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Understanding the Flow of Electronic Parts and Components in East Asia

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Understanding the Flow of Electronic Parts and Components in East Asia [1]

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Abstract

This paper investigates East Asia's exploding trade in electronic parts and components (ep&c). The results indicate that foreign direct investment (FDI) increases the level of ep&c exports. Thus, FDI has promoted the slicing up of the value chain in the region. Higher capital intensity increases the share of a country's ep&c exports relative to its Asian trading partners. Thus, one reason why South Korea and Taiwan have gained market share is because they have invested heavily in plant, equipment, and technology. Exchange rate depreciations significantly increase both the level and the share of a country's ep&c exports. This implies that regional exchange rate stability may reduce beggar-thy-neighbor policies and promote intra-regional trade.

Keywords: Electronics industry, Global value chains, East Asia
JEL classification: F14, F23, F42

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1. INTRODUCTION

The value of intra-Asian trade in electronic parts and components (ep&c) equaled $300 billion in 2014. When measured at the International Standard Industrial Classification (ISIC) four-digit level, intra-regional trade in ep&c was three times more than intra-regional trade in the next leading category.[1] The volume of electronics intermediate goods traded within the region has increased sixfold since 2001. As Figure 1 shows, Taiwan and South Korea are the leading exporters. Their shares and China's share in ep&c trade have increased, while the Association of Southeast Asian Nations's (ASEAN's) share has decreased. How can we understand the explosion of electronics exports and the changing export shares within the region?

Electronic parts and components such as semiconductors are key inputs into computers, cellphones, and consumer electronics products. The value of these final electronics goods exports from East Asia increased from $250 billion in 2001 to $750 billion in 2014. The IMF (2005) observed that parts and components should flow elastically to downstream Asian countries in response to an increase in demand for final goods in the rest of the world. One key driver of ep&c trade should thus be demand in the rest of the world for tablet computers, smartphones, and other electronic devices produced in Asia.

Integrated circuits, accelerometers, and other inputs into electronic devices are sophisticated, and the technology advances relentlessly. For instance, consistent with Moore's Law, the dimension of state of the art transistors on microprocessors has fallen from 32 nanometers (nm) in 2009 to 22 nm in 2011 to 14 nm in 2014 (Chafkin and King, 2016). Countries with more advanced technology structures have an advantage at producing these

[1] The data in this and the next paragraph come from the CEPII-CHELEM database.

cutting edge products. Fabricating ep&c also requires massive capital investment.[2] The rising shares of exports from Taiwan and Korea that are evident in Figure 1 may reflect advancing know-how and heavy investment in these economies.

In addition, foreign direct investment (FDI) can facilitate the production of sophisticated goods. Kojima (1973, 1975) noted that FDI channels superior technologies to emerging countries by transmitting capital goods, managerial skills, and technical knowledge to the host country. For instance, engineers in the host country can learn from interacting with engineers from the home country.

Dunning, Kim, and Lin (2001) posited that, as countries develop, firms generate more ownership specific advantages and exploit these through exports and outward direct investment. At higher stages of development, they argued that the created asset component of production will increase. The created asset component reflects value-added due to improved technologies, trademarks, managerial and marketing know-how, organizational abilities, and other factors. They hypothesized that an increase in the created assets component is associated with increased intra-industry trade. Since ep&c shipments reflect primarily intra-industry trade, one might expect East Asian economies to export more as they develop.

Finally, the exchange rate can influence the flow of electronic parts and components exports in two ways. First, a depreciation in the exporting country can lower the dollar prices of the exported intermediate goods that in turn can lower the dollar prices of the final electronic goods and increase the volume of their exports. Thorbecke (2016) presented evidence that this effect is important for parts and components sent to China for assembly into final goods and re-export to the rest of the world. Second, a depreciation in one Asian exporting country may

[2] A single machine the size of a photocopier that is used to fabricate microprocessors can cost USD 50 million (Chafkin and King, 2016).

increase the country's price competitiveness relative to its neighbors and increase its share of ep&c exports.

