{ijt} - \beta_{ij}^{dc} DC_{jt} - \beta_{ij}^{e} E_{jt} - \beta_{ij}^{w} I_{jt} \tag{8}$$

Equations 3 to 6—corresponding to the long run and short run demand and supply

equations—are estimated using GSL with the pooled data, after allowing for first-order

auto-correlation in the error structure as well as heteroskedasticity across countries. The

panel comprises of exports from Hong Kong SAR, Indonesia, Korea, Singapore, and

Thailand for the period March 1993 until July 2002.[23][24] We drop Malaysia from the

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[23] To have balanced panel, we use the rate of growth of the export price from Singapore
to obtain additional six months of data for Hong Kong in 2002. Our results do not change
if we do not the last six months of observations for which we do not have data.

sample as it has very few observations overlapping with the other countries' data in this sample. Besides using monthly dummies to control for seasonality as before, country dummies are used to control for country-specific effects.

The panel estimation results are given in Table 7.[25] The results indicate a standard demand equation for Asian exports.[26] Price elasticity of demand for each export commodity is negative and significant at the 5 percent level of significance. Similarly, competitors' price elasticity is positive and significant except for clothing. The absolute value of elasticity for competitors' price is large, supporting the argument that there is a considerable degree of intra-Asian competition. Exports for all commodity groups, except clothing, are sensitive to world demand. Clothing has a negative and insignificant sign, reflecting in part that Asian exporters have been moving away from this sector.

The supply equations do not perform as well as the demand equations. The coefficient on the price variable is insignificantly different from zero for all commodity groups except

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[24] Using a Hausman test we could not reject a Random Effects model, i.e., GLS is more efficient. Note that for road vehicles (SITC 78) the panel is imprecise, since the Korean and Thai data are on passenger cars (SITC 7812).

[25] The panel on road vehicles has three countries (Indonesia, Korea, and Thailand) as Hong Kong SAR has an insignificant export of vehicles, and Singaporean data beyond the one-digit level could not be retrieved. For all one digit other commodity groups we have five countries.

[26] See also Faini, Clavijo, and Senhadji-Semlali (1991); Muscatelli, et. al (1994); and Reinhart (1995).

17

clothing and road vehicles, implying that export supply curves are basically horizontal in the long run.[27] Export prices are negatively and significantly sensitive to nominal depreciation. Note also that the pass-through elasticity is higher in manufactures and semiconductors than in the other industries—consistent with the argument that pass-through elasticities are higher in industries with relatively more market power (see Knetter (1993)). Export supply price is positively and significantly associated with increases in domestic input prices. Overall, these results with monthly data support similar findings in the literature (see Muscatelli and Stevenson (1995)), and Giorgianni and Milesi-Ferretti (1997)) based on lower frequency data.

The panel results support a significant influence of changes in private domestic credit on export supply.[28] However, under the single equation approach only 3 equations out of 30 have the negative sign for private credit and are significant (after excluding the results for Malaysia). Based on these results and also noting that the speed of adjustment in the export supply function is on average 1.5 years, the evidence for a domestic credit crunch to be responsible for the decline in East Asian exports is somewhat mixed. This result is

[27] No obvious explanation can be provided for the perverse relationship between price and volume in the export supply equations for road vehicles and clothing. However, for clothing, the gradual shift in exports away from this sector may have led to a structural break in the export supply function that could not be captured by the standard export supply equation estimated here. Besides, Asia's clothing exports were subject to quotas under the Multi Fiber Arrangement (MFA), which could have distorted the standard price-quantity relationship for the export supply equation.

[28] Noting that only a small share of private domestic credit is disbursed to each of the specific industries considered in this sample, the possibility of private credit being endogenous to a specific commodity export is expected to be low.

consistent with the findings of Ghosh and Ghosh (1999) for East Asia, and the observation of Krueger and Tornell (1999) who find that the Mexican tradable sector had responded strongly to depreciation in the crisis of December 1994, severe credit crunch notwithstanding.

The short-run equations show that price and quantities do not adjust immediately to shocks. However, the speed of adjustment, measured by the negative of the inverse of the error correction terms in the short run equations, is relatively faster for the demand equations, ranging from 4 months to 17 months compared to the supply equation, ranging from 14 months to 23 months.

D. Robustness

For a robustness check of the above results, the demand and supply equations are estimated (in unreported regressions) using equation-by-equation estimation technique of Stock and Watson (1989) and instrumental variable regressions and the results are similar but weaker than the results under the co-integration approach.

As a further robustness test, the U.S. import prices are used as alternative deflators for export revenues to obtain export volumes. This alternative method does not significantly change the results.

East Asia exports could be sensitive to individual economic activity in the United States, Japan, or other Asian countries such that both aggregate world demand and its composition become important determinants of demand for Asian exports. In unreported regressions, alternative specifications with several scale variables corresponding to different geographical areas are used (for each industry). These results reveal that there is no significant difference between using some composition of world income or using aggregate world income.

Other alternative specifications are also used for the demand and supply equations. In particular, real interest rate is used as an alternative to domestic credit, and the results of the latter too are as inconclusive as the results using private domestic credit.

