CITS WP 2005-09

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November 2005

Center for International Trade Studies (CITS) Working Paper

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October 31, 2005

Abstract

Exporter's price setting behavior and currency invoicing play a key role in the literature on the new open-economy macroeconomics. This paper estimates exchange rate pass-through coefficients for the exports of four ASEAN countries: Indonesia, Malaysia, the Philippines and Thailand. In addition, previous estimates of pass-through as well as invoicing behavior in East Asia are discussed in the context of regional integration. The new pass-through coefficients are estimated under two alternate specifications for up to 34 goods for each of the four ASEAN countries destined for up to 13 major markets. The results suggest: a) little pass-through is occurring in Southeast Asia and; b) this lack of pass-through is more likely attributable to the fact that they are small countries in a relatively integrated market, rather than evidence of pricing to market. The implications for regional monetary integration of this apparently low degree of pass-through are detailed.

JEL Classification: F12, F15, F31, F41

Keywords: exchange rate pass-through, pricing to market, invoice currency, ASEAN

[†] Earlier work on this subject was presented at the Joint YNU/KIEP International Conference in Yokohama, September 1-2, 2005 and the 80th Annual Conference of Western Economic Association International in San Francisco, July 4-8, 2005. The authors would like to thank Paul De Grauwe, Masanaga Kumakura, Akira Kohsaka, Etsuro Shioji, Kenshi Taketa, Nazrul Islam, Eric Ramstetter, Chan-Hyun Sohn, Sadayuki Takii, and Fukunari Kimura for helpful comments on earlier drafts. The study is financially supported by the Japan Society for the Promotion of Science through the Grant-in-Aid for Scientific Research (B), 116330059.

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1. Introduction

As regional integration has deepened through increased trade, investment and financial flows, there is now a lively debate as to whether East Asian economies can (successfully) form a monetary union. Analysis of East Asian monetary union generally follows one of two approaches.

The first is to apply the theory of optimum currency areas (OCA) to the East Asian region and to examine whether the region meets the pre-conditions for forming an OCA. Among the pre-conditions for OCA, business cycle synchronization and symmetry in the pattern of shocks are typically analyzed in the literature, as seen in Bayoumi and Eichengreen (1994), Bayoumi, Eichengreen and Mauro (2000), Shin and Wang (2004) and Zhang, Sato and McAleer (2004).

The second approach is to apply the framework of the "new open-economy macroeconomics" to the issues of East Asian monetary integration, optimal basket pegs, and other related issues. Otani (2002), for example, develops a theoretical model which examines the transmission effects of domestic and foreign monetary policies and conducts simulations for the international transmission effects between Japan and the United States. The new open-economy macroeconomics models make specific assumptions about firms' export pricing behavior, which greatly affects both the results of his theoretical analysis and model simulations. Otani (2002) reveals that the transmission effects differ substantially if firms adopt different price setting practices. Shioji (2004) investigates the optimal basket peg system for the East Asian economies with a new open-economy macroeconomics model. Notably, Shioji introduces the choice of invoice currency to the price-setting behavior of East Asian exporters as a variable and again finds the results sensitive to differences in the assumptions about invoicing practices. Thus, the firms' price setting behavior and currency invoicing play a key role in the literature on the new open-economy macroeconomics.

Price setting is particularly important when we investigate business cycle synchronization and symmetry in shocks under the OCA framework. Shin and Wang (2004) show that real output co-movements are driven by international trade, especially by

intra-industry trade. But, the extent of transmission through trade largely depends on the firm's price setting behavior. If the degree of exchange rate pass-through is low, shocks to the domestic country will not be smoothly transmitted to its trading partner. Thus, without analyzing the pattern of exchange rate pass-through, it is hard to discuss whether monetary integration is feasible in the region.

The objective of this study is, therefore, to examine the price-setting behavior of East Asian exporters relying on the analytical framework of exchange rate pass-through. While there have been numerous studies on exchange rate pass-through and pricing to market (PTM) over the past two decades (see Marston, 1990; Knetter, 1993; Gil-Pareja, 2002 among many others), typically these have focused on developed countries' export pricing behavior, such as the US, Japan and western European nations.[1] While there are recent exceptions, such as the study on export pricing in MERCOSUR (Chang and Winters, 2002) and a handful on export pricing in non-Japanese Asian countries (Lee, 1995; Toh and Ho, 2001; Parsley, 2004), pass-through studies on low- and middle-income countries are still scarce.

However, in the wake of the 1997-98 Asian financial crisis, it is imperative that we learn more about how, and to what degree, shocks are transmitted within the region in response to massive exchange rate changes.[2] Moreover, in response to the crisis, the most severely affected economies abandoned their *de facto* US dollar-peg systems and started to adopt more flexible exchange rate policies. Under the *de facto* US dollar-peg system, stabilizing their export prices in terms of US dollar was beneficial in avoiding exchange rate risk. Under the more flexible exchange rate system, however, price setting and/or currency invoicing became an imminent concern for East Asian economies owing to the increasing variability in bilateral exchange rates vis-à-vis the US dollar. Accordingly, the

[1] Much of the original pass-through and PTM literature was in response to concerns over the huge US-Japan trade deficit in the 1980s, so naturally much of the original work (Ohno, 1989 and Marston, 1990, for example) examined US and Japanese data.

[2] Ito, Sasaki and Sato (2005) examine the pass-through effects of exchange rate changes on domestic prices among East Asian countries using a conventional pass-through equation and VAR analysis, albeit using aggregated import price data and domestic price levels.

parameters of exchange rate pass-through derived from an empirical exercise will help better inform decisions on appropriate exchange policy and other open-macroeconomic issues. Our work will contribute to this field by providing empirical evidence on pricing behavior of East Asian exporters.

The current paper advances the empirical literature in four respects: 1) a more comprehensive measurement of exchange-rate pass-through in ASEAN is conducted to augment existing knowledge on the degree of pass-through in East Asia (we cover four major ASEAN countries and at a greater level of detail); 2) there are few papers on LDCs and other small countries in general, thus, our paper will contribute to the understanding of pass-through from smaller, lower-income countries, and enable us to compare the results with previous work on developed countries; 3) the predominance of US dollar invoicing of East Asian exports is documented and its implications discussed in the context of possible regional monetary integration; and 4) an overall picture of the relationship between exchange rate movements and transmission of shocks based on 1) and 2) will yield important insights into the viability of monetary integration in the region.

The paper is organized as follows. Section 2 summarizes the previous work on the estimation of pass-through in East Asia. Section 3 presents two specifications of exchange pass-though, then describes the data used in estimation of 34 categories of goods exported by the four ASEAN countries, and finally presents the results of the those two sets of regressions. Section 4 discusses the prevalence of dollar invoicing in East Asia and the implications for exchange-rate pass-through and regional monetary integration. Section 5 concludes the paper by summarizing the findings of low pass-though and widespread dollar invoicing and putting this in the greater context of East Asian monetary integration.

2. Previous Estimates of Pass-Through and PTM in East Asia

Estimates of exchange pass-through can be conducted at a very micro level (see, for example, Bourdet, 1996; or Hellerstein, 2004), more commonly at the industry-level (Feenstra, 1989; Knetter, 1989; Gil-Pareja, 2002 *inter alia*), and also at a semi-aggregate or aggregate macro level (Campa, Goldberg and González-Mínguez (2005) and Campa and

Goldberg (2002) to name just two.) Few studies have been done on smaller, developing countries, one notable exception being Chang and Winters' (2002) study on export pricing in MERCOSUR.

Some of the first estimates of exchange-rate pass-through and pricing to market were done for East Asia, most notably for Japan (see footnote 1). Many of these early studies were done at an industrial level, as is done in this paper. The seminal work by Marston (1990) found little pass-through and a great deal of PTM, at least among Japanese exports of transportation and electrical machinery. More recent work on exchange rate movements and prices have focused largely on Japanese trade (Takagi and Yoshida, 2001; Sasaki, 2002 among others). Very recently these studies have expanded estimates for East Asia (Sato, 2003; Sasaki, 2005 both of whom use HS 9-digit level of Japanese export and import data, respectively). There does not seem, as of yet, to be a general consensus as to whether Japan has a large or small amount of pass-through, though pass-through in exports seems to be greater than in Japanese imports (Takagi and Yoshida, 2001.)