Before reviewing previous work it is helpful to consider a specific example of the structure of trade within regional production networks. Han, Oh, and Yoo (2012) examined the structure of the liquid crystal display (LCD) industry in Asia. LCDs are flat panel displays that can be used for watches, calculators, cell phones, digital cameras, laptop and desktop monitors, personal digital assistants, and televisions. The LCD industry has three parts, the panels, the materials and components, and the manufacturing equipment. Han *et al*. reported that Korea specializes in exporting panels, and exports these primarily to China. Japan specializes in exporting manufacturing equipment, and runs surpluses with China, Korea, and Taiwan in this technologically advanced category. Taiwan specializes in exporting both panels and materials and components. China runs large deficits with Japan, Korea, and Taiwan in the LCD industry. It then runs large surpluses in the finished products such as cellphones, digital cameras, and laptop computers that are produced using LCDs. So Japan is the most technologically advanced in this value chain, Korea and Taiwan provide intermediate inputs to China, and China specializes in exporting the final products to the world.

In previous work, several authors have reported that, within regional production networks, imports into an East Asian country depend on that country's exports. Baak (2014) found that Japan's imports from China and Korea depend on Japan's exports to the world. Baak (2013) also reported that China and Japan's imports from Korea are positively related to these countries' exports, but that U.S. and Eurozone imports from Korea are not related with these countries' exports. Cheung, Chinn, and Qian (2012) reported that parts and components (imports for processing) into China are positively and significantly related to China's subsequent exports of final goods (processed exports). Others reporting similar findings include Nishimura and Hirayama (2013) and Ahuja *et al.* (2012).

Ahuja *et al.* (2012) also included FDI in a regression for China's exports. They did this to control for China's increased involvement in international production networks. They found that FDI is closely related to exports. They also reported that including FDI in the export equation resulted in much more reasonable values for the other parameters.

Cheung, Chinn, and Qian (2012) included the Chinese capital stock in manufacturing in regressions for China's processed exports, ordinary exports, and total exports to the world and to the U.S. They reported that in every case the Chinese capital stock was closely and positively related to exports. They also found that controlling for the capital stock caused the other parameter values to become more plausible.

Dunning, Kim, and Lin (2001) investigated the hypothesis that intra-industry trade is positively related to economic development for South Korea and Taiwan. They measured intra-industry trade using the ratio of exports minus imports in a sector to the ratio of exports plus imports in the sector. They measured the level of development using per-capita GDP. They reported that for both economies there was a positive and statistically significant relationship between the degree of intra-industry trade and the level of development.

Several researchers have investigated how exchange rates affect trade within Asian production networks. Hooy, Law, and Chan (2015) investigated exports from the Association of Southeast Asian Nations (ASEAN) countries to China. They reported that exports of both parts and components and finished goods increase as ASEAN currencies depreciate relative to the Chinese renminbi. Cheung, Chinn, and Qian (2012) examined aggregate imports for processing into China. When including processed exports in the import demand function, they found that a

10 percent appreciation of the renminbi would increase imports for processing by 11 percent. Freund, Hong, and Wei (2011) examined China's imports for processing and ordinary imports from all trading partners. They found correctly signed exchange rate elasticities of 0.2 for both categories of imports.

This paper focuses on understanding electronic parts and components trade, which is the most important intermediate good traded within East Asian production networks. It investigates both the level of ep&c exports and the shares of these exports among Asian supply chain countries. Increases in the levels reflect cooperation within the region, as countries export more parts and components to supply chain partners for processing and re-export. Increases or decreases in the shares reflect competition within the region, as countries gain or lose market share relative to other East Asian countries.

The results indicate that there is a tight relationship between ep&c trade within the region and East Asia's exports of final electronics goods to the world. They also indicate that the stock of FDI helps to explain the level of trade to East Asian neighbors. Thus FDI promotes the slicing up of the value chain in Asia. The degree of capital intensity explains the share of ep&c exports. Thus one reason why South Korea and Taiwan have played an increasingly important role within the electronics value chain (EVC) is because they have invested heavily in plant and equipment.

Weaker exchange rates also significantly increase both the share and the level of ep&c exports from a country. Exchange rates affect the share of exports because, as one country's currency depreciates relative to its neighbors, its ep&c exports become more competitive relative to similar goods produced by other East Asian countries. Exchange rates affect the level of ep&c exports for this reason and also because exchange rate depreciations decrease the dollar prices of an upstream country's electronic components exports, in turn decreasing the dollar prices of final electronics goods exports assembled in downstream countries using the imported electronic components. As the dollar prices of computers, smartphones, and other final goods fall, more of these are exported to the world. The increase in exports of final goods from downstream countries in turn causes exports of memory chips, sensors, and other ep&c from upstream countries to increase.