E. Interpretations

As noted in the introduction, four factors are considered as possible explanations behind the lagging of Asian exports following the huge depreciations. First, a credit crunch could choke off export supply. Second, world demand slowdown could affect East Asian exports. Third, the export demand could be inelastic in the short run. Fourth, export demand for a single country might have slowed down due to currency depreciation of its competitors. Table 9 summarizes the expected coefficient of the explanatory variables in the estimated demand and supply equations for each of the above explanations.

The results provide weak support for the credit crunch explanation for three reasons: First, there is mixed evidence on the significance of the relationship between domestic credit and export supply price. Second the calculated speed of adjustment for the supply curve (between 1.5 to 2 years) indicates that any effect of a credit crunch would not be reflected within a year. Finally, an upward shift of the supply curve along the demand curve should *increase* the equilibrium price not *decrease* it. An upward shift of the supply curve without any change in prices is possible only if the demand curve is horizontal and the estimated equations do not reveal horizontal demand curves for any commodities.

Table 9: Implied Coefficients of Alternative Explanations for Slow Response of Exports to Depreciation

Explanation	X_i (Quantity in demand curve)			P_i (Price in supply curve)			
	P_i	P_i^c	Y^w	X_i	DC	E	I
Credit crunch					--		
Contraction of world demand			--				
J-curve effect	0(short run)					--	
Competitive depreciation	--	++				--	++

On the second explanation, although the estimated results show large and positive income elasticity of demand for exports, Figure 4 shows that world import demand did not collapse at the end of the 1990s. Moreover, Table 1 indicates that world demand for

21

commodities typically exported by Asia relative to total world demand also did not decline. Thus, noting that neither total demand nor the demand for those commodities mostly exported by Asia declined, we rule out the world demand contraction explanation.

The third explanation implying a vertical demand curve in the short run (e.g., during the period 1997-mid 1999 that was characterized by sharply falling export prices without comparable increases in export volumes) is ruled out from the short-run analysis, which indicates a relatively quick adjustment along the export demand equation (within 1 year).

The fourth explanation—competitive depreciation—implies that exports of an individual country did not pick up because competitors were depreciating and cutting their export prices as well. In the supply equation, depreciation has to translate into lower export prices, while in the demand equation, export quantity has to be very sensitive to own and competitors' prices.[29] Our results support both these requirements.[30] Hence, a nominal depreciation in each country shifts down its export supply curve by some proportion, thereby reducing the export prices. At the same time, nominal depreciation by its competitors' shifts its demand curve to the left, such that quantity sold in exports does not increase by much despite a sharp decline in export price.

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[29] The results also show that export supply price is responsive to domestic input costs, which likely decreased relative to imported costs following the nominal depreciation.
[30] The only way to verify the depreciation explanation is by estimating demand and supply as done here. Looking at changes in market shares cannot work because countries that engage in competitive devaluation could end up with the same market shares.

It is somewhat puzzling that the sharp decline in East Asian export prices did not significantly increase overall Asian exports to the world (owing to the fact that the region as a whole had become more competitive relative to the rest of the world). This could be explained by the fact that while the elasticity of substitution between goods from individual East Asian countries is very high, the elasticity of substitution between East Asia as a whole and the rest of the world is less strong. This argument is confirmed by several studies that have looked specifically at the issue of different elasticities of substitution for goods from different countries. For instance, Faini, Clavijo, and Senhadji-Semlali (1991) find that the competition in exports between two LDC countries is much stronger than the competition between a DC and a LDC country. Giorgianni and Milesi-Ferretti (1997) find that using two exchange rates—one vis-à-vis Korea and industrialized and another vis-à-vis Korea and non-industrialized countries— can better explain demand for Korea exports than using one exchange rate. Finally, Spilimbergo and Vamvakidis (2000) show that the assumption of equal elasticity of substitution of export demands for LDC and DC countries is not supported by the data and export equations work much better using two exchange rates.

IV. Conclusion

This paper attempts to identify demand and supply curves for specific export groups at a monthly frequency, whereas most of the empirical trade literature has so far focused on lower time frequencies. The analysis of the developments up to and after a currency crisis could be done only with high frequency data. However, working with recent monthly

trade data poses several challenges. First, there is no readily available database. Second, there is a risk that trade equations, which may work well at low frequency, would not yield conventional results at high frequency. These challenges are dealt with by constructing an original database on monthly prices and quantities for the industries in the sample. When the data are not available from the original sources, best alternative proxies are constructed to check the robustness of the results. The specification challenge is dealt with by using a vector co-integration framework in panel. The results are robust to different specifications and different ways of constructing the data set.

The main results are that demand for East Asian exports is very sensitive to prices—both its own and competitors—and to world import demand. Export supply prices are very sensitive to depreciation and domestic input prices. These results indicate that competitive depreciation played a key role in exacerbating the real effects of the crisis by working through a trade channel and that these effects occur relatively quickly—between 4 months to 16 months. This paper calls for an interpretation of the Asian crisis that would put a stronger emphasis on the role of trade, the importance of competitive depreciation in prolonging the crisis, and the causes underlying the slowdown in export supply. An optimistic forecast is also presented about the future for East Asian exports—the results indicate that Asian exports would return to their pre-crisis growth rates as their economies strengthen and currencies stabilize, as was evidenced from the fast recovery of the Asian exports during 1999-2000.