A number of studies for nearly all OECD countries have been conducted at an aggregate or semi-aggregate level, including some East Asian countries. The above mentioned Campa and Goldberg (2002) is one fairly comprehensive study widely cited in recent years.

In contrast, very few studies have been specifically for the smaller members of East Asia[3], and even fewer at the industry-level. Lee (1995) looked at Korean manufacturing exports and found evidence of low pass-through (implying PTM under his modeling assumptions). Toh and Ho (2001) examined several primary good exports as well as several manufactured goods at a semi-aggregate level for Malaysia, Singapore, Taiwan, and Thailand for the pre-crisis period. Their study was not bilateral in nature, but instead estimated the co-movement of export prices with effective exchange rates which may account, in part, for their mixed results. For Taiwan, they found very low overall pass-through (13%) in their more aggregate study and suggest that this may be because

[3] The reader will note that we are using the term "East Asia" in the broadest sense, to include 'traditional' East Asia, namely, Japan, the Three Chinas, and South Korea, along with Southeast Asia.

Taiwanese exporters are price-takers in the large world market. Aw (1993) conducted a very careful study of footwear exports in Taiwan and found no pass-through in two out of four destination countries, and full pass-through in the other two (US and Hong Kong). While an important model for future work in this area, it is, alas, only one industry.

Parsley (2004) examined Hong Kong exports at an industrial level and found virtually no pricing to market. He equates this with full pass-though and attributes it to competitive market conditions and a lack of market segmentation for this very small, open economy. He does note, however, that alternative explanations are possible. Toh and Ho (mentioned above), also found a large degree of pass-through in their more aggregate study of Singaporean exports. In both cases, of course, the countries are entrepôts, and thus any results must be treated with caution given their huge dependence on imported inputs.

In other recent work, Parsons and Sato (2004), and Parsons (2004) found, again using detailed (9-digit, and 6 digit, respectively) data on Malaysia, Indonesia, and the Philippines, very little evidence of pass-through.[4]

Unfortunately, studies for mainland China seem non-existent and thus points to the desperate need for estimates for what is sure to be the largest exporter in the world very shortly.[5]

With this background in mind, we attempt to give a more complete picture of the relationship between exchange rate movements and export prices in the region. This is done in the next section where we present new results of estimates for four large ASEAN countries. Also, importantly, in the penultimate section, we discuss the impact of widespread US dollar invoicing conducted by (in many cases) small country exporters on regional shock transmissions. Based in part on our results, as well as invoicing currency data, the common practice by some open-macro modelers to assume of partial or even full exchange rate pass-through will be challenged.

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[4] To the authors' knowledge, these are the first studies of pass-through at an industry level of any kind for Indonesia and the Philippines.

[5] Having said this, the challenges working with Chinese data, especially when so much entrepôt activity occurs between mainland China, Hong Kong, and Taiwan before reaching its final destination market, are well-noted.

3. New Estimates of Exchange Rate Pass-Through in ASEAN

Most studies of pass-through or pricing to market have some model either explicitly or implicitly in mind and then proceed to estimate some relationship between the movement of exchange rates and the price of the good from the exporter's point of view (Knetter, 1989, 1992; Gil-Pareja, 2002; *inter alia*) or by looking at the import prices (e.g. Feenstra, 1989). Either specification, under certain assumption implies something about the behavior of price at "both ends" of the exporter/importer relationship. As Kreinin (1977) said in his seminal empirical work on this area,

> "The extent to which exchange rate changes are transformed into changes in the prices of imports (denominated in the local currency) and exports (denominated in the foreign currency) is known as the "pass-through" effect of the exchange rate adjustment." (p. 297.)

In the widely used Knetter specification (similar to equation 1 below), a correlation between the changes in export prices (denominated in the exporters' currency) and the bilateral exchange rate is typically interpreted as evidence of PTM.[6] An implication which follows from the model and this correlation is that the exchange rate change and related prices are *not* passed through to the destination country. Conversely, in the Feenstra paper, he looks at the movement of US import prices of Japanese cars, trucks and motorcycles in response to yen/dollar exchange rate changes. Under his modeling assumptions, the fact that there is less than full pass-through of the dollar appreciation of the earlier 1980s implies that at least some of the adjustment in the price is occurring at the other (Japanese exporter's) end. That is to say, loosely speaking, if the bilateral exchange rate fluctuates and the price doesn't change on the one end, it must be changing on the other. But in neither case did the authors actually look at what was happening at the other end. This is precisely what we set out to do in this section of the paper.

[6] Though, as Knetter makes quite clear, several alternatives are possible depending on a number of factors.

First, a Knetter-type equation is estimated, which looks at the movement of exporter prices in response to bilateral exchange rates. Next, we estimate an equation (for the same good) but instead look at the correlation between the price in the destination market's currency, to see if an appreciation or depreciation of the exporter's currency truly "passes through" in the form of higher or lower prices, as the case may be. Through this method of dual equation estimation we can infer whether or not: 1) bilateral exchange movements, particularly for small countries like those in ASEAN, actually pass through to the destination markets; and 2) whether this lack of pass-through (as it turns out in most cases) is due to adjustment at the exporters' end possibly due to PTM behavior, or whether it maybe something else.

The "something else" we posit may have very important implications. Unlike many of the highly differentiated manufactured goods exported by the US, Japan and Germany, the subject of many early pass-through studies, most of the goods exported from ASEAN are likely be bought in a worldwide, more or less integrated market, where the predictions of the models based on assumptions of imperfect competition, and more importantly, segmented markets may not be appropriate. While our results are straightforward, and perhaps less than exciting, we feel the implications for potential regional integration are.

3.1 Two Model Specifications

The first equation we estimate draws on the literature on "pricing to market" (PTM) and analyzes the degree of response of export prices to exchange rate changes based on the monopolistic firms' profit maximization problem.[7] This paper is a variant of the fixed-effects model proposed by Knetter (1989, 1993) and employs the following specification:[8]

$$\Delta \ln p_{it}^{x} = \theta_t + \beta_i \cdot \Delta \ln e_{it} + \varepsilon_{it}, \qquad (1)$$

[7] See Goldberg and Knetter (1997) for a detailed discussion on the exchange rate pass-through and PTM literature.

[8] Gil-Pareja (2002) also follows the Knetter's (1989, 1993) model.

where $i = 1,...,N$ and $t = 1,...,T$ index the destination of exports and time, respectively; Δ denotes the first difference operator; p^x is the export price in terms of the *exporter's* currency; e is the bilateral exchange rate (expressed as units of the exporter's currency per unit of the destination currency) multiplied by the destination market price level. The error term, ε, is assumed to be independently and identically distributed with mean zero and constant variance, σ_ε^2. θ_t and β_i are parameters to be estimated.

Prices and marginal costs may be different across destinations as the quality of goods may differ. These differences, so long as they are constant over time but differ only across destinations, can be "solved" away by differences as is done here and elsewhere (Knetter, 1993; Gil-Pareja, 2002 *inter alia*). Any changes in the quality of the good that may occur over time, so long as they are similar across destinations (a tenuous, yet also standard assumption), can be captured by time dummies (i.e. period effects) if necessary.