This paper differs from the work of Ahmed (2009) and Thorbecke (2016) by focusing on trade in parts and components within Asian value chains rather than China's exports to the world. Ahmed and Thorbecke took account of how conditions in East Asian supply chain countries affected China's exports of final goods and other products. This paper investigates the factors influencing the flow of parts and components trade within regional production networks. Thus this work is complementary to the work of Ahmed and Thorbecke.

The next section presents the data and methodology. Section 3 contains the results. Section 4 concludes.

2. DATA AND METHODOLOGY

Data on electronic components exports between East Asian countries are available from the CEPII-CHELEM database.[3] Since these data are measured in U.S. dollars and since East Asia's exports of electronic components represent imports by countries such as the United States,

[3] The website for CEPII is www.cepii.fr. Electronic components come from Harmonized System (HS) categories 8540, 8541, and 8542.

the data are deflated using the U.S. import price deflator for semiconductor imports. The deflator data come from the U.S. Bureau of Labor Statistics (BLS).[4]

Following Baak (2013, 2014), re-exports within East Asian production networks are included as an explanatory variable.[5] Exports of final electronics goods from East Asian countries to the world are used. These are defined to include exports of computers, telecommunications equipment, and consumer electronics. These data are also obtained from the CEPII-CHELEM database. The great majority of these exports are in the categories of computers and telecommunications equipment. As before, since these data are measured in U.S. dollars and since Asia's exports of these goods represent imports by countries such as the U.S., these data are deflated using U.S. import price deflators. In this case they are deflated using a weighted average of U.S. import price deflators for computers and for telecommunications equipment, where the weights reflect the shares of computer and telecommunications equipment in Asia's exports each year. Price deflator data again come from the U.S. BLS.

Following Ahuja *et al.* (2012), FDI is included as an explanatory variable. This is measured either as the stock of FDI per capita. Data on the stock of FDI are obtained from the United Nations Conference on Trade and Development (UNCTAD) website and data on population are obtained from the CEPII-CHELEM database.[6]

[4] The website for the Bureau of Labor Statistics is www.bls.gov.

[5] Modeling exports of parts and components to downstream East Asian economies as a function of the downstream economies' exports of final goods to the world would be appropriate if there were a recursive relationship between the variables, with exports of final goods from downstream countries depending on demand conditions in the rest of the world and exports of parts and components from upstream countries depending on final goods exports from downstream economies. The IMF (2005) argued that this may be the case.

[6] The website for UNCTAD is www.unctad.org.

To measure capital intensity, the capital stock per person is used. Data on the capital stock are obtained from Berlemann and Wesselhöft, (2014).[7] These data extend to 2011. They are assumed to grow at the same rate thereafter as their average growth rate over the 2001-2011 period. The capital stock is measured in U.S. dollars and deflated using population data obtained from the CEPII-CHELEM database.

Following Dunning, Kim, and Lin (2001), GDP per capita is used as a proxy for the level of development. These data are measured in real U.S. dollars and are obtained from the CEPII-CHELEM database.

As discussed above, countries with more advanced technology structures may have an advantage at producing and exporting ep&c. To measure technological sophistication, the country sophistication indexes of Kwan (2002) and Hausmann, Hwang, and Rodrik (2007) are employed. Kwan first calculated a product sophistication index for a product k that a country exports using the formula:

$$PSI(k) = \frac{\sum_j x(jk)Y(j)}{X(k)}, \tag{1}$$

where PSI(k) is the product sophistication index for product k, x(jk) are exports of product k by country j, Y(j) is per capita gross domestic product in country j, and X(k) are total world exports of product k. Equation (1) is thus a weighted average of the per capita GDPs of product k's exporters, using the countries' shares of global exports of k as weights.

Kwan (2002) then used the PSI to calculate a country's sophistication index (CSIK) using the following formula:

[7] Berlemann and Wesselhöft did not provide data on Taiwan. These were obtained from the Federal Reserve Bank of St. Louis FRED database (https://research.stlouisfed.org/fred2/) The Taiwan data were re-calibrated in constant 2000 U.S. dollars to be consistent with the other capital stock data.

$$CSIK(j) \;=\; \frac{\sum_k x(jk)PSI(k)}{X(j)}, \tag{2}$$

where CSIK(j) is the country sophistication index for country j, x(jk) are exports of product k by country j, PSI(k) is the product sophistication index for product k, and X(j) are total exports of country j to the world. Equation (2) is thus a weighted average of the product sophistication indexes of the goods that country j exports, using the percentage of country j's total exports in each good as weights.