FIGURES
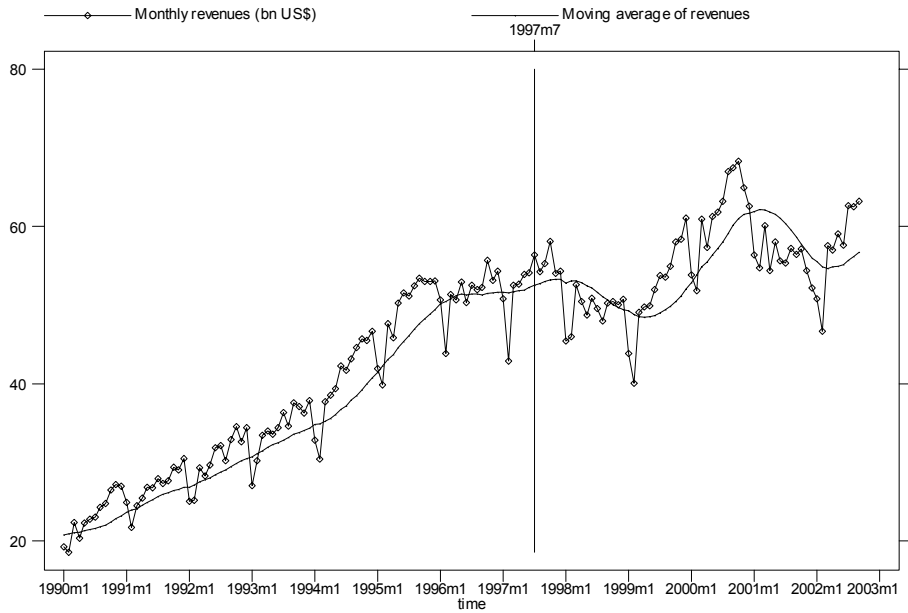
Figure 1: Monthly East Asian Exports (bn US$)
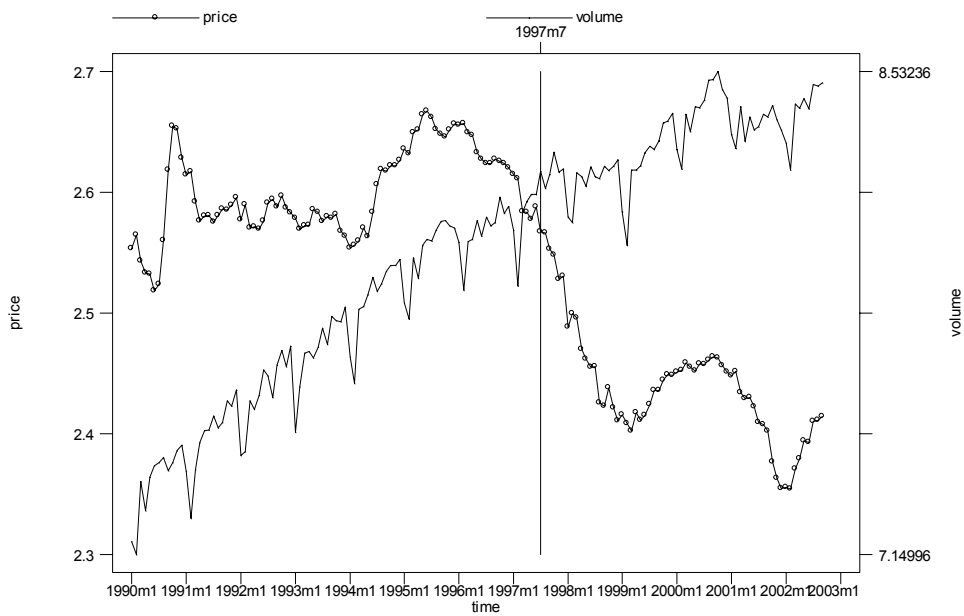
Figure 2: East Asia (log)export prices and (log) volumes