Our main interest is in the coefficient β_i. Our initial model allows for possible differences in the slope coefficient, β_i, across destination markets. The period effects (time dummies), θ_t, capturing possible quality changes over time, common to all destinations, may or not be significant. As the reader will see, our samples are quite small in some cases, and so if the betas can be pooled, it will greatly increase the power of our tests. *F*-tests conducted on the two countries with the largest samples (Indonesia and Malaysia) showed overwhelming support for the "common betas" hypothesis.[9] Thus, as in other studies (see Gil-Pareja (2002), Parsley (2004) *inter alia*), we find the assumption of common slope coefficient to be generally valid and thus assume it for all regressions. The validity of period effects was not as consistent, varying across specifications and countries, with roughly half accepting and half rejecting the hypothesis. In line with previous work, and in

[9] Only one good, for example, rejected the null of "common beta" in all 33 Indonesia exports, and even that was a borderline result.

order to err on the side too many coefficients rather than too few, we have included period effects in all estimates presented here.[10]

β can be interpreted as follows. Under the imperfect competition model where price discrimination may occur, a value of β equal to zero ($\beta = 0$) implies that the export price in terms of the exporter's currency does not respond to fluctuations in the bilateral exchange rate of the exporter's currency vis-à-vis the importer's currency. Hence, changes in exchange rates are fully passed through to importers.[11] Positive and significant values of β indicate a positive linkage between export prices in terms of the exporter's currency and exchange rates, which implies that exporters tend to stabilize the export price in terms of the importer's currency at least to a certain extent and, hence, they are likely to adopt a PTM strategy.[12]

However, a finding of $\beta = 0$ needs to be carefully interpreted, because the interpretation depends upon the market structure assumed. If perfect (worldwide) competition exists with little or no ability to segment destination markets, the export price is determined in an integrated world market, where price is equal to marginal cost. If a small country trades a product in such an integrated world market, the price is set at the world price (i.e. the small country is a price-taker) and is often invoiced in a major international currency, say, US dollars.[13] Hence, it is unlikely we would find any

[10] All regressions were done with no period effects as well. The evidence still points heavily towards our dual conclusions of "little pass-through" as well as rejection of the pricing to market model.

[11] Under the imperfect competition model, $\beta = 0$ implies constant elasticity of demand with respect to the local currency price in the destination markets, where the price charged to each destination market is a *fixed* markup over marginal cost.

[12] The positive and significant β implies that the demand schedule is less convex than a constant elasticity schedule.

[13] McKinnon (1979) argues that homogeneous and/or less differentiated goods that are traded in an integrated world market are invoiced in a major international currency, typically the US dollar. Although it is widely recognized that currency invoicing can matter a great deal in PTM and exchange rate pass-through (see, for example, Knetter, 1989, 1993, Gagnon and Knetter, 1995, Goldberg and Knetter, 1997), only a few attempts have been made at empirical examination of this

correlation between export prices in terms of the destination country's currency and the bilateral exchange rate of exporter's currency vis-à-vis the destination country's currency. In this case, $\beta = 0$ would also be consistent with a "small country in integrated world market" model, which for convenience we will refer as the "SCIM" model. Previous studies often assume the imperfect competition model and the existence of market segmentation or choose industries they think are likely candidates for PTM (automobiles, wine, and other manufactures.) However, as we wish to estimate pass-through coefficients which are reflective of overall East Asian trade, we do not want to rule out integrated markets *a priori*.

Accordingly, there are two types of interpretation for $\beta = 0$ in Equation 1, each of which largely depends on the assumption about market structure. To confirm which interpretation is more reasonable, we propose a second stage of empirical analysis in which we also consider the following specification:

$$\Delta \ln p_{it}^{m} = \theta_t + \beta_i \cdot \Delta \ln e_{it} + \varepsilon_{it}, \qquad (2)$$

where p^m is the export price in terms of the *destination* market's currency. In this specification, we can interpret β in the following way.[14] $\beta = 0$ implies that the price paid by importing countries does not respond to exchange rate fluctuations and hence, changes in bilateral exchange rates are not passed through in the PTM sense. Another interpretation of $\beta = 0$, however, is that the trading price is determined in a competitive and integrated world market (SCIM) and/or the price is set in a particular international currency (typically the US dollar), which results in no correlation between export prices in the destination market's currency and the bilateral exchange rate. Thus, there are two possible

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issue. A few exceptions are Fukuda and Ji (1994), Sato (1999), Donnenfeld and Haug (2003) and Sato (2003).

[14] As in the first specification, although Equation 2 indicates separate betas across destinations, our final regressions results reported here are only for pooled or "common" betas (and with period effects.)

interpretations even within Equation 2, which is conditional on the assumption of market structure. On the other hand, positive and significant values of β imply that at least some of the exchange rate movement is passed on to the importer in the form of higher or lower prices as the case may be. A value of unity would imply complete exchange rate pass-through. The various interpretations we have so far discussed are summarized in Table 1 which we will refer to again later when we interpret the empirical results.

Table 1: Matrix of Combination between Two Test Results

Stage 2 **: Eq.(2)** / ***Stage 1*** **: Eq.(1)**	$\beta = 0$	$\beta = -1$
$\beta = 0$	*FULL or SCIM* / *NO or SCIM*	*FULL or SCIM* / *FULL*
$\beta = 1$	*NO* / *NO or SCIM*	*NO* / *FULL*

Notes: The first column (row) shows the accepted hypothesis of coefficient β in Equation 1 (Equation 2). For example, the second row where the null hypothesis of $\beta = 0$ is accepted in Equation 1 implies either: (a) "FULL" (or complete) pass-through or (b) SCIM. The second column where the null of $\beta = 0$ is accepted in Equation 2 indicates (c) "NO" pass-through or (d) SCIM.

3.2 Data

This paper uses annual unit values of exports from four ASEAN countries: Indonesia, Malaysia, the Philippines, and Thailand at the HS-6 digit level distinguished by destination country and commodity. Data was taken from the UN COMTRADE database. The length of the panel is particular short, only spanning 1999-2004 for reasons which are explained below. There is a maximum of thirteen total destination markets for each exporting country, and so after differencing, the largest panel is 64 observations; those country-commodity panels with less than 15 observations were omitted. Appendix Table A1 contains a list of the destination markets. WPI (or PPI) was used as the destination market price for all countries except China, where only CPI is available. These price data

were obtained from the IMF, *International Financial Statistics (IFS)* CD-ROM. Bilateral exchange rates, all in foreign currency units per destination market currency, are cross-rates (vis-à-vis the dollar) constructed from the IFS source.[15]

It is often argued that unit value series do not account for quality changes in the product over time. However, such series of unit values used in this study are the only measure of export prices which are from individual countries and at the same time distinguished by destination market. The advantages of this approach should far outweigh the disadvantages for estimation of exchange rate pass-through.[16]

It is difficult to find such commodities ranging over a longer period which were actively exported by all four countries. Also, either because they simply were not exported at that time or due to other changes in the classification system over time, many categories do not extend back (in the COMTRADE data) very far, even at the six-digit level. Thus, the lengths of the panels are still quite short. However, this may be a strength as well as a weakness. As the samples are short, we largely avoid concerns that the product changed considerably over the time period. Also, in starting the sample after the Asian financial crisis of 1997-98, we bypass the major issues that such a massive shock may entail.[17]

Table 2: Top Export Categories for ASEAN-4

Indonesia	
HS-27	Mineral Fuels (oil)
HS-85	Electronic Equipment
HS-44	Wood and article of wood
HS-15	Animal and vegetable fat/oil (palm oil)
HS-84	Nuclear Reactors, Boilers

[15] Bilateral exchange rates vis-à-vis the German mark and French franc were calculated with the euro conversion rates taken from the European Central Bank's website (http://www.euro.ecb.int/en/section/conversion.html).

[16] Furthermore, as mentioned above, period effect dummies may capture any changes in quality over time.

[17] Thailand abandoned its basket-peg regime, and Malaysia initiated a fixed exchange rate regime in the wake of the crisis. Also, with massive swings in the exchange rate (as well as overall uncertainty as to the exchange regime itself) expectations may greatly complicate otherwise straightforward pass-through estimates.