Hausmann *et al*. (2007) argued that the weighting scheme in equation (1) gives too much weight to large countries. They proposed a different weighting scheme. In equation (1), they recommended weighting per capita GDP by each country's revealed comparative advantage in product k. They call the resulting measure the productivity level of product k:

$$PRODY(k) \;=\; \sum_j \frac{\left(\frac{x(jk)}{X(j)}\right)}{\sum_j \left(\frac{x(jk)}{X(j)}\right)} Y(j), \tag{3}$$

where PRODY(k) is the productivity level of good k, x(jk)/X(j) is the share of commodity k in the country's overall export basket, $\sum_j$(x(jk)/X(j)) is the sum of the value shares across all countries j exporting product k, and Y(j) is per capita GDP in country j. Equation (3) thus weighs a country's per capita GDP by the country's revealed comparative advantage in product k.

Hausmann *et al*. (2007) used PRODY to find each country's sophistication index:

$$CSIK(j) \;=\; \frac{\sum_k x(jk)PRODY(k)}{X(j)}, \tag{4}$$

where CSIK(j) is the productivity level associated with country j's export basket, PRODY(k) is the productivity level of good k, and the other variables are defined after equation (2).

These sophistication indexes are calculated using both Kwan's (2002) method (equations (1) and (2)) and Hausmann *et al*'s (2007) method (equations (3) and (4)). To calculate these values, countries exports to the world disaggregated to the four-digit ISIC level are employed. The data are measured in U.S. dollars. Per capita GDP is measured in constant US dollars. These data are also obtained from the CEPII-CHELEM database.

Real exchange rate data are also obtained from the CEPII-CHELEM database. They represent a country's exchange rate relative to the world, measured in purchasing power parity (PPP) terms. Freund, Hong, and Wei (2011) and Tang (2014) also used exchange rates measured in PPP terms to investigate how exchange rates affect intermediate goods trade and other variables in Asia.

The focus of the study is on ep&c exports from East Asian supply chain countries to other East Asian supply chain countries. Electronic parts and components exports from East Asian countries to the whole world are also investigated. Exports are either measured in levels, or as a share of exports from East Asian countries.

The empirical model can be represented as:

$$ex_i = f(fex\ \ , CAP_i, FDI_i, lrer_{ij}, GDP_i, CSIK_i, TREND) \tag{5}$$

where,

ex_i = either the level of electronic parts and components exports from economy *i* or the share of ep&c exports from economy *i* relative to ep&c exports from all East Asian supply chain countries

fex = final electronic goods exports from either East Asian supply chain countries to the world (when ex_i represents exports to East Asian supply chain countries) or from the whole world (when ex_i represents exports to the world)

CAP_i = capital stock per capita in exporting country *i*

FDI_i = FDI stock per capita in the exporting economy *i*

$lrer_i$ = real exchange rate in exporting country *i*

GDP_i = real GDP per capita in exporting country *i*

$CSIK_i$ = export sophistication index in exporting country *i*

TREND = a time trend[8]

The electronics supply chain changed fundamentally after China joined the WTO in 2001. More and more final electronics goods were produced in China, and more and more parts and components from Asia went to China for processing and assembly. The sample period thus begins in 2001.[9] It extends to 2014.

For most of the sample period, the electronics value chain was centered on eight economies. There are China, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand. The Japanese electronics industry, once the flagship of the Japanese economy, nosedived over the sample period. This was related to bad decision by electronics firms (see, e.g., Sato *et al.*, 2013). The decline was not related independent variables such as capital intensity, the stock of FDI, GDP per capita, or export sophistication. For this reason, Japan is not included in the sample. Singapore is also excluded because much of its exports represent

[8] A time trend is included in some specifications for the level of exports. It is not included for the share of exports. As Figure 1 indicates, there is not clear evidence of a trend in the share of exports across the six economies.