25
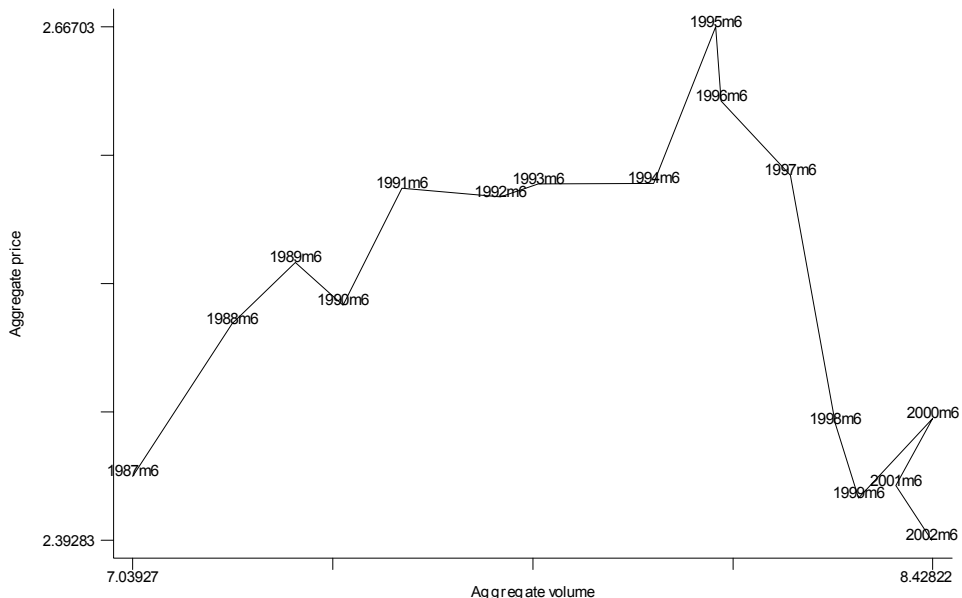
Figure 3: East Asian Price vs Volume
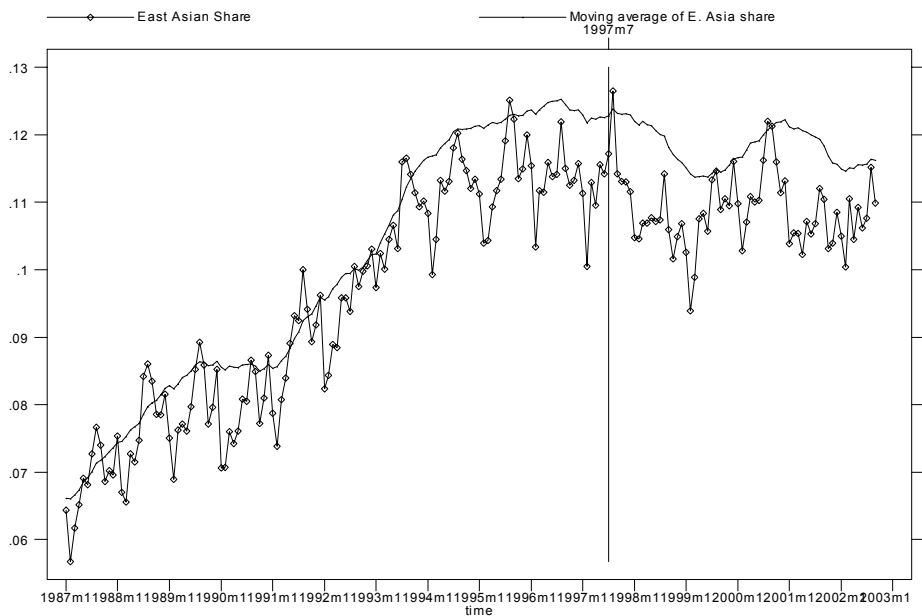
Figure 4: East Asian Share in World Import

26

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Appendix I. Data

The sample covers monthly data between January 1990-July 2002, with a few exceptions when data could not be retrieved. A complete description of the variables and the data sources is given below:

Price and volume of exports: Export prices are used to deflate the export revenues and obtain volumes of exports. For commodities disaggregated at the one-digit level, such as chemicals, manufactured items, and machinery, commodity-specific export price indices for Korea, Singapore and Thailand are available. At the two and three digit levels, the best available country- and commodity-specific export price index is used. For instance, export price index of SITC 7 (machinery) is used to obtain volumes of SITC 78 (road vehicles) and 776 (semiconductors) and so on. For Indonesia and Malaysia, commodity-specific export prices cannot be retrieved and unit value of exports is used to deflate all export revenues. Hong Kong SAR has export price indexes for clothing and semiconductors. For other commodities, the unit value of exports is used.

The use of alternative proxies for price indexes when individual price information is missing is not uncommon. For instance, Muscatelli, et al. (1994), have used import (and sometimes export) price indices of the United States to obtain volumes of developing country manufacturing exports. However, there is a problem with this deflator. Ideally we would like to have $X_{ij} = R_{ij}/P_{ij}$, where R_{ij} is the export revenue earned by the j-th country in the i-th good. However, when P_{ij} is not available, and a proxy like the U.S. import price

index for i (denote it by $P_{i,USA}$) is used, a new variable, $X_{ij}^{°}$, is created such that, $X_{ij}^{°} = R_{ij}/$ $P_{i,USA}$. $P_{i,USA}$ depends on the exports of commodity i from all exporters of i to the United States. Hence, an increase in the exports of i from all other countries (except j) leads to a decline in the import price faced by the United States ($P_{i,USA}$) which, increases the value of $X_{ij}^{°}$ even though X_{ij} does not increase. This is one caveat that needs to be kept in mind when using the commodity specific import price indices from United States. However, in order to check the robustness of the results, U.S. import price is used as an alternative proxy for Asian export price variables.

Competitor's price: For every commodity group geometric average weights are constructed (average of 1992-96) by taking the annual share of country j's exports of commodity i (to the world) as a proportion of total Asian exports of that commodity. The weights are then used to obtain a geometric mean of export prices of the competitors. Thus, by construction,

$$\ln P_{ij}^{c} = \sum_{\substack{h=1 \\ h \neq j}}^{H} w_{ih} \ln P_{ih} \; ; \; w_{ih} = X_{ih} / \sum_{k=1}^{K} X_{ik} , \tag{7}$$

where h are all the other Asian competitors of good i for country j. The term H refers to the five other competitors. The variable X_{ih} is the total (annual) export of commodity *i* by country *h*. When country *h* does not have a commodity-specific export price, we simply use the overall export price, i.e., the unit value of exports. The term K refers to the six countries in the sample. The weights are constructed with annual data obtained from the IMF's *Direction of Trade Statistics*.

The country-specific sources on the price and quantities of exports are:

Hong Kong SAR: Data on export revenue of chemicals, manufactures and machinery come from Hong Kong SAR's *Census and Statistic Department's Monthly Digest of Statistics*. Data on exports of road vehicles, clothing and semiconductors come from the same department's Trade Analysis Section (Hong Kong SAR's External Trade). Unit value index numbers for domestic exports (from the same source) are used to deflate export revenues of chemicals, manufactures, machinery and road vehicles. The specific export price index is used for clothing, while that of electronic components is used for semiconductors (these price data are retrieved from the Census and Statistics Department). The price data are available from 1988:10-2002:01.

Indonesia: Export data are obtained from the Bank of Indonesia's Economics and Statistics Department. The following data points for export revenue are missing in the sample of estimation for chemicals, manufactures and machinery: 94:1-2; for road vehicles, clothing and semiconductors: 1994:1-2, 1995:1-2, 1995:12, 1996:1-2, 1996:4-5. The unit value of export index (in dollars) is used to obtain volumes of exports of these commodities (Source for the latter is *International Financial Statistics* Database (IFS), series 74DZF). This series is available from 1980:01-1998:12 and are interpolated to obtain the missing values for the data points 1981:07-08 and 1987:01-02.

Malaysia: Export revenue data come from Malaysia's *Monthly External Trade Statistics*, Department of Statistics covering 1994:01-2002:07. Values for 2000:12 and 2001:12 are

missing for all the series. The unit value of export index is used to deflate export revenues and obtain volumes. Source for the latter is *IFS*. (series 74DZF). The series is interpolated to obtain the missing data points between 1992:04 to 1993:06 and 1996:07 and 1998:2. After interpolation the series is complete only till 1999:03. In order to have the graphs, we use the (rate of growth) of the export price from Indonesia. Given the data limitation we do not use Malaysia in the panel regressions.

South Korea: Export revenue data come from the Bank of Korea's *Monthly Bulletin* and covered the period 1990:01 – 2002:10.

Singapore. Data on revenue and prices come from the *Monthly Digest of Statistics*, Singapore Dept. of Economics. Data on revenue and export prices cover the period 1989:01 to 2002:02 (missing between 1998:02-1998:06). The missing points are interpolated to complete the series.

Thailand. *Monthly Bulletin*, Bank of Thailand is the source for exports of chemicals, manufactures and machinery (available from 1989:01–2002:12), and of the following subcategories: integrated circuits and parts: 18a of the bulletin, a proxy for SITC 776, semiconductors; textile products: 2 of the bulletin, a proxy for SITC 84, clothing; and Passenger cars and parts: 51a of the bulletin, a proxy for SITC 7812. Commodity specific export prices are available during the same period. General export price index for Thailand is obtained from the IFS (series 74DZF).

The data for **United States import price index** (used to deflated export revenues for the alternative definition of volume) come from the Bureau of Labor Statistics. For chemicals, manufactures, machinery and clothing we retrieved quarterly series between 1990:03 and 1992:08, and monthly thereafter until 2003:1. For semiconductors the data is quarterly from 1989:09 to 1993:12, and monthly thereafter (till 2003:1). The quarterly series for vehicles starts from 1989:09 and ends at 1993:12 and is monthly thereafter until 2003:01. All quarterly data are interpolated.

Scale variable: As discussed before, we first construct a trade weighted world demand for each export commodity for the scale variable. However the use of this variable does not alter the performance of the estimated equations. This is because export data is highly trended, and therefore as long as we use a scale variable that is suitably trended, it performs well in the demand equation. Therefore we use world import demand for the estimation retrieved from the IFS database (series 71D). The world unit value of imports (the series 75D) is used to deflate revenues and obtain volume of imports. The series for real world import is available from 1980:01-2002:09.

Domestic credit. The data source is *IFS* (Domestic credit, based on claims on private sector, series, 32DZF). This series (in domestic currency) covers the period 1980:01-2002:12 for all countries. For Hong Kong SAR, the series is annual between 1990 and 1993, quarterly between 1994:1-1995:12 and then monthly. Real domestic credit to the private sector is obtained by deflating with the country-specific consumer price index (CPI) data for which is also obtained from *IFS* (series 64ZF) covering 1980:01-2002:12

(For Hong Kong SAR, CPI data was available from 1990:01). Hong Kong SAR real domestic credit has to be interpolated for the co-integration tests. However all estimations are carried out without interpolating this variable.

Input price. In the absence of wage prices at monthly frequency, the whole sale price index is used to proxy for input price. The series is retrieved from IFS (line 63).

Nominal Exchange Rate. This monthly series comes from *IFS* (period average market rate, series RFZF) and covers the period 1980:01-2003:01.

Appendix II. Market Shares

Table 1. Share of specific commodity sections out of total exports
(in percentage, comparison between 1995, 1998 and 2000).[31]

		Chemical	Manufacture	Machinery	Vehicle	Clothing	Semiconductor
Hong Kong SAR	1995	4.0	11.1	29.4	0.0	31.9	7.5
	1998	3.5	9.5	24.4	0.0	39.3	9.5
	2000	3.4	8.7	24.5	0.0	42.2	10.7
Indonesia	1995	3.4	23.0	8.4	0.8	7.4	0.3
	1998	4.3	18.0	9.5	0.6	5.4	0.4
	2000	5.1	19.9	17.3	0.8	7.6	1.2
Korea	1995	7.2	22.0	52.5	8.1	4.0	15.5
	1998	7.7	21.6	49.2	8.9	3.5	14.7
	2000	8.0	17.6	58.2	9.0	2.9	14.3
Malaysia	1995	3.0	8.8	55.1	0.6	3.1	17.9
	1998	3.5	8.3	59.2	0.7	3.1	19.0
	2000	3.8	6.9	62.5	0.4	2.3	19.1
Singapore	1995	6.0	6.3	65.6	1.0	1.2	15.6
	1998	6.5	4.5	66.4	0.8	1.3	17.7
	2000	7.0	3.8	67.4	0.7	1.3	25.0
Thailand	1995	4.4	11.7	33.6	1.3	8.9	5.2
	1998	4.5	11.7	40.8	2.4	6.6	5.9
	2000	5.9	11.7	43.7	3.6	5.5	8.5
Memorandum item: World demand for specific commodities in total world demand							
	1995	10.0	16.1	37.8	2.6	8.7	3.4
	1998	9.9	15.0	40.3	2.6	9.1	3.6
	2000	9.5	13.7	40.8	3.2	8.6	3.5

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[31] The shares in Tables 2-6 are computed from annual data from the Direction of Trade Statistics. The first figure is for 1995, the second for 1998 and the third for 2000.

Table 2. Asian exports to each other: Percentage of specific exports to Asian Partners (Comparison between 1995, 1998 and 2000).

		Chemical	Manufacture	Machinery	Vehicle	Clothing	Semiconductor
Hong	1995	10.4	10.1	18.4	7.7	0.9	32.1
Kong	1998	7.3	8.1	12.3	1.6	0.3	20.8
SAR	2000	12.1	7.6	14.3	14.1	0.4	22.2
Indonesia	1995	32.1	25.8	42.1	55.3	4.3	62.7
	1998	31.6	22.0	42.6	31.0	2.5	54.6
	2000	30.9	23.0	41.5	29.0	3.4	44.0
Korea	1995	25.9	27.4	17.9	5.4	1.6	30.0
	1998	16.6	19.2	14.9	1.1	2.5	30.7
	2000	18.3	19.2	13.4	3.0	1.1	29.2
Malaysia	1995	46.0	38.7	34.3	27.2	7.4	34.4
	1998	36.7	36.7	28.6	14.9	4.9	31.4
	2000	41.1	34.9	32.4	27.3	4.8	43.6
Singapore	1995	46.2	53.2	33.7	36.2	8.0	41.9
	1998	37.1	43.8	27.8	23.2	5.0	38.3
	2000	34.7	48.3	33.7	37.9	5.5	40.3
Thailand	1995	53.3	25.9	34.4	15.2	9.4	40.5
	1998	34.7	19.8	23.4	5.9	1.9	27.2
	2000	38.3	19.2	24.6	7.8	2.0	29.4

Table 3. Asian exports of specific commodities to the US
In percent of total exports of specific commodities (comparison between 1995, 1998 and 2000)

		Chemical	Manufacture	Machinery	Vehicle	Clothing	Semiconductor
Hong	1995	0.9	9.6	19.2	4.3	48.1	29.1
Kong	1998	1.0	12.4	17.6	1.3	47.1	26.8
SAR	2000	1.4	15.0	18.7	8.0	45.5	28.7
Indonesia	1995	3.4	7.4	24.4	11.2	32.5	23.5
	1998	5.4	11.4	15.2	10.4	45.3	14.8
	2000	6.2	10.0	14.7	8.0	42.6	7.1
Korea	1995	4.8	8.4	25.7	22.1	36.8	34.1
	1998	6.9	12.9	21.6	18.9	44.4	27.0
	2000	6.6	13.0	27.2	37.3	48.6	22.3
Malaysia	1995	9.3	6.8	29.3	3.2	48.7	33.5
	1998	10.3	8.1	28.5	7.7	54.2	30.9
	2000	10.0	8.8	25.7	5.3	53.3	19.7
Singapore	1995	7.6	2.3	24.1	3.9	53.4	20.3
	1998	6.5	3.6	25.5	5.1	54	20.8
	2000	5.9	4.8	21.6	3.0	56.8	18.6
Thailand	1995	2.3	13.6	20.6	6.3	24.9	21.8
	1998	2.7	17.8	24.3	4.0	50.1	23.1
	2000	3.5	18.6	20.4	2.7	54.0	21.0

Table 4. Asian exports of specific commodities to Japan
In percent of total exports of specific commodities (comparison between 1995, 1998 and 2000).

		Chemical	Manufacture	Machinery	Vehicle	Clothing	Semiconductor
Hong Kong SAR	1995	2.8	2.4	4.6	0.3	3.2	5.1
	1998	2.0	0.9	5.8	0.3	1.0	7.0
	2000	1.6	1.6	5.0	1.1	0.7	4.5
Indonesia	1995	8.9	22.7	7.6	6.0	10.0	7.1
	1998	7.3	13.0	16.2	8.7	4.5	14.0
	2000	8.9	17.9	15.7	14.5	3.9	29.7
Korea	1995	10.2	12.9	8.5	1.5	37.0	15.3
	1998	7.9	8.7	5.7	1.0	20.6	8.7
	2000	8.3	9.4	8.3	1.2	21.4	11.4
Malaysia	1995	10.8	14.7	9.4	3.8	5.0	7.9
	1998	9.7	11.5	8.7	3.2	4.4	6.8
	2000	11.1	15.0	10.9	4.0	5.6	8.3
Singapore	1995	5.3	3.5	7.6	3.2	4.3	8.6
	1998	5.0	4.6	6.4	5.1	3.2	6.3
	2000	5.2	3.5	6.6	4.7	2.3	6.3
Thailand	1995	8.9	11.3	15.3	6.0	9.9	16.5
	1998	10.2	9.3	12.6	7.1	8.0	18.0
	2000	10.4	12.7	14.3	6.3	7.2	14.4

Table 5. Co-integration Results for Single Equation Demand Estimation

Country	Industry	Co-integration at 5 percent level of significance	Coefficient* Own price	Competitors price	World demand
Hong Kong	Chemicals	YES	2.0	0	1.06
	Manufactures	YES	0.98	0	0.97
	Machinery	YES	1.9	0.7	0.9
	Semiconductors	YES	0.0	1.4	0.68
	Clothing	YES	1.25	0	0
Korea	Chemicals	YES	-1.2	1.6	0.6
	Manufactures	YES	0	1.03	1
	Machinery	NO	-0.42	1.09	1.66
	Passenger cars	NO	0	7.5	2.16
	Semiconductors	YES	-0.77	0	0.49
	Clothing	YES	-3.06	0	0.72
Singapore	Chemicals	NO	-0.96	0.7	1
	Manufactures	NO	0.48	0.78	1.25
	Machinery	YES	-0.56	0	1.26
Thailand	Chemicals	YES	0	0	1.28
	Manufactures	YES	-0.73	0.74	1.1
	Machinery	YES	-0.6	1.52	0.99
	Passenger cars	YES	0	0	2.13
	Semiconductors	YES	-0.62	1.86	0.61
	Clothing	NO	-0.62	1.16	0.54
Indonesia	Chemicals	YES	-0.89	0.62	0.95
	Manufactures	YES	-0.86	0	0.61
	Machinery	YES	-0.85	0	0
	Road vehicles	YES	-0.85	2.02	0.68
	Semiconductors	NO	0	0	0
	Clothing	YES	-0.72	0	0
Malaysia	Chemicals	YES	-0.58	1.17	0.63
	Manufactures	YES	-0.85	1.56	0.72
	Machinery	YES	-0.82	2.52	0.89
	Road vehicles	YES	-0.77	0	1
	Semiconductors	YES	-0.76	2.12	0.4
	Clothing	NO	-1.17	1.98	0.89

*Actual coefficient values are reported only if the variable is significantly different from zero at 5 percent level of significance

Table 6. Co-integration Results for Single Equation Supply Estimation

Country	Industry	Co-integration at 5 percent level of significance	Coefficient* Export Volume	Private Credit	Nominal Exchange rate	Input Price
Hong Kong	Chemicals	YES	0	0	0	1.06
	Manufactures	YES	0	0	0	1.06
	Machinery	YES	0	0	0	1.05
	Semiconductors	YES	0	-0.29	0	2.13
	Clothing	YES	0.02	0	0	0.91
Korea	Chemicals	YES	-0.04	0	-0.31	0.88
	Manufactures	YES	0	0	-0.37	0.67
	Machinery	YES	-0.01	0	-0.24	0.61
	Passenger cars	YES	0	0	-0.27	0.89
	Semiconductors	YES	0	0	-0.27	0.88
	Clothing	YES	-0.02	0	-0.28	1.01
Singapore	Chemicals	YES	-0.03	0	-0.75	0.2
	Manufactures	YES	0	0	-0.9	0
	Machinery	YES	-0.04	0	-0.65	0
Thailand	Chemicals	YES	0	0	-0.43	1.15
	Manufactures	YES	0	0	-0.41	0.9
	Machinery	YES	-0.05	0	-0.33	0
	passenger cars	YES	0	0	-0.31	0
	Semiconductors	YES	0	0	-0.32	0
	Clothing	YES	0	0	-0.4	0.82
Indonesia	Chemicals	YES	-0.12	0	0	-0.89
	Manufactures	YES	-0.2	-0.18	0.26	-0.93
	Machinery	YES	-0.1	0	0.26	-0.92
	Road vehicles	YES	-0.06	0	0	-0.78
	Semiconductors	YES	0	-0.82	0	-1.32
	Clothing	YES	-0.09	0	0	-1.01
Malaysia	Chemicals	YES	-0.09	-0.32	-0.62	1.26
	Manufactures	YES	-0.13	-0.3	-0.7	1.3
	Machinery	YES	-0.9	-0.33	-0.64	1.28
	Road vehicles	YES	0	-0.38	-0.62	1.32
	Semiconductors	YES	-0.14	-0.28	-0.61	1.25
	Clothing	YES	0	-0.39	-0.6	1.28

*Actual coefficient values are reported only if the variable is significantly diiferent
from zero at 5 percent level of significance

Table 7. Estimation Results (Panel Approach)[32]

Long Run Demand: Dependent variable $= X_{it}$

	Chemicals	Manufactures	Machinery	Vehicle	Semiconductor	Clothing
P_{it}	-0.633	-0.753	-0.791	-0.736	-0.477	-1.164
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
P_{it}^c	0.564	1.184	1.408	0.691	1.680	0.043
	(0.26)	(0.00)	(0.00)	(0.05)	(0.00)	(0.90)
Y_t^w	1.713	0.497	1.551	1.680	1.810	-0.137
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.16)
Log likelihood	547.90	667.43	556.33	48.36	398.83	364.08
Countries	5	5	5	3	4	4
Obs. #	630	630	630	400	420	500

Short Run Demand: Dependent Variable $= \Delta X_{it}$

	Chemicals	Manufactures	Machinery	Vehicle	Semiconductor	Clothing
ΔP_{it-1}	-0.257	0.009	0.204	0.119	-0.144	0.604
	(0.17)	(0.95)	(0.45)	(0.62)	(0.39)	(0.00)
ΔP_{it-1}^c	0.694	0.149	0.341	1.352	0.866	-0.474
	(0.01)	(0.64)	(0.43)	(0.14)	(0.03)	(0.40)
ΔY_{t-1}^w	-0.409	-0.154	-0.136	-0.704	0.338	0.019
	(0.01)	(0.22)	(0.35)	(0.05)	(0.04)	(0.91)
ECD_{t-1}	-0.077	-0.088	-0.060	-0.130	-0.113 (0.00)	-0.254
	(0.00)	(0.00)	(0.01)	(0.00)		(0.00)
Implied speed (months)	12.9	11.4	16.6	7.7	8.8	3.9
R^2	0.36	0.48	0.38	0.27	0.29	0.57

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[32] Each long-run regression includes one lead and lag for the first difference of each continuous variable. The short-run equations include two lags for each continuous variable. All regressions include fixed effects for each country and monthly dummies, and controls for country-specific first-order auto-correlation in the error structure and contemporaneous correlation across countries in the long-run regressions. R-squares are not defined in the long-run regressions (see Greene, 1997). The speed of adjustment is calculated as the inverse of the opposite of the coefficient on the error correction term.

Table 7 (continuation)

Long Run Supply: Dependent variable: P_{it}

	Chemicals	Manufacture	Machinery	Vehicle	Semiconductor	Clothing
X_{ijt}	0.010	0.018	-0.018	-0.028	0.010	-0.047
	(0.45)	(0.13)	(0.12)	(0.01)	(0.23)	(0.01)
DC_{jt}	-0.057	-0.119	-0.204	-0.334	-0.342	-0.098
	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
E_{jt}	-0.229	-0.383	-0.252	-0.258	-0.507 (0.00)	-0.202
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
I_{jt}	0.441	0.526	0.387	0.181	0.990	0.206
	(0.00)	(0.00)	(0.00)	(0.12)	(0.00)	(0.00)
Log likelihood	1285.06	1430.44	1375.32	717.52	961.29	970.35
Countries	5	5	5	3	4	4
Obs. #	630	630	630	400	420	500

Short Run Supply: Dependent Variable $= \Delta P_{it}$

	Chemicals	Manufactures	Machinery	Vehicle	Semiconductor	Clothing
ΔX_{it-1}	0.025	0.010	-0.002	-0.007	0.021	-0.006
	(0.09)	(0.60)	(0.88)	(0.50)	(0.23)	(0.76)
ΔDC_{it-1}^c	0.041	0.070	0.034	0.033	0.065	0.029
	(0.67)	(0.46)	(0.72)	(0.75)	(0.61)	(0.77)
ΔE_{t-1}	0.067	0.053	0.081	0.118	0.324	0.128
	(0.59)	(0.65)	(0.47)	(0.32)	(0.00)	(0.31)
ΔI_{t-1}	-0.388	-0.414	-0.535	-0.668	-0.247	-0.687
	(0.11)	(0.08)	(0.02)	(0.03)	(0.42)	(0.03)
ECS_{t-1}	-0.052	-0.076	-0.044	-0.053	-0.038	-0.062
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Implied speed (months)	19.2	13.2	22.7	18.7	26.3	16.1
R^2	0.09	0.14	0.12	0.17	0.17	0.17