Malaysia	
HS-85	Electronic Equipment
HS-84	Nuclear Reactors, Boilers
HS-27	Mineral Fuels (oil)
HS-15	Animal and vegetable fat/oil (palm oil)
HS-44	Wood and article of wood
Philippines	
HS-85	Electronic Equipment
HS-84	Nuclear Reactors, Boilers
HS-62	Articles of Apparel (knit)
HS-87	Vehicles
HS-61	Articles of Apparel (not knit)
Thailand	
HS-85	Electronic Equipment
HS-84	Nuclear Reactors, Boilers
HS-40	Rubber
HS-87	Vehicles
HS-39	Plastics

Unlike many previous studies on PTM and pass-through, we chose categories, not on the likelihood that we would find PTM (i.e. in differentiated products such as automobiles and wine, typical in studies on Japan, the US, and Europe), but rather on what reflects the bulk of the ASEAN-4 countries' exports. Table 2 displays the top five categories of goods exported (at an HS 2-digit level) for each of the four countries examined. As one can see, the composition of exports is not dissimilar. However, within each two-digit category, at a six-digit level, there are many products which one country may export to a large number of countries, while another ASEAN country may not export it at all. Thus, while the primary object was to estimate pass-through coefficients for "representative" commodities for each country, we also wanted to be able to compare across countries, and with commodities used in the few previous studies. Such a strategy guided our somewhat heuristic approach to selecting categories.

As seen in Appendix Table A2, a good deal of the categories are classified under the HS-85, which is a "top five" group for all four countries. However, in an effort to find similar products exported by all countries, we selected major (by volume) 6-digit level

commodities (in HS-85) exported by Indonesia[18], and at the same exported by the other three. Thus, as Malaysia's export composition is more similar to Indonesia, we have adequate data for almost all categories. Conversely, in Thailand and the Philippines the pattern is more dissimilar, and thus for more than a few categories, there was insufficient data to conduct proper analysis. Oil, rubber, palm oil and wood, were chosen both because they are in the top five, but also because they are "signature" exports for the region and have been the subject of earlier studies.[19] Lastly, some of the larger clothing categories (HS-62) exported by Thailand and the Philippines were chosen in part to capture another major type of export in ASEAN and also to broaden the sample, especially for these two countries.[20] This gives us a wide range of goods, both primary commodities and products involving (presumably) more sophisticated technology and reflects the top exports from the ASEAN region.

3.3 Results

As mentioned above, a separate regression for each source country-commodity pair was estimated (e.g. "Malaysian exports of palm oil, crude"). Thus, with four countries and a maximum of 34 commodities exported by each, after some missing commodities for some countries, we end up estimating 101 equations[21]. Appendix Tables A1 and A2 list the destination markets and commodities examined, respectively. We conducted the first stage analysis of exchange rate pass-through using Equation 1. 101 pass-through coefficients are

[18] Indonesia was chosen as the starting point purely for alphabetical reasons.

[19] And, perhaps, as "raw" commodities, pass-through coefficients can be more readily understood and interpreted.

[20] In the selection process, it is relatively easy to find goods that Thailand and the Philippines, and at the same time Indonesia and Malaysia consistently export. The reverse case is a bit more challenging.

[21] Although we have a maximum of 34 commodities for each country, several commodities were dropped from the sample if the number of observations was very small, i.e., 15 or less.

reported in Appendix Tables A3a-d.[22] Table 3 presents the summary results of tests for estimates with a common β across commodities for each destination.

Table 3: Summary Results of Hypothesis Tests from Two Pass-Through Equations

Country:	Results:	Equation 1 Exporter Prices	Equation 2 Destination Prices
Indonesia	Reject beta=0	1	2
	Cannot reject beta=0	32	31
Malaysia	Reject beta=0	3	5
	Cannot reject beta=0	28	26
Philippines	Reject beta=0	3	2
	Cannot reject beta=0	13	14
Thailand	Reject beta=0	5	8
	Cannot reject beta=0	16	13

Notes: All regressions include period effects, are corrected for heteroskedasticity and, if significant, at a 5% or greater level. Stage 1 (Stage 2) analysis employs Equation 1 (Equation 2) in the left-hand side of which export price in terms of exporter's (destination country's) currency appears.

Interestingly, the null hypothesis of $\beta = 0$ in Equation 1 cannot be rejected in most cases. The null is rejected in only 1 out of 33 goods for Indonesia, 3 out of 31 goods for Malaysia and 3 out of 16 goods for the Philippines. While the null is rejected in about one-third of the goods in Thailand, it is safe to say $\beta = 0$ in most cases, which could imply that complete pass-through is dominant in ASEAN-4 trade. Overall this would imply, *under PTM assumptions*, that complete pass-through is dominant in ASEAN-4 trade. A puzzle is how to interpret this result that seemingly shows such a strong tendency of complete pass-through.

[22] As mentioned in Section 3.1, the result of *F*-tests show that the null hypothesis of common β coefficients is not rejected in almost all cases. Hence, we report the results of estimation for a common β.

Recall that, as discussed in the previous sub-section, $\beta = 0$ can have two potential implications in Equation 1. Specifically, the interpretation depends on the assumption of market structure: (i) if imperfect competition is assumed, $\beta = 0$ implies complete pass-through; but (ii) if perfect competition or an integrated world market is assumed, $\beta = 0$ implies SCIM where the export price is determined in a world market.

To check which model is more appropriate, we move on to the second stage of analysis by estimating Equation 2. The far right column in Table 3 shows that the null of $\beta = 0$ cannot be rejected again in most cases,[23] but the implication is now very different. When interpreting Equation 2, $\beta = 0$ suggests no pass-through (or complete PTM) under the imperfect competition model, which is the complete opposite of the result obtained by Equation 1. If we assume the perfect competition model, however, $\beta = 0$ has another interpretation, namely that price is determined in a integrated world market. Looking back to Table 1, the combination of two "$\beta = 0$" indicates a conflict in interpretation of the results in the usual sense (i.e. under the imperfect competition model) between two equations. However, finding $\beta = 0$ in both equations is consistent with SCIM. Indeed, only if we assume SCIM are the estimates in both Equations 1 and 2 consistent.

Though the above results, like most pass-through studies, are found to be consistent with certain modeling assumptions without explicitly testing a structural model, we feel the preponderance of evidence suggests that exchange pass-through in the traditional "Kreinin" sense is indeed not occurring bilaterally for most exports in ASEAN. We now turn to the interpretation of these results in the context of monetary integration in East Asia.

4. Interpretation and Implications for Regional Integration in East Asia

The results of estimations summarized in Table 3 provide us with somewhat of a puzzle: one implies complete pass-through (from Equation 1) and the other no pass-through (from Equation 2) when assuming the imperfect competition model. If we assume the

[23] See Appendix Tables A4a-d as well, which report the detailed results of estimating Equation 2.

perfect competition model, however, $\beta = 0$ implies no correlation between export prices and bilateral exchange rates because the export commodity is traded in an integrated world market and the price is likely to be set or invoiced in a major international currency. It is of interest to note that Parsley (2004) employed the Knetter-type regression equation and found of 29 goods exported from Hong Kong, only 5 goods could reject the null of full pass-through. That is to say, he found "full" pass-through in the majority cases and attributed this to a lack of market segmentation power and its position as a small country.[24] As discussed so far, however, an analysis of exchange rate pass-through or PTM using only the Knetter-type equation may mask the "true" price setting behavior when we investigate a small country's trade.

Looking carefully at the sample commodities in our study, about half of the 34 commodities are electronics products that appear to be far more sophisticated and differentiated than mineral fuels, woods, rubber, etc. (see Appendix Table A2). However, electronics products which are actively traded in intra-Asian trade are, for the most part, intermediate products in the region and their final destination is mainly the United States (and, to a lesser extent, Japan and the EU). In this case, intra-Asian trade as well as trade with non-Asian countries is likely conducted (invoiced) in US dollars. This likely explains the finding of no correlation between the export price and the bilateral exchange rate vis-à-vis the importing (non-US) country's currency.[25]

Table 4 reports the pattern of currency invoicing in Indonesian non-oil exports. Some may find it surprising that US dollar invoicing is dominant (90 percent or over) in Indonesian exports. This implies that the US dollar is widely used in Indonesian exports to non-US markets including intra-Asian trade, as well as to the US, of course, even after the

[24] There are, of course, other technical challenges with using Hong Kong as a test-case for the 'typical small country' given its unique entrepôt status, and the various difficulties interpreting any data of the "Three China's" due to double-counting, switching invoices, re-exports, etc. See Feenstra *et al* (1998) *inter alia*. For similar reasons, we have not yet included Singapore in our study, but are now in the process of tackling those issues.