[9] Garcia-Herrero and Koivu (2007) reported that there was a structural break in China's exports beginning in 2001.

entrepôt trade. The study thus focuses on China, Malaysia, the Philippines, South Korea, Taiwan, and Thailand.

To specify the econometric model a battery of panel unit root tests and Kao residual cointegration tests are performed. For both the levels regression and the shares regression the results indicate that there are cointegrating relationships.[10] Panel dynamic ordinary least squares (DOLS), a technique for estimating cointegrating relations, is thus employed.

Panel DOLS involves regressing the dependent variable on the independent variables and lags and leads of the first differences on the independent variables. The number of lags and leads is determined here for each cross section by the Schwarz Information Criterion. The Mark and Sul (1999) approach is used to allow for heterogeneity in the long run variances.

3. RESULTS

Table 1 presents results for the level of electronics parts and components exports to regional supply chain countries and Table 2 presents results for the level of ep&c exports to the world. In Table 1 there is a tight link in every specification between ep&c exports within East Asia and East Asia's exports of final electronics goods. In Table 2 the evidence is weaker of a link between ep&c exports to the world and the world's re-exports of final electronics goods. Baak (2013) reported similar results when he found that Korea's exports to China and Japan are

[10] For exports measured in levels, the unit root tests in five of the six specifications point to unit roots. For exports measured in shares, the unit root tests in every specification point to unit roots. For the levels regression, the probability value for the Kao residual cointegration test statistic equals 0.0002. For the shares regression, the corresponding probability value equals 0.012. Thus in both cases the null hypothesis of no cointegration is rejected.

positively related to these countries' exports, but that Korea's exports to the U.S. and the Eurozone are not related with these countries' exports.

Across all of the specifications in Tables 1 and 2, the stock of FDI is closely related to the level of electronics parts and components exports. On average across the specifications, a 10 percent rise in the FDI stock per capita increases ep&c exports by 7 percent.

Tables 1 and 2 also indicate that the exchange rate helps to explain the level of exports. On average across the specifications, a 10 percent depreciation of the exchange rate increases ep&c exports by 11.4 percent.

Tables 1 and 2 report the results for the export sophistication index calculated using the method of Hausmann (2007) *et al.* The coefficients are of the correct sign, but only significant in some specifications. The results are weaker for the export sophistication index calculated using the method of Kwan (2002).

The results for capital intensity are only statistically significant when a time trend is excluded. In Table 1, though, they are of the expected positive sign in every case.

The results for per capita GDP are also very sensitive to the inclusion of a trend term. When a time trend is included the coefficients take on the wrong sign.

Overall, the results in Tables 1 and 2 indicate that final electronics goods exports to the world, the stock of FDI, and the exchange rate are important explanatory variables for the level of ep&c exports in the region.

Table 3 presents results for the share of electronics parts and components exports to regional supply chain countries and Table 4 presents results for the share of ep&c exports to the world. The level of final electronics exports is not included as an explanatory variable since the dependent variable is the share of ep&c exports rather than the level of exports. In every specification where capital intensity is included as an explanatory variable, it is highly statistically significant. Thus countries that invest more in plant and equipment are able to capture a greater share of the electronics supply chain.

Table 3 also indicates that the exchange rate significantly affects countries' shares of electronics exports to regional supply chain partners. On average across the six specifications, a 10 percent depreciation of a country's currency *ceteris paribus* is associated with a 1 percent increase in the country's share of electronics parts and components exports to the region. Table 4 indicates that the exchange rate also affects the share of exports to the world, although the effect is weaker.

The export sophistication index findings are for the Hausmann *et al.* (2007) measure. There is no consistent evidence across the specifications that this variable is related to exports. The results, available on request, are slightly stronger using the Kwan (2002) measure.

The coefficients on FDI per capita and GDP per capita vary. Both the signs and the statistical significance of the coefficients change across the columns. Thus there is no robust evidence that these variables are related to the shares of ep&c exports.

What can we learn by comparing the shares regression results with the levels regression results. The shares data captures competition between supply chain countries. If the share from one supply chain country increases, the shares from at least one other supply chain country must decrease. The levels data also includes cooperation. As each country exports more within regional value chains, trade between regional economies expands and the total amount produced by the value chain increases.

FDI increases the level of exports but not the shares. This finding makes sense in light of the findings of Kojima (1973, 1975) and Yoshitomi (2013). Kojima showed that FDI channels superior technologies to emerging countries by transmitting capital goods, managerial skills, and technical knowledge to the host country. Yoshitomi (2003), however, noted that technology exporting firms are reluctant to transfer technologies to emerging competitors. Thus FDI and its attendant technology transfer should increase a country's ability to produce ep&c, but not its competitive position relative to other East Asia economies.

The capital stock, on the other hand, is closely related to the share of exports. This reflects the fact that remaining competitive in the very demanding electronics parts industry requires expensive equipment and constant retooling.

The exchange rate is highly significant in both sets of regressions. Hiratsuka (2011) found that manufacturers in the region often source parts and components from firms in several countries. In such an environment, exchange rate depreciations offer parts producers in one country the chance to gain a competitive advantage against parts producers in neighboring countries. Exchange rate depreciations throughout the region also lower the foreign currency prices of the final electronic goods and increases the volume of their exports and the volume of ep&c exports used to produce these goods.

4. CONCLUSION

The electronics industry has exploded within East Asia. Trade in parts and components has increased six times since 2001, and Northeast Asian countries are gaining larger shares of the overall trade.

This paper has investigated these phenomena. The results indicate that trade in semiconductors, hard disk drives, and other ep&c is closely related to the exports of smartphones, computers, and other final electronics goods from Asia to the world.

In addition, the stock of FDI is an important determinant of the level of parts and components exports from East Asian countries. Thus, FDI facilitates production fragmentation in the region. Policymakers should take account of the benefits that FDI can bring by facilitating technology transfer (see Kojima 1973, 1975). They should seek to maintain FDI-friendly environments by improving infrastructure, investing in education, and fighting corruption.

The level of capital intensity is a key determinant of countries' shares of ep&c exports. Producing memory chips and other electronic components require sophisticated capital goods, and higher investment levels enable countries to internalize more of the electronics industry within their own borders.

The exchange rate is a key explanatory variable for both the level of exports and for the export shares. So as countries' currencies depreciate, the level of their exports of electronic components increases and as their currencies depreciate relative to other supply chain countries' currencies their market share increases at the expense of East Asian trading partners. This suggests, as Sato *et al.* (2013) have argued, that there may be a role for regional exchange rate stability to prevent beggar-thy-neighbor policies and to facilitate intra-regional trade.

Vietnam's imports of electronics parts and components has increased four times since the Global Financial Crisis of 2008-2009. Since the crisis its exports of electronics goods have also multiplied. Future research should investigate why Vietnam has risen as a producer of electronics goods, and what lessons this holds for countries such as Indonesia that have never succeeded in joining EVCs.

There are several lessons for Japan from the results here. One is that FDI helps neighboring countries to participate in regional value chains. Since joining East Asian value chains promotes technology transfer and development (Lim and Kimura, 2010), this finding can help policymakers as they consider Japan's outward development assistance policies. A second lesson is that China, South Korea, and Taiwan are not only Japan's comrades in regional value chains; they are also increasingly strong competitors in this technologically advanced industry. Japanese policymakers may want to consider how to promote the electronics industry (e.g., by funding research and development) and to prepare for layoffs and dislocation in this sector. A third lesson is that exchange rates in the region are vitally important for the electronics industry. Given the importance of this industry, this provides one more reason for policymakers to focus their minds when devising exchange rate policy and when engaging in policy discussions on exchange rates with neighboring countries.[11]

[11] Of course, policymakers need to consider the effect of exchange rates on the entire economy and not just on the electronics sector.

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Table 1 Dynamic OLS estimates for the Level of Electronics Exports to East Asian Supply Chain Economies, 2001-2014

	(1)	(2)	(3)	(4)	(5)	(6)
Final Electronics Goods Exports from East Asia	0.34***	0.40**	0.57***	0.48***	0.61***	0.66***
	(0.10)	(0.17)	(0.13)	(0.17)	(0.07)	(0.11)
Capital Intensity	0.39	0.97**			0.41	1.07***
	(0.30)	(0.14)			(0.33)	(0.14)
Stock of FDI Per Capita	1.16***	0.72***	0.83***	0.33	0.63***	0.39***
	(0.16)	(0.20)	(0.21)	(0.20)	(0.15)	(0.16)
GDP per Capita			-4.00***	1.57***		
			(1.04)	(0.23)		
Export Sophistication Index	0.88	0.58	3.19***	1.06		
	(0.62)	(0.88)	(0.96)	(0.99)		
Real Exchange Rate	-1.30***	-1.66***	-0.90***	-0.89***	-0.65***	-1.23***
	(0.23)	(0.29)	(0.30)	(0.24)	(0.19)	(0.33)
Fixed Effects Included	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend Included	Yes	No	Yes	No	Yes	No
Number of Observations	78	78	78	78	78	78
Adjusted R-squared	0.996	0.991	0.994	0.968	0.993	0.987