[25] Sato (1999, 2003) reveals that even in Japanese exports of electronics products to East Asian countries, the exporters tend to invoice their products in US dollars so that the prices can be stabilized in terms of the US dollar.

currency crisis in 1997-98. Table 5 shows that Korea's exports are also largely invoiced in US dollars; the share of US dollar-invoiced exports accounts for around 85 percent even after the start of the euro in 1999. Table 6 presents the destination breakdown of the currency invoicing ratio in Thailand's exports, which also suggests a very high share of US dollar invoicing even in its exports to developed countries, such as Japan and the EU. Accordingly, our results on exchange rate pass-through which suggest trade in a fairly integrated world market, may also reflect the dominant use of US dollar in East Asian trade. So long as the US dollar is the dominant invoice currency and/or East Asian exporters are price-takers in a world market, destination-specific PTM is unlikely to occur in East Asian exports. Importers both within and outside of East Asia in turn will bear the risk of exchange rate changes between US dollar and their own currency.

Table 4. Currency Invoicing Ratio of Indonesian Non-Oil Exports (Percentage Share)

	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
US Dollar	93.0	94.3	94.3	93.2	92.8	93.3	92.3	91.9	90.2	90.7	91.3
Japanese Yen	1.8	1.5	1.6	1.3	2.9	1.7	2.2	2.0	2.2	2.2	2.4
Singapore Dollar	1.7	2.7	2.8	2.5	1.8	2.8	3.0	2.8	2.8	3.1	2.9
German Mark	0.6	0.5	0.4	0.4	0.8	0.6	0.7	0.6	0.0	0.0	0.0
UK Pound	2.0	0.2	0.2	0.1	0.2	0.1	0.2	0.3	0.7	0.2	0.2
Euro	n.a.	n.a.	n.a.	n.a.	n.a.	0.1	0.4	1.0	2.4	2.3	2.0
Others	0.9	0.8	0.7	2.5	1.4	1.3	1.2	1.5	1.8	1.5	1.2

Note: "n.a." denotes "not available".

Source: Bank of Indonesia, *Statistik Ekonomi Keuangan Indonesia*, various issues

Table 5. Currency Invoicing Ratio of Korea's Exports (Percentage Share)

	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
US Dollar	88.0	88.1	89.1	89.2	88.5	85.6	84.8	87.4	86.8	85.4	84.3
Japanese Yen	7.8	6.5	5.1	5.0	5.0	6.0	5.4	5.4	5.2	5.4	5.3
German Mark	2.1	2.4	2.2	1.8	2.7	2.4	1.8	1.5	n.a.	n.a.	n.a.
UK Pound	0.5	0.8	1.0	0.9	1.0	0.9	0.7	0.7	0.8	0.8	1.0
Euro	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5.8	7.0	7.8
Others	1.7	2.2	2.6	3.2	2.9	5.1	7.4	5.0	1.4	1.5	1.6

Note: "n.a." denotes "not available".

Source: Bank of Korea, *Monthly Statistical Bulletin*, various issues

Table 6. Currency Invoicing Ratio of Thailand's Exports by Region (Percentage Share)

	US Dollar		Japanese Yen		Euro		Thai Baht		Others	
Export to:	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003
World	87.6	84.4	5.2	5.9	0.2	2.7	3.7	5.0	3.3	2.0
NAFTA	97.3	95.8	0.2	0.3	n.a.	n.a.	2.3	3.6	0.2	0.3
Japan	72.9	69.9	19.5	21.5	n.a.	n.a.	7.4	8.1	0.2	0.5
EU15	81.0	73.8	n.a.	n.a.	1.2	20.1	1.2	1.8	16.6	4.3
ASEAN	91.3	89.6	1.5	1.7	n.a.	n.a.	5.7	6.3	1.5	2.4

Notes: NAFTA consists of the United States, Canada and Mexico; ASEAN indicates the other nine ASEAN countries; "n.a." denotes "not available".

Source: Bank of Thailand's website (http://www.bot.or.th/BOTHomepage/databank/EconData/EconData_e.htm).

If SCIM and/or the dominant US dollar invoicing in East Asian exports continue to be robust, then the implications are important for the understanding of possible regional monetary integration in East Asia. First, under the new open-economy macroeconomics framework, Otani (2002) shows that the international transmission effect of domestic and foreign monetary policies is conditional on the firms' price setting behavior, i.e., producer currency pricing or local currency pricing. When investigating the transmission effect with East Asia or between an East Asian country and, say, Japan, we need to introduce "US dollar pricing" in the model.[26] Second, given the fact that East Asian countries invoice their trade in US dollars, US economic shocks will be transmitted to East Asian countries, but not vice versa. Third, as long as US dollar invoicing is dominant in East Asian trade, it is more advantageous for East Asian countries to stabilize their currencies vis-à-vis the US dollar as about 50 percent or more of the ASEAN-4 exports are directed toward the other East Asian economies and the United States.[27] However, when East Asian countries export

[26] Shioji (2004) already introduced US dollar invoicing in the model for his work on basket peg systems in East Asian countries.

[27] The share of exports to regional (the other eight East Asian countries) economies plus the United States as of 2004 was 48.3 percent for Indonesia, 61.8 percent for Malaysia, 50.6 percent for Thailand, and 56.9 percent for the Philippines (calculated from ICSEAD, 2005).

their products outside the region, a depreciation of East Asian currency vis-à-vis the US dollar will not necessarily result in lower prices in the destination market nor in an improvement of trade balances because the importers' currency may fluctuate freely vis-à-vis the US dollar. These aspects need to be taken into consideration in any study of East Asian monetary integration.

5. CONCLUSION

We are still a bit far away from being able to generalize the extent of pass-through in East Asia. However, as recent estimates in this paper and some previous estimates suggest, pass-through is far less prevalent, and indeed may be virtually non-existent in some countries in East Asia. At the same time, unlike some previous work in this area, we suspect this lack of pass-through has far less to do with an ability to segment markets and price discriminate than with the fact that these are, in many cases, small countries exporting in a relatively integrated world market, and whose exports are invoiced primarily in the US dollar.

As we have detailed above, this apparent lack of pass-through has important implications for the transmission of shocks throughout the region, as well as with countries outside East Asia. These implications can help lead to both more accurate assumptions regarding open-macro modeling of East Asia in the future and help guide policymakers in assessing the future and fate of regional monetary integration for East Asia.

The empirical work of pass-through in East Asia up to date is still insufficient. Aw's (1993) detailed study of the footwear is one possible strategy to expand upon, though the informational demands would be quite large. More studies at an industry level, such as those presented here, especially for Taiwan, China, and Hong Kong, are paramount. Great care must be taken, however, to assess pass-through here due to the data complications arising from determination of final destination, transshipment and "switched bills" resulting in "missing data" and the like which plagues Chinese trade data (see Feenstra, 1998, and Sung, 2002). Likewise, the ever-growing role of MNCs in trade, as well as the effect of

large tariff changes and anti-dumping duties (when they occur) on the estimates must be considered.

Nonetheless, these challenges should not deter more work towards much needed estimates in this area. Moreover, we must keep an open mind when making the estimates, and not simply carry over equations from the PTM literature which was developed often with different countries, specific industries, and sometimes different policy questions in mind. Indeed, as Kreinin (1977) said, "In essence, the pass-through question is an empirical one …When an issue is sufficiently important, then—given the well-known possibility of errors in any empirical investigation—it is desirable to employ as many approaches as possible to investigate it."

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Appendix Table A1: List of Destination Markets Used in Study

1	Australia
2	Canada
3	China
4	France
5	Germany
6	Hong Kong
7	Indonesia
8	Japan
9	Korea
10	Malaysia
11	Singapore
12	Thailand
13	United Kingdom
14	United States

Appendix Table A2: Commodities Selected for Study

	HS Code	Product description
1	151110	Palm Oil, Crude
2	270900	Petroleum oils, oils from bituminous minerals, crude
3	400110	Natural rubber latex, including prevulcanised
4	440910	Coniferous wood continuously shaped along any edges
5	440920	Non-conifer wood continuously shaped along any edges
6	441300	Densified wood, in blocks, plates, strips or profile
7	441810	Windows, French-windows, frames, of wood
8	441820	Doors, frames and thresholds, of wood
9	441830	Parquet panels and tiles, of wood
10	441890	Builder's joinery and carpentry of wood, n.e.s.
11	442010	Video recording of magnetic tape-type
12	442090	Wood marquetry, laid; caskets & cases for jewels, etc.
13	620342	Mens', boys' trousers & shorts, of cotton, not knit
14	620462	Womens', girls' trousers & shorts, of cotton, not knit
15	620520	Mens', boys' shirts, of cotton, not knit
16	620630	Womens', girls' blouses & shirts, of cotton, not knit
17	621210	Brassieres and parts thereof
18	841480	Air or gas compressors, hoods
19	847110	Analogue or hybrid computers
20	850110	Electric motors of an output < 37.5 watts
21	851310	Portable battery and magneto-electric lamps
22	852110	Video recording/reproducing apparatus, magnetic tape
23	853210	Fixed power capacitors (50/60 herz circuits)
24	853223	Electric capacitors, fixed, ceramic, single layer
25	853225	Electric capacitors, fixed, paper/plastic dielectric
26	853321	Electrical resistors fixed, power capacity < 20 watt
27	853329	Electrical resistors, fixed, except heating, > 20 watt
28	853339	Wirewound variable resistors, rheostats, etc. > 20 watt
29	853400	Electronic printed circuits
30	853620	Automatic circuit breakers for < 1,000 volts
31	853641	Electrical relays for < 60 volts
32	853649	Electrical relays for 60 - 1,000 volts
33	853922	Filament lamps, of a power <= 200 Watt, > 100 volts
34	853931	Fluorescent lamps, hot cathode

Appendix Table A3a: Estimates of β across Products in Indonesian Exports (Eq.1)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	-0.64	0.93		30
270900	2	Petroleum oils, oils from bituminous minerals, crude	2.42	2.19		34
400110	3	Natural rubber latex, including prevulcanised	0.09	1.90		51
440910	4	Coniferous wood continuously shaped along any edges	-0.57	1.15		54
440920	5	Non-conifer wood continuously shaped along any edges	0.07	0.62		54
441300	6	Densified wood, in blocks, plates, strips or profile	-0.17	0.28		54
441810	7	Windows, French-windows, frames, of wood	-1.76	3.43		44
441820	8	Doors, frames and thresholds, of wood	-0.09	0.55		54
441830	9	Parquet panels and tiles, of wood	-0.23	0.13		53
441890	10	Builder's joinery and carpentry of wood, n.e.s.	0.47	0.27		54
442010	11	Video recording of magnetic tape-type	0.66	0.75		54
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	0.24	1.45		54
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	2.38	0.88	**	64
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	1.08	0.56		60
620520	15	Mens', boys' shirts, of cotton, not knit	0.25	0.48		64
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	-0.55	2.90		63
621210	17	Brassieres and parts thereof	-1.81	2.13		60
841480	18	Air or gas compressors, hoods	1.63	5.37		43
847110	19	Analogue or hybrid computers	2.98	3.45		40
850110	20	Electric motors of an output < 37.5 watts	0.70	2.79		43
851310	21	Portable battery and magneto-electric lamps	-0.82	1.43		39
852110	22	Video recording/reproducing apparatus, magnetic tape	2.59	2.26		53
853210	23	Fixed power capacitors (50/60 herz circuits)	-11.22	11.65		18
853223	24	Electric capacitors, fixed, ceramic, single layer	7.97	6.18		21
853225	25	Electric capacitors, fixed, paper/plastic dielectric	n.a.	n.a.		5
853321	26	Electrical resistors fixed, power capacity < 20 watt	1.66	2.53		30
853329	27	Electrical resistors, fixed, except heating, > 20 watt	-4.32	8.66		20
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	-7.13	6.55		29
853400	29	Electronic printed circuits	0.09	3.67		44
853620	30	Automatic circuit breakers for < 1,000 volts	-0.54	3.81		29
853641	31	Electrical relays for < 60 volts	2.93	1.76		40
853649	32	Electrical relays for 60 - 1,000 volts	0.85	1.70		49
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	-2.83	3.60		30
853931	34	Fluorescent lamps, hot cathode	-0.14	1.06		54

Notes: The results of estimations by Equation 1 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A3b: Estimates of β across Products in Malaysian Exports (Eq.1)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	0.66	0.33	*	21
270900	2	Petroleum oils, oils from bituminous minerals, crude	-0.06	0.15		34
400110	3	Natural rubber latex, including prevulcanised	-0.21	0.26		51
440910	4	Coniferous wood continuously shaped along any edges	n.a.	n.a.		11
440920	5	Non-conifer wood continuously shaped along any edges	n.a.	n.a.		n.a.
441300	6	Densified wood, in blocks, plates, strips or profile	3.46	2.33		54
441810	7	Windows, French-windows, frames, of wood	-0.46	2.31		24
441820	8	Doors, frames and thresholds, of wood	0.30	0.39		52
441830	9	Parquet panels and tiles, of wood	0.09	1.10		48
441890	10	Builder's joinery and carpentry of wood, n.e.s.	0.85	0.64		54
442010	11	Video recording of magnetic tape-type	-0.76	1.51		35
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	1.73	6.56		35
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	-1.11	1.29		62
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	1.00	1.05		50
620520	15	Mens', boys' shirts, of cotton, not knit	0.23	0.86		63
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	1.95	1.06		49
621210	17	Brassieres and parts thereof	-3.32	2.32		58
841480	18	Air or gas compressors, hoods	5.26	3.11		54
847110	19	Analogue or hybrid computers	-0.16	2.32		49
850110	20	Electric motors of an output < 37.5 watts	2.33	0.34	**	53
851310	21	Portable battery and magneto-electric lamps	1.50	2.36		31
852110	22	Video recording/reproducing apparatus, magnetic tape	2.75	0.57	**	52
853210	23	Fixed power capacitors (50/60 herz circuits)	1.17	1.09		47
853223	24	Electric capacitors, fixed, ceramic, single layer	-3.45	5.76		32
853225	25	Electric capacitors, fixed, paper/plastic dielectric	4.92	6.14		42
853321	26	Electrical resistors fixed, power capacity < 20 watt	10.18	2.90	**	48
853329	27	Electrical resistors, fixed, except heating, > 20 watt	2.48	9.69		49
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	-1.94	5.92		35
853400	29	Electronic printed circuits	-4.93	3.97		54
853620	30	Automatic circuit breakers for < 1,000 volts	2.47	5.68		45
853641	31	Electrical relays for < 60 volts	-4.08	2.39		54
853649	32	Electrical relays for 60 - 1,000 volts	2.97	2.70		52
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	n.a.	n.a.		12
853931	34	Fluorescent lamps, hot cathode	2.83	5.94		18

Notes: The results of estimations by Equation 1 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A3c: Estimates of β across Products in Philippines Exports (Eq.1)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	n.a.	n.a.		n.a.
270900	2	Petroleum oils, oils from bituminous minerals, crude	n.a.	n.a.		n.a.
400110	3	Natural rubber latex, including prevulcanised	n.a.	n.a.		n.a.
440910	4	Coniferous wood continuously shaped along any edges	n.a.	n.a.		n.a.
440920	5	Non-conifer wood continuously shaped along any edges	n.a.	n.a.		n.a.
441300	6	Densified wood, in blocks, plates, strips or profile	n.a.	n.a.		n.a.
441810	7	Windows, French-windows, frames, of wood	n.a.	n.a.		n.a.
441820	8	Doors, frames and thresholds, of wood	0.82	3.69		23
441830	9	Parquet panels and tiles, of wood	n.a.	n.a.		n.a.
441890	10	Builder's joinery and carpentry of wood, n.e.s.	-3.49	4.23		33
442010	11	Video recording of magnetic tape-type	2.22	0.84	**	45
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	4.45	3.49		34
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	-0.44	0.93		49
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	-0.38	0.78		49
620520	15	Mens', boys' shirts, of cotton, not knit	1.07	0.88		52
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	-0.47	3.10		44
621210	17	Brassieres and parts thereof	-2.83	1.67		50
841480	18	Air or gas compressors, hoods	-3.05	1.77		32
847110	19	Analogue or hybrid computers	n.a.	n.a.		n.a.
850110	20	Electric motors of an output < 37.5 watts	-8.41	6.22		26
851310	21	Portable battery and magneto-electric lamps	n.a.	n.a.		n.a.
852110	22	Video recording/reproducing apparatus, magnetic tape	n/a	n/a		11
853210	23	Fixed power capacitors (50/60 herz circuits)	n.a.	n.a.		n.a.
853223	24	Electric capacitors, fixed, ceramic, single layer	n.a.	n.a.		n.a.
853225	25	Electric capacitors, fixed, paper/plastic dielectric	n.a.	n.a.		n.a.
853321	26	Electrical resistors fixed, power capacity < 20 watt	n.a.	n.a.		n.a.
853329	27	Electrical resistors, fixed, except heating, > 20 watt	0.03	1.94		37
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	n.a.	n.a.		n.a.
853400	29	Electronic printed circuits	1.47	2.73		48
853620	30	Automatic circuit breakers for < 1,000 volts	n.a.	n.a.		10
853641	31	Electrical relays for < 60 volts	2.27	0.82	**	20
853649	32	Electrical relays for 60 - 1,000 volts	n.a.	n.a.		15
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	-5.44	8.22		23
853931	34	Fluorescent lamps, hot cathode	0.85	0.17	**	16

Notes: The results of estimations by Equation 1 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A3d: Estimates of β across Products in Thailand Exports (Eq.1)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	n.a.	n.a.		n.a.
270900	2	Petroleum oils, oils from bituminous minerals, crude	n.a.	n.a.		n.a.
400110	3	Natural rubber latex, including prevulcanised	0.21	0.14		22
440910	4	Coniferous wood continuously shaped along any edges	n.a.	n.a.		n.a.
440920	5	Non-conifer wood continuously shaped along any edges	0.73	0.79		20
441300	6	Densified wood, in blocks, plates, strips or profile	n.a.	n.a.		n.a.
441810	7	Windows, French-windows, frames, of wood	n.a.	n.a.		n.a.
441820	8	Doors, frames and thresholds, of wood	-1.21	1.22		17
441830	9	Parquet panels and tiles, of wood	n.a.	n.a.		13
441890	10	Builder's joinery and carpentry of wood, n.e.s.	-9.95	5.07		20
442010	11	Video recording of magnetic tape-type	1.35	0.83		22
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	-2.81	2.29		18
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	-1.25	0.24	**	26
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	-0.05	0.01	**	25
620520	15	Mens', boys' shirts, of cotton, not knit	-4.35	1.15	**	26
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	0.97	0.20	**	26
621210	17	Brassieres and parts thereof	1.31	1.72		24
841480	18	Air or gas compressors, hoods	8.93	3.14	**	18
847110	19	Analogue or hybrid computers	n.a.	n.a.		n.a.
850110	20	Electric motors of an output < 37.5 watts	1.48	1.32		22
851310	21	Portable battery and magneto-electric lamps	-6.47	8.72		16
852110	22	Video recording/reproducing apparatus, magnetic tape	n.a.	n.a.		8
853210	23	Fixed power capacitors (50/60 herz circuits)	n.a.	n.a.		14
853223	24	Electric capacitors, fixed, ceramic, single layer	-0.13	1.36		19
853225	25	Electric capacitors, fixed, paper/plastic dielectric	n/a	n/a		n/a
853321	26	Electrical resistors fixed, power capacity < 20 watt	-0.08	0.06		19
853329	27	Electrical resistors, fixed, except heating, > 20 watt	2.61	7.16		16
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	n.a.	n.a.		14
853400	29	Electronic printed circuits	-0.16	0.14		22
853620	30	Automatic circuit breakers for < 1,000 volts	n.a.	n.a.		12
853641	31	Electrical relays for < 60 volts	-0.75	1.92		19
853649	32	Electrical relays for 60 - 1,000 volts	3.25	3.87		20
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	n.a.	n.a.		11
853931	34	Fluorescent lamps, hot cathode	0.34	0.31		16

Notes: The results of estimations by Equation 1 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A4a: Estimates of β across Products in Indonesian Exports (Eq.2)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	-1.03	0.90		30
270900	2	Petroleum oils, oils from bituminous minerals, crude	2.10	2.21		34
400110	3	Natural rubber latex, including prevulcanised	-0.24	1.92		51
440910	4	Coniferous wood continuously shaped along any edges	-0.91	1.16		54
440920	5	Non-conifer wood continuously shaped along any edges	-0.27	0.60		54
441300	6	Densified wood, in blocks, plates, strips or profile	-0.51	0.20		54
441810	7	Windows, French-windows, frames, of wood	-2.11	3.34		44
441820	8	Doors, frames and thresholds, of wood	-0.43	0.60		54
441830	9	Parquet panels and tiles, of wood	-0.59	0.21	**	53
441890	10	Builder's joinery and carpentry of wood, n.e.s.	0.14	0.23		54
442010	11	Video recording of magnetic tape-type	0.32	0.71		54
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	-0.10	1.47		54
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	2.17	0.88	*	64
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	0.89	0.60		60
620520	15	Mens', boys' shirts, of cotton, not knit	0.04	0.52		64
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	-0.75	2.93		63
621210	17	Brassieres and parts thereof	-2.01	2.11		60
841480	18	Air or gas compressors, hoods	1.36	5.44		43
847110	19	Analogue or hybrid computers	2.54	3.42		40
850110	20	Electric motors of an output < 37.5 watts	0.37	2.79		43
851310	21	Portable battery and magneto-electric lamps	-1.11	1.41		39
852110	22	Video recording/reproducing apparatus, magnetic tape	2.26	2.25		53
853210	23	Fixed power capacitors (50/60 herz circuits)	-11.74	11.46		18
853223	24	Electric capacitors, fixed, ceramic, single layer	8.23	6.32		21
853225	25	Electric capacitors, fixed, paper/plastic dielectric	n.a.	n.a.		5
853321	26	Electrical resistors fixed, power capacity < 20 watt	1.62	2.49		30
853329	27	Electrical resistors, fixed, except heating, > 20 watt	-4.26	8.70		20
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	-7.10	6.46		29
853400	29	Electronic printed circuits	-0.23	3.65		44
853620	30	Automatic circuit breakers for < 1,000 volts	-0.64	3.71		29
853641	31	Electrical relays for < 60 volts	2.55	1.85		40
853649	32	Electrical relays for 60 - 1,000 volts	0.48	1.65		49
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	-3.07	3.61		30
853931	34	Fluorescent lamps, hot cathode	-0.48	1.13		54

Notes: The results of estimations by Equation 2 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A4b: Estimates of β across Products in Malaysian Exports (Eq.2)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	-0.11	0.33		21
270900	2	Petroleum oils, oils from bituminous minerals, crude	-0.73	0.22	**	34
400110	3	Natural rubber latex, including prevulcanised	-0.72	0.30	*	51
440910	4	Coniferous wood continuously shaped along any edges	n.a.	n.a.		11
440920	5	Non-conifer wood continuously shaped along any edges	n.a.	n.a.		n.a.
441300	6	Densified wood, in blocks, plates, strips or profile	2.93	2.29		54
441810	7	Windows, French-windows, frames, of wood	-1.23	2.25		24
441820	8	Doors, frames and thresholds, of wood	-0.20	0.34		52
441830	9	Parquet panels and tiles, of wood	-0.41	1.20		48
441890	10	Builder's joinery and carpentry of wood, n.e.s.	0.32	0.61		54
442010	11	Video recording of magnetic tape-type	-1.21	1.42		35
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	1.25	6.47		35
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	-1.50	1.26		62
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	0.74	1.02		50
620520	15	Mens', boys' shirts, of cotton, not knit	-0.20	0.82		63
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	1.75	1.13		49
621210	17	Brassieres and parts thereof	-3.69	2.31		58
841480	18	Air or gas compressors, hoods	4.73	3.09		54
847110	19	Analogue or hybrid computers	-0.71	2.25		49
850110	20	Electric motors of an output < 37.5 watts	1.81	0.28	**	53
851310	21	Portable battery and magneto-electric lamps	0.85	2.37		31
852110	22	Video recording/reproducing apparatus, magnetic tape	2.25	0.60	**	52
853210	23	Fixed power capacitors (50/60 herz circuits)	0.68	1.10		47
853223	24	Electric capacitors, fixed, ceramic, single layer	-3.94	5.66		32
853225	25	Electric capacitors, fixed, paper/plastic dielectric	4.59	6.08		42
853321	26	Electrical resistors fixed, power capacity < 20 watt	9.72	2.89	**	48
853329	27	Electrical resistors, fixed, except heating, > 20 watt	1.97	9.75		49
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	-2.21	5.91		35
853400	29	Electronic printed circuits	-5.46	4.01		54
853620	30	Automatic circuit breakers for < 1,000 volts	1.86	5.75		45
853641	31	Electrical relays for < 60 volts	-4.68	2.44		54
853649	32	Electrical relays for 60 - 1,000 volts	2.48	2.63		52
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	n.a.	n.a.		12
853931	34	Fluorescent lamps, hot cathode	2.12	6.11		18

Notes: The results of estimations by Equation 2 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A4c: Estimates of β across Products in Philippines Exports (Eq.2)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	n.a.	n.a.		n.a.
270900	2	Petroleum oils, oils from bituminous minerals, crude	n.a.	n.a.		n.a.
400110	3	Natural rubber latex, including prevulcanised	n.a.	n.a.		n.a.
440910	4	Coniferous wood continuously shaped along any edges	n.a.	n.a.		n.a.
440920	5	Non-conifer wood continuously shaped along any edges	n.a.	n.a.		n.a.
441300	6	Densified wood, in blocks, plates, strips or profile	n.a.	n.a.		n.a.
441810	7	Windows, French-windows, frames, of wood	n.a.	n.a.		n.a.
441820	8	Doors, frames and thresholds, of wood	0.54	3.63		23
441830	9	Parquet panels and tiles, of wood	n.a.	n.a.		n.a.
441890	10	Builder's joinery and carpentry of wood, n.e.s.	-4.00	4.12		33
442010	11	Video recording of magnetic tape-type	1.58	0.88		45
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	3.81	3.42		34
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	-0.89	1.00		49
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	-0.85	0.82		49
620520	15	Mens', boys' shirts, of cotton, not knit	0.59	0.83		52
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	-0.92	3.22		44
621210	17	Brassieres and parts thereof	-3.34	1.66	*	50
841480	18	Air or gas compressors, hoods	-3.80	1.66	*	32
847110	19	Analogue or hybrid computers	n.a.	n.a.		n.a.
850110	20	Electric motors of an output < 37.5 watts	-8.92	6.30		26
851310	21	Portable battery and magneto-electric lamps	n.a.	n.a.		n.a.
852110	22	Video recording/reproducing apparatus, magnetic tape	n.a.	n.a.		11
853210	23	Fixed power capacitors (50/60 herz circuits)	n.a.	n.a.		n.a.
853223	24	Electric capacitors, fixed, ceramic, single layer	n.a.	n.a.		n.a.
853225	25	Electric capacitors, fixed, paper/plastic dielectric	n.a.	n.a.		n.a.
853321	26	Electrical resistors fixed, power capacity < 20 watt	n.a.	n.a.		n.a.
853329	27	Electrical resistors, fixed, except heating, > 20 watt	-0.66	1.92		37
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	n.a.	n.a.		n.a.
853400	29	Electronic printed circuits	0.84	2.79		48
853620	30	Automatic circuit breakers for < 1,000 volts	n.a.	n.a.		10
853641	31	Electrical relays for < 60 volts	1.47	0.81		20
853649	32	Electrical relays for 60 - 1,000 volts	n.a.	n.a.		15
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	-6.29	8.34		23
853931	34	Fluorescent lamps, hot cathode	-0.09	0.22		16

Notes: The results of estimations by Equation 2 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.

Appendix Table A4d: Estimates of β across Products in Thailand Exports (Eq.2)

HS-6	No.	Product:	beta	s.e.		n
151110	1	Palm Oil, Crude	n.a.	n.a.		n.a.
270900	2	Petroleum oils, oils from bituminous minerals, crude	n.a.	n.a.		n.a.
400110	3	Natural rubber latex, including prevulcanised	-0.45	0.02	**	22
440910	4	Coniferous wood continuously shaped along any edges	n.a.	n.a.		n.a.
440920	5	Non-conifer wood continuously shaped along any edges	0.03	0.61		20
441300	6	Densified wood, in blocks, plates, strips or profile	n.a.	n.a.		n.a.
441810	7	Windows, French-windows, frames, of wood	n.a.	n.a.		n.a.
441820	8	Doors, frames and thresholds, of wood	-1.90	1.05		17
441830	9	Parquet panels and tiles, of wood	n.a.	n.a.		13
441890	10	Builder's joinery and carpentry of wood, n.e.s.	-10.65	5.25		20
442010	11	Video recording of magnetic tape-type	0.70	0.95		22
442090	12	Wood marquetry, laid; caskets & cases for jewels, etc.	-3.51	2.10		18
620342	13	Mens', boys' trousers & shorts, of cotton, not knit	-1.81	0.28	**	26
620462	14	Womens', girls' trousers & shorts, of cotton, not knit	-0.59	0.01	**	25
620520	15	Mens', boys' shirts, of cotton, not knit	-4.91	1.19	**	26
620630	16	Womens', girls' blouses & shirts, of cotton, not knit	0.40	0.16	*	26
621210	17	Brassieres and parts thereof	0.77	1.75		24
841480	18	Air or gas compressors, hoods	8.29	3.26	*	18
847110	19	Analogue or hybrid computers	n.a.	n.a.		n.a.
850110	20	Electric motors of an output < 37.5 watts	0.82	1.20		22
851310	21	Portable battery and magneto-electric lamps	-7.27	8.47		16
852110	22	Video recording/reproducing apparatus, magnetic tape	n.a.	n.a.		8
853210	23	Fixed power capacitors (50/60 herz circuits)	n.a.	n.a.		14
853223	24	Electric capacitors, fixed, ceramic, single layer	-0.76	1.48		19
853225	25	Electric capacitors, fixed, paper/plastic dielectric	n.a.	n.a.		n.a.
853321	26	Electrical resistors fixed, power capacity < 20 watt	-0.80	0.11	**	19
853329	27	Electrical resistors, fixed, except heating, > 20 watt	1.97	7.00		16
853339	28	Wirewound variable resistors, rheostats, etc. > 20 watt	n.a.	n.a.		14
853400	29	Electronic printed circuits	-0.81	0.26	**	22
853620	30	Automatic circuit breakers for < 1,000 volts	n.a.	n.a.		12
853641	31	Electrical relays for < 60 volts	-1.40	2.04		19
853649	32	Electrical relays for 60 - 1,000 volts	2.60	3.75		20
853922	33	Filament lamps, of a power <= 200 Watt, > 100 volts	n.a.	n.a.		11
853931	34	Fluorescent lamps, hot cathode	-0.27	0.19		16

Notes: The results of estimations by Equation 2 are reported. Double (**) and a single (*) asterisk, respectively denote 1 and 5 percent significance levels. “s.e.” indicates standard errors, “n” the number of observations, and “n.a.” not available.