Notes: The exporting countries are China, Malaysia, the Philippines, South Korea, Taiwan, and Thailand. The dependent variable is the level of their electronic parts and components exports to East Asian supply chain economies (i.e., these six economies plus Japan and Singapore). Final electronics goods exports represent exports of consumer electronics goods, computer equipment, and telecommunications equipment from East Asian supply chain economies to the world. Capital intensity is measured using the capital stock per person. The export sophistication index is calculated using the method of Hausmann *et al*. (2007). The lag length for each cross section is selected based on the Schwarz Criterion. Standard errors are calculated using the Bartlett Kernel and the Newey-West fixed bandwidth method.
*** (**) denotes significance at the 1% (5%) level.

Table 2 Dynamic OLS estimates for the Level of Electronics Exports to the World, 2001-2014

	(1)	(2)	(3)	(4)	(5)	(6)
Final Electronics Goods	-0.07***	0.10	0.39***	0.32***	0.43***	0.48***
Exports from the World	(0.11)	(0.14)	(0.11)	(0.15)	(0.07)	(0.08)
Capital Intensity	0.04	1.05***			-0.11	1.16***
	(0.26)	(0.12)			(0.36)	(0.12)
Stock of FDI Per Capita	1.25***	0.91***	0.67***	0.32*	0.71***	0.44***
	(0.12)	(0.17)	(0.17)	(0.17)	(0.14)	(0.13)
GDP per Capita			-2.40***	1.68***		
			(0.83)	(0.20)		
Export Sophistication	2.10***	1.28	3.21***	1.13		
Index	(0.65)	(0.78)	(0.83)	(0.88)		
Real Exchange Rate	-1.54***	-1.84***	-0.88***	-0.82***	-0.90***	-1.12***
	(0.17)	(0.23)	(0.26)	(0.22)	(0.18)	(0.19)
Fixed Effects Included	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend Included	Yes	No	Yes	No	Yes	No
Number of Observations	78	78	78	78	78	78
Adjusted R-squared	0.996	0.991	0.993	0.988	0.994	0.988

Notes: The exporting countries are China, Malaysia, the Philippines, South Korea, Taiwan, and Thailand. The dependent variable is the level of their electronic parts and components exports to the world. Final electronics goods exports represent exports of consumer electronics goods, computer equipment, and telecommunications equipment from the world to the world. Capital intensity is measured using the capital stock per person. The export sophistication index is calculated using the method of Hausmann *et al*. (2007). The lag length for each cross section is selected based on the Schwarz Criterion. Standard errors are calculated using the Bartlett Kernel and the Newey-West fixed bandwidth method.
*** (*) denotes significance at the 1% (10%) level.

Table 3 Dynamic OLS estimates for the Share of Electronics Exports to East Asian Supply Chain Economies, 2001-2014

	(1)	(2)	(3)	(4)	(5)	(6)
Capital Intensity	0.25***	0.13***		0.25***		
	(0.05)	(0.01)		(0.04)		
Stock of FDI Per Capita	0.00	-0.01	-0.04***		0.02*	
	(0.01)	(0.01)	(0.01)		(0.01)	
GDP per Capita	-0.20***		0.16***	-0.20***		-0.14***
	(0.06)		(0.02)	(0.05)		(0.02)
Export Sophistication	0.01	0.00	-0.02	0.01	0.00	-0.12*
Index	(0.06)	(0.07)	(0.07)	(0.06)	(0.10)	(0.07)
Real Exchange Rate	-0.05**	-0.12***	-0.07***	-0.07***	-0.13***	-0.14***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Fixed Effects Included	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend Included	No	No	No	No	No	No
Number of Observations	78	78	78	78	78	78
Adjusted R-squared	0.979	0.968	0.960	0.976	0.940	0.947

Notes: The exporting countries are China, Malaysia, the Philippines, South Korea, Taiwan, and Thailand. The dependent variable is the share of their electronic parts and components exports to East Asian supply chain economies (i.e., these six economies plus Japan and Singapore). Capital intensity is measured using the capital stock per person. The export sophistication index is calculated using the method of Hausmann *et al*. (2007). The lag length for each cross section is selected based on the Schwarz Criterion. Standard errors are calculated using the Bartlett Kernel and the Newey-West fixed bandwidth method.
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 4 Dynamic OLS estimates for the Share of Electronics Exports to the World, 2001-2014

	(1)	(2)	(3)	(4)	(5)	(6)
Capital Intensity	0.24***	0.15***		0.28***		
	(0.04)	(0.01)		(0.04)		
Stock of FDI Per Capita	0.02*	-0.04***	-0.06***		0.00	
	(0.01)	(0.01)	(0.01)		(0.01)	
GDP per Capita	-0.15***		0.18***	-0.22***		0.07**
	(0.05)		(0.02)	(0.05)		(0.03)
Export Sophistication	0.01	-0.06	0.05	-0.05	0.06	-0.08
Index	(0.06)	(0.05)	(0.06)	(0.06)	(0.09)	(0.09)
Real Exchange Rate	-0.03	-0.03***	0.02	-0.06***	-0.06*	-0.09***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Fixed Effects Included	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend Included	No	No	No	No	No	No
Number of Observations	78	78	78	78	78	78
Adjusted R-squared	0.979	0.970	0.955	0.976	0.920	0.912

Notes: The exporting countries are China, Malaysia, the Philippines, South Korea, Taiwan, and Thailand. The dependent variable is the share of their electronic parts and components exports to the world. Capital intensity is measured using the capital stock per person. The export sophistication index is calculated using the method of Hausmann *et al*. (2007). The lag length for each cross section is selected based on the Schwarz Criterion. Standard errors are calculated using the Bartlett Kernel and the Newey-West fixed bandwidth method.
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

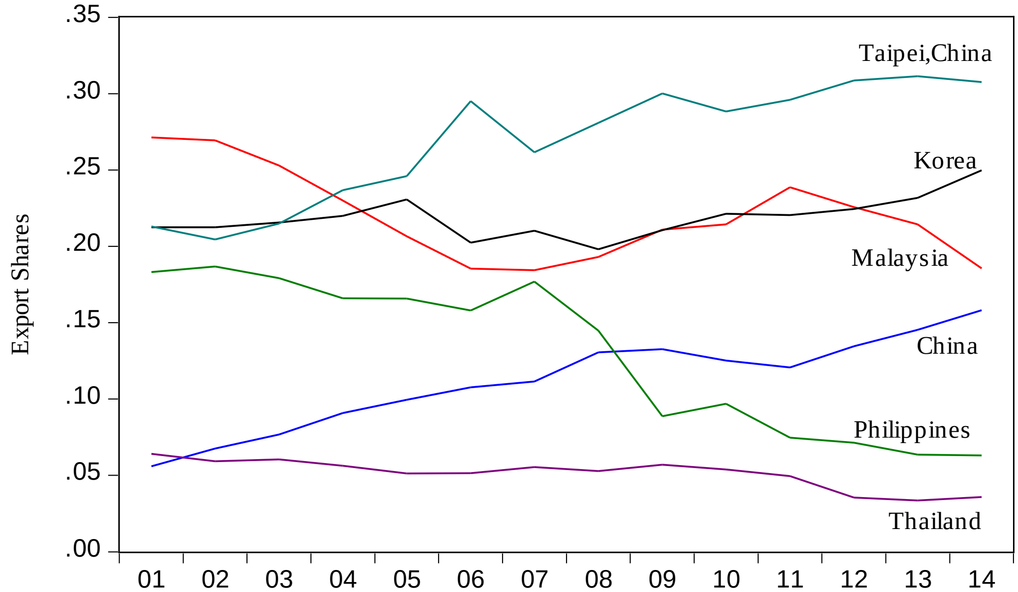

Figure 1. Share of Electronic Parts and Components Exports from Individual Economies to the Region as a Whole.
Source: CEPII-CHELEM database.
Note: The figure shows the share of exports from each of the exporting economies to China, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand.