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Machinery Trade in East Asia, and the Global Financial Crisis

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Abstract: The global financial crisis since Q3 2008 has influenced the world economy, including that of East Asia. This paper focuses on international production/distribution networks, mainly observed in the machinery sectors in East Asia, and attempts to examine patterns of machinery trade movements during the crisis to explore how and to what extent it has affected trade. More specifically, the paper analyzes these trade patterns, with distinctions between machinery intermediate goods and machinery final products, among trading partners (regions), between intra-regional trade and inter-regional trade, and among machinery sectors, so as to investigate whether there were any differences in reactions to the crisis. Moreover, in order to consider possible seasonality in trade, the paper also attempts to apply the X-12 model and discusses features of trade patterns based not only on actual trade values but also on estimated trade values with seasonal adjustment.

Our results demonstrate that effects of the global financial crisis on international production/distribution networks in East Asia do indeed exist but, at the same time, that East Asia's trade has rapidly recovered through the regional production/distribution networks. In particular, East Asia itself is the major contributor to such a rapid recovery, not only for machinery parts and components trade but also for the machinery final goods trade. This suggests that the existence of dense production/distribution networks in East Asia helps industries to avoid becoming destabilized. It also suggests that East Asia is increasingly gaining importance not only as the production site but also as the consumption site for final products that are produced in the production/distribution networks in the region, implying that [further] activation and expansion of intra-regional demand are essential

***Keywords*:** Fragmentation; International Production Networks; East Asia; Machinery Trade; Global Financial Crisis

***JEL clarification*:** F14, G01, L23, O53

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1. Introduction

The formation of international production/distribution networks in East Asia, with extensive promotion of foreign direct investment (FDI), is an important phenomenon. The major industries involved comprise machinery sectors including general machinery, electric machinery, transport equipment, and precision machinery. Although international production/distribution networks have also been formed in other regions of the world, the production/distribution networks in East Asia observed mainly in machinery industries are distinctive in (i) their significance in the regional economy, (ii) in their geographical spread, involving many countries at different income levels, and (iii) in their sophistication in both intra-firm and arm's length (inter-firm) relationships (Ando and Kimura, 2005). First, production networks have already become a substantial component of each East Asian country. No longer can each country's manufacturing activities and international trade be discussed without considering the existence of production networks. Second, the production networks involve a large number of countries with various income levels in the region, in contrast to networks between specific countries or between a developed country and a developing country in geographical proximity, such as those in the US-Mexico nexus and in the Western Europe and Central-and-Eastern-Europe nexus. Third, the production networks effectively utilize intra-firm and arm's length transactions among different firm nationalities, including multinational enterprises (MNEs) as well as indigenous firms in each country.

The global financial crisis since Q3 2008 has significantly influenced production networks with the above-mentioned features. This paper highlights machinery sectors that are major participants in production networks in East Asia and attempts to examine patterns of trade movement in the pre- and post-crisis period in order to explore how and to what extent the crisis has affected trade. More specifically, the paper attempts to reveal the features of the reactions of production/distribution networks in East Asia during the global financial crisis, focusing on differences between intermediate goods and final goods, between intra-regional and inter-regional transactions, and among machinery sectors.

The remainder of the paper is organized as follows. Section 2 discusses features of international production/distribution networks from the perspective of machinery trade, and Section 3 analyzes patterns of machinery trade movement during the crisis. Section 4 discusses some policy implications.

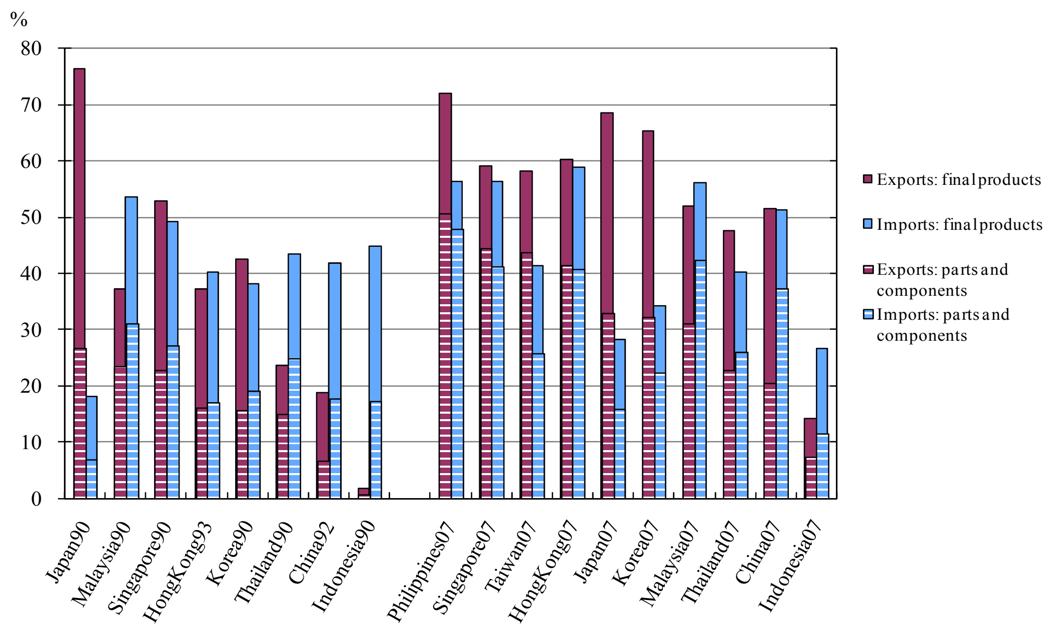
2. International Production/Distribution Networks in East Asia and in Machinery Trade

Machinery trade comprises a significant proportion of East Asian trade. Figure 1 presents the share of machinery goods in total exports to and imports from the world in the early 1990s and in 2007, with a distinction between machinery final products and parts and components, for each East Asian country.[1] Comparison of the shares in the

[1] Unless specified otherwise, machinery industries in this paper are basically composed of Harmonized System (HS) 84-92: general machinery, electric machinery, transport equipment, and precision machinery. The definitions of machinery parts and components are slightly revised ones for the HS2002 classification and the HS2007 classification, based on the definition proposed by Ando and Kimura (2005). We use two versions of the definition because monthly trade data available from the World Trade Atlas utilize the HS2007 classification January 2007 for China, Thailand, Hong Kong,

early 1990s with those in 2007 shows that the shares of machinery trade, in particular machinery parts and components trade, have rapidly increased. This indicates how explosively back-and-forth transactions of machinery intermediate goods have expanded during the last decade or so.

Figure 1. Machinery Trade in East Asia: Shares in Total Exports/Imports (Early 1990s and 2007)



Source: Author's preparation, using trade data available form World Trade Atlas and UN Comtrade.

Similar analysis for major countries of the world (Figure 1 presents only East Asian countries) indicates that the proportions of machinery trade, in particular those of machinery parts and components trade, have tended to grow for countries not only in East Asia but also in other regions. When the figure is arranged to plot countries from highest

Korea, Singapore, and Japan, April 2008 for Malaysia, January 2009 for Indonesia, and February 2009 for Taiwan. Trade in machinery goods other than trade in machinery parts and components is regarded as trade in machinery final products. See Table A.1 for the definition of machinery intermediate goods.

to lowest export share of machinery parts and components in order to address the relative significance of machinery intermediate goods trade, however, most countries with higher shares of machinery parts and components exports were developed countries in the early 1990s, but these were replaced by East Asian countries in 2007 with much higher shares. In other words, the significance of machinery trade, mainly machinery intermediate goods trade, has shown a definite relative increase for each economy in East Asia.

In addition, the ratios of machinery intermediate goods are high for both exports and imports in East Asia, which implies the existence of export-oriented operations as well as active and drastically expanding vertical back-and-forth transactions. On the other hand, for instance, most Latin American countries except Mexico, which has developed active production sharing with the United States, present low shares of machinery intermediate exports. While they have a certain amount of machinery parts imports, their machinery parts shares for exports are close to zero, suggesting the existence of import-substituting operations in these countries.

A large proportion of the above-mentioned machinery parts and components trade in East Asia is intra-regional.[2] When intra-regional export/import shares in 2000 are compared with those in 2007 (data for all ten East Asian countries are available for these two years), one can observe a rapid expansion of intra-regional machinery parts and components shares (except in the case of Chinese machinery intermediate exports), reaching 55 percent - 73 percent for exports and 63 percent - 82 percent for imports. Considering that intra-regional trade values of machinery parts and components *per se*

[2] Unless specified otherwise, East Asia in this section is composed of ten East Asian economies: China, Association of Southeast Asian Nations (ASEAN) 4, Newly Industrializing Economies (NIEs) 4, and Japan. Thus, intra-regional trade is the trade among these ten economies.

have significantly expanded (from US$525.7 billion to 1099.3 billion for exports and from US$418 billion to 974.1 billion for imports), including Chinese parts exports (from US$38.2 billion to 250.5 billion), these facts demonstrate how rapidly vertical back-and-forth transactions of machinery parts and components have proliferated throughout the region.

Table 1. Intra-regional and Inter-regional Shares of Machinery Trade in East Asia

	Type of products	Destination/origin	China		ASEAN4		NIEs4		Japan	
			2000	2007	2000	2007	2000	2007	2000	2007
EX	Parts	East Asia	61	55	58	62	60	73	46	55
		US	16	14	22	13	19	9	28	18
		EU15	13	14	15	14	13	7	16	14
	Final	East Asia	36	31	37	36	31	33	24	21
		US	27	23	28	25	30	18	37	29
		EU15	23	23	21	17	21	19	19	17
IM	Parts	East Asia	70	82	64	71	69	75	54	63
		US	9	6	21	13	17	12	32	20
		EU15	18	9	10	11	10	9	10	12
	Final	East Asia	50	56	62	67	66	69	44	55
		US	19	12	16	9	18	12	27	18
		EU15	26	26	18	18	12	13	22	19

Data source: Author's calculation, using trade data available from World Trade Atlas.

Note: "EX" and "IM" indicate exports and imports, respectively.

The rapid expansion of back-and-forth transactions of machinery parts and components trade within East Asia reflects the development of fragmentation of production.[3] Fragmentation of production involves splitting up production processes that were originally located in one place into two or more production blocks and locating them at appropriate places for each production block. When production blocks are fragmented,

[3] See Jones and Kierzkowski (1990, 2001), Arndt and Kierzkowski (2001), and Deardorff (2001) for fragmentation theory. See, for instance, Ando and Kimura (2005, 2010) and Kimura and Ando (2005) for the analysis of production networks in East Asia.

costs of service links connecting production blocks arise, while one can enjoy a cost reduction at each production block by utilizing a location advantage. In particular, when production blocks are located beyond the national border, service link costs include not only costs originating from geographical distance, such as transport costs, telecommunications costs, and coordination costs, but also cross-border costs (typically trade barriers). Fragmentation occurs when the service link costs are sufficiently low to make the total costs (i.e., production costs plus the service link costs) lower than otherwise. Therefore, the key to fragmentation (or expansion of back-and-forth transactions of machinery parts and components) is reduction of these service link costs. In the 1990s, as Ando (2006) emphasizes, vertical transactions, particularly vertical back-and-forth transactions of parts and components in vertically fragmented production processes across borders, rather than the trade of quality-differentiated commodities that is supported by the theoretical model of intra-industry trade with vertical product differentiation, were greatly expanded in East Asia.

Table 1 also demonstrates important further evidence: the East Asian market is rising in its significance as a market for final products. On the import side, both the intra-regional ratio and the trade values (from US$253.7 billion to 982.7 billion) rose during seven years in the 2000s. In particular, intra-regional ratios for the ASEAN4 and the NIEs4 reached values close to 70 percent. On the export side, intra-regional trade values increased from US$446.2 billion to 982.8 billion, and from 20 percent to nearly 40 percent of final goods exports went to East Asia (though intra-regional shares dropped slightly in some cases). In East Asia, intra-regional demand has expanded along with economic development. On considering East Asian countries, in particular the ASEAN4 and the NIEs4, East Asia is increasingly gaining importance not only as a production site but also as a consumption site for final products that are produced in the production/distribution networks in the region.

3. East Asia's Machinery Trade during the Global Financial Crisis

The global financial crisis starting in Q3 2008 has significantly affected machinery trade in East Asia through the above-mentioned international production/distribution networks. This section analyzes patterns of machinery trade movement during the global economic recession, employing monthly trade data available from the World Trade Atlas. Figure 2 (a) displays the trend of machinery trade (exports (1) and imports (2)) from January 2000 to July (September) 2009, with a distinction between machinery intermediate goods and machinery final products as well as with a distinction among trading partners (regions). In order to examine whether there were any differences in reactions between intra-regional trade and inter-regional trade, this paper focuses on East Asia (China, ASEAN4, NIEs4, and Japan), the US, and the EU15, in addition to the world as trading partners. Moreover, besides an analysis for the machinery sectors as a whole, we conduct a similar analysis for the electrical machinery sector and the transport equipment sector; Figure 2 (b) and Figure 2 (c) display patterns of trade movement for these sectors, respectively. Furthermore, as will be discussed below, there seems to be some seasonality in trade. In order to consider such seasonality, this paper attempts to estimate trade values with seasonal adjustment by applying the X-12 model and will discuss the features of trade patterns based not only on actual trade values but also on estimated trade values with seasonal adjustment.

Figure 2. (a). East Asia's Trade: Machinery Sectors

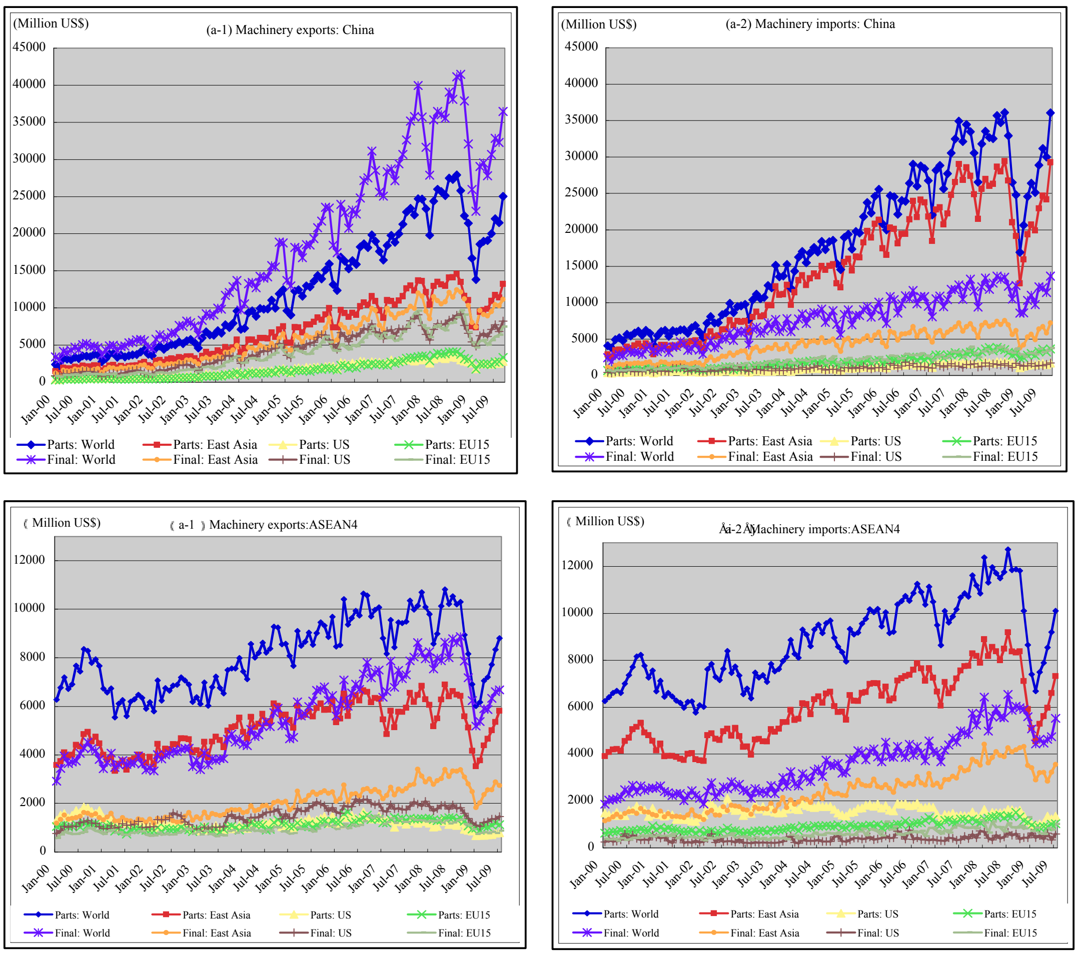
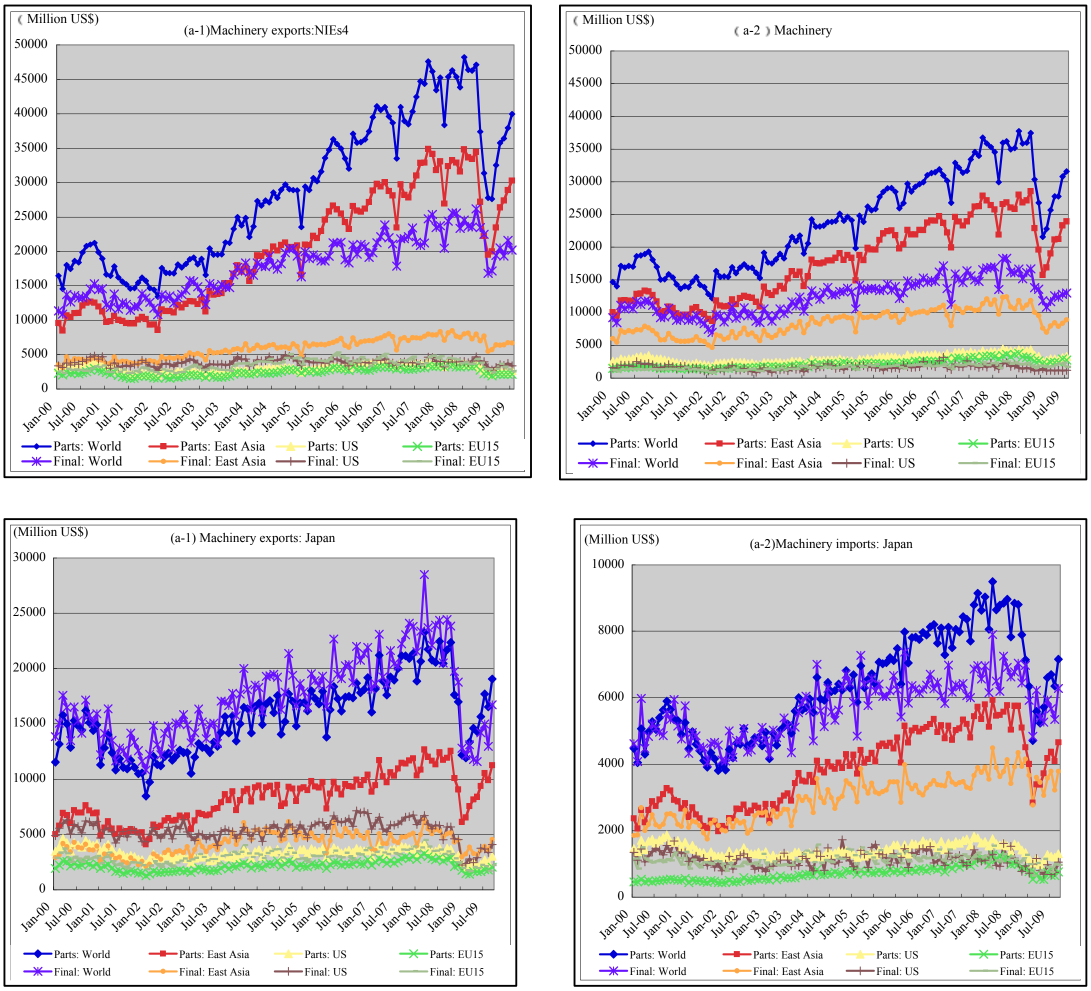


Figure 2. (a). ***Continued***



Data source: Author’s preparation, using trade data available from World Trade Atlas.

Figure 2 (b) East Asia's Trade: Electric Machinery Sectors

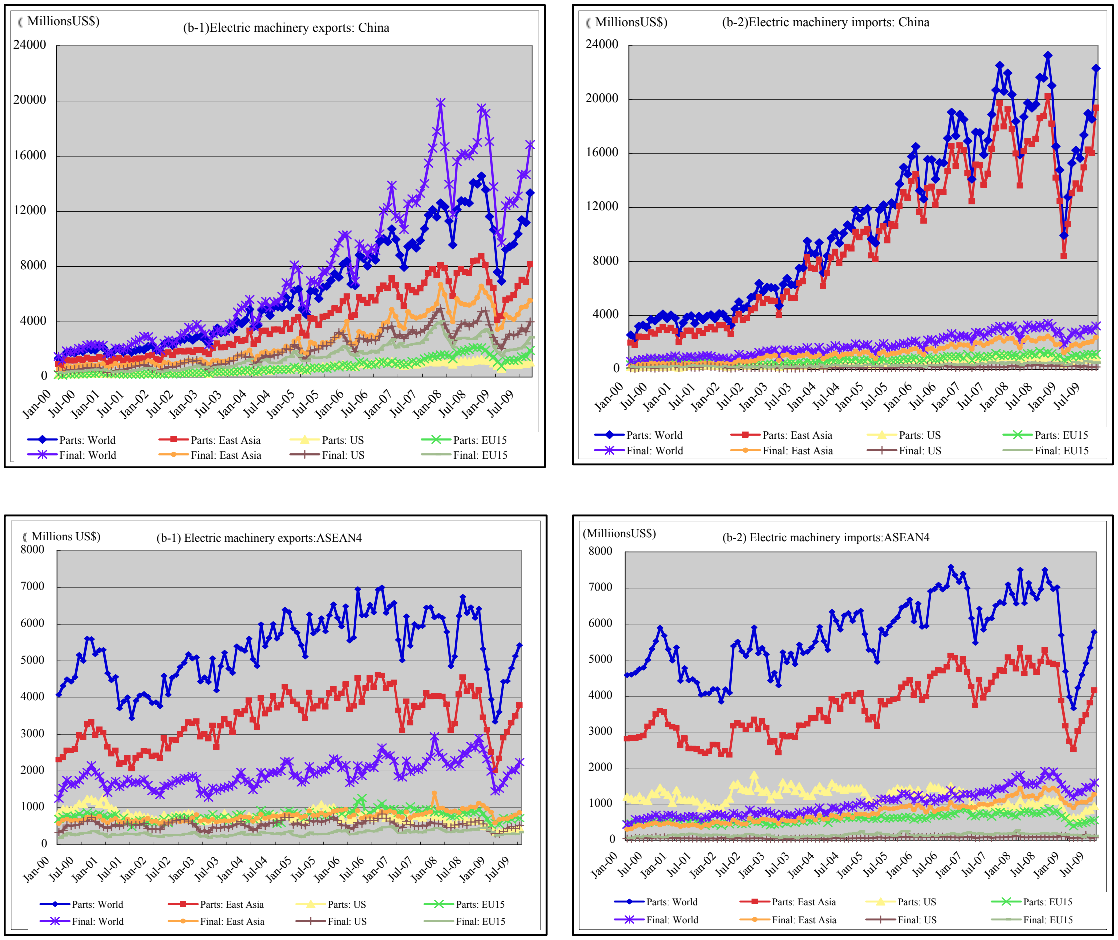
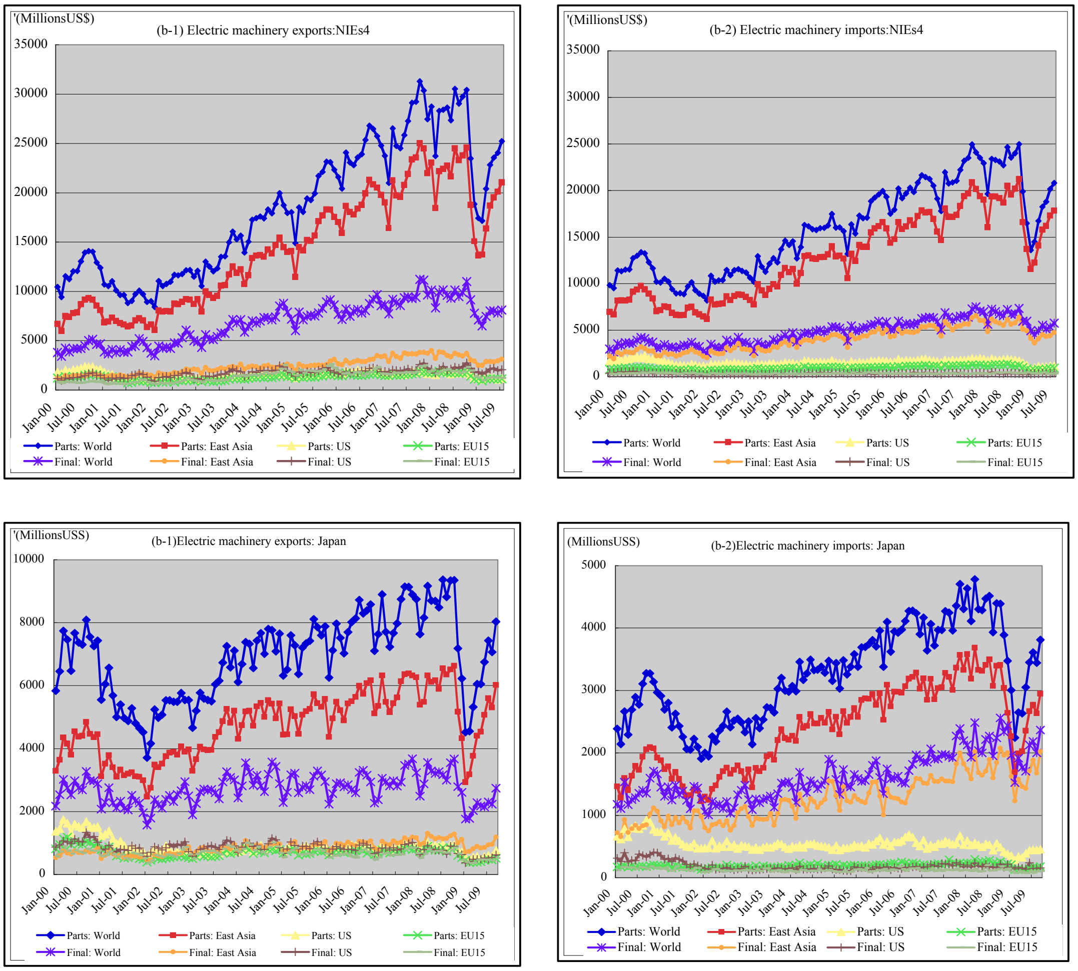


Figure 2 (b). *Continued*



Data source: See Figure 2 (a).

Note: See Figure 2 (a).

Figure 2 (c) East Asia's Trade: Transport Equipment Machinery Sectors

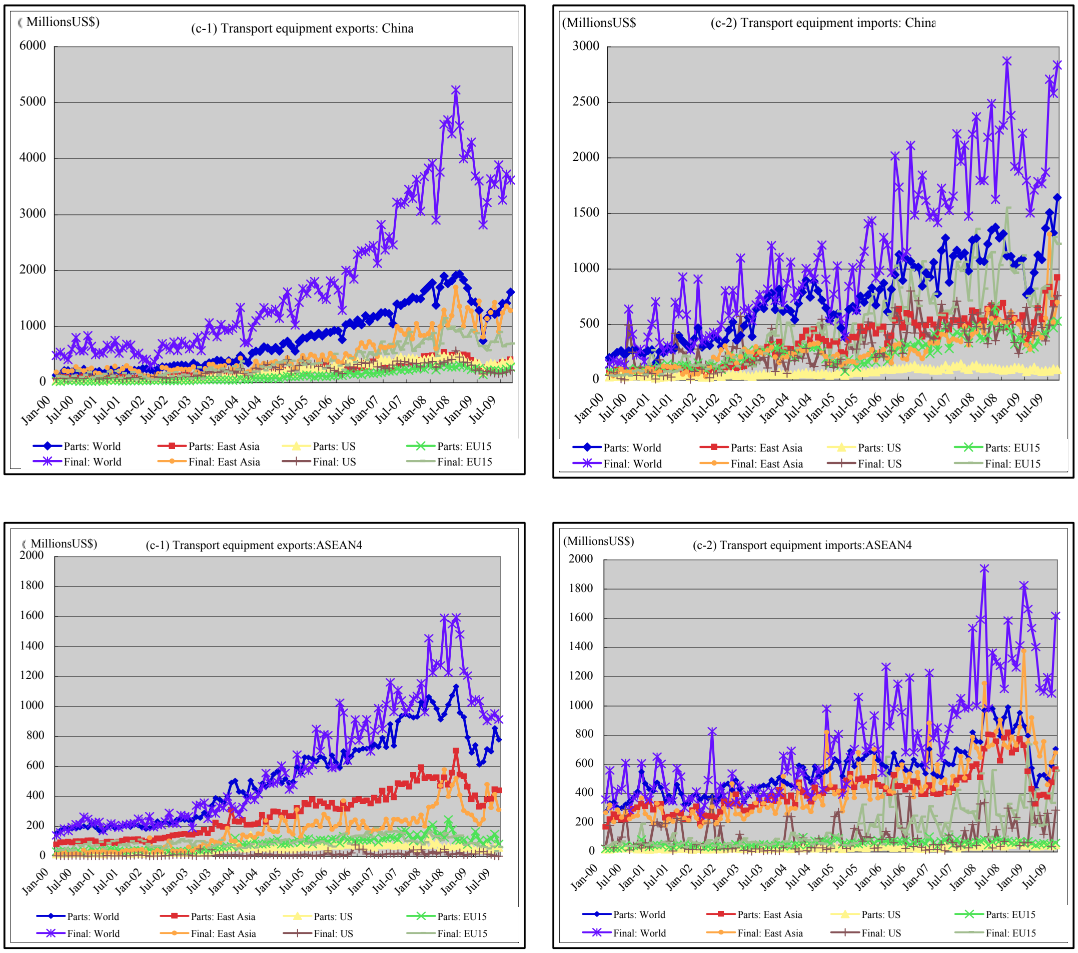
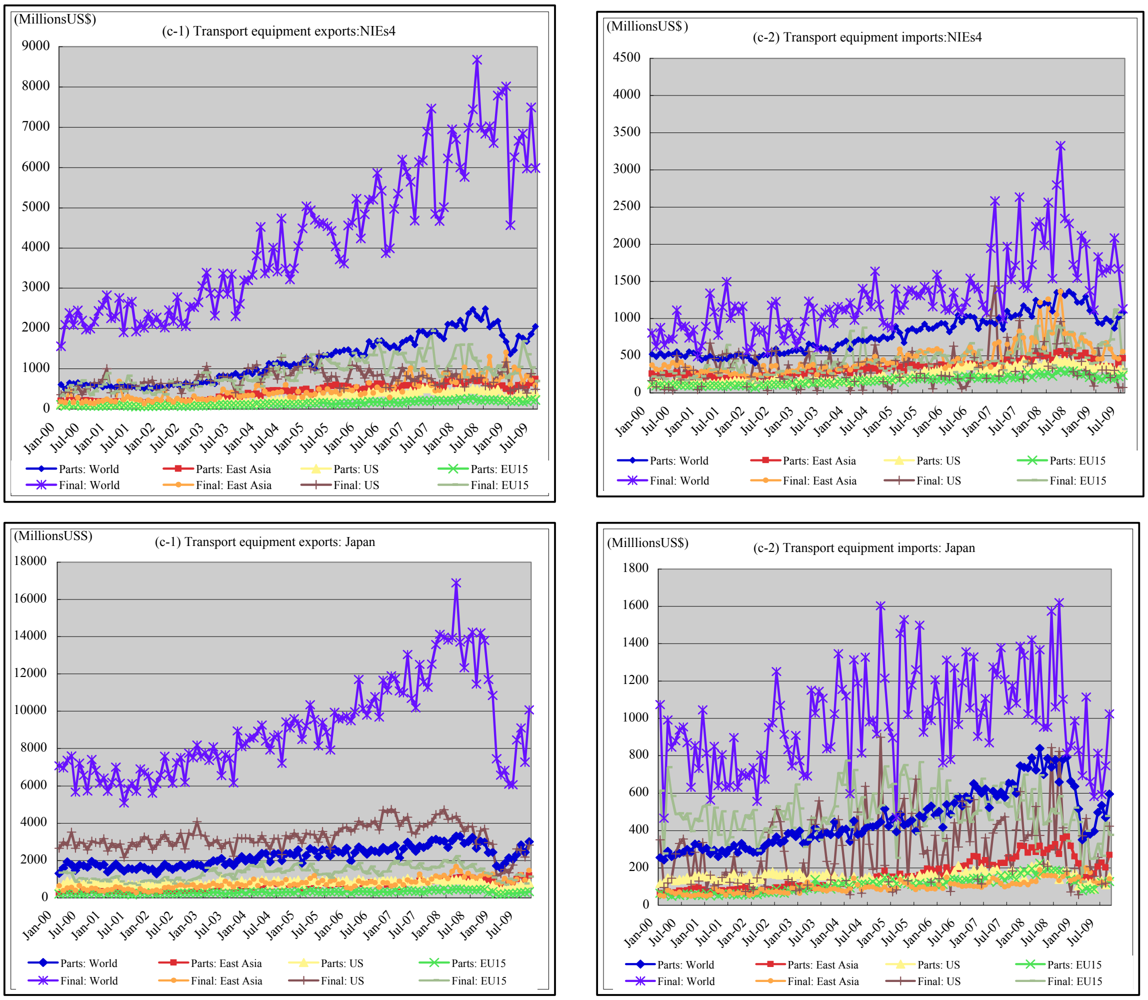


Figure 2 (c) Continued



Data source: see Figure 2 (a).
Note: see Figure 2 (a).

It appears that machinery trade has significantly changed since Q3 2008; whilst both exports and imports drastically declined from a peak in September or October 2008, they started to recover rapidly, bottoming around January to February 2009. As the trend of trade during the last eight years suggests, seasonality seems to exist and trade tends to drop in February. The drop in January or February 2009, however, could not be fully explained by the normal seasonality.

Focusing on differences in the reactions of machinery parts and components trade and final goods trade clearly demonstrates that, except in the case of exports for China and Japan as shown in Figure 2 (a), parts and components trade with the world exceeded final goods trade before the crisis, and the former vividly displays a V-shape, which is deeper than the latter's V-shape. Moreover, a large proportion of such trade with the world is composed of intra-East Asian trade. This would seem to reflect in part some kind of "magnification effect" of intermediate goods trade, as emphasized by Yi (2003). When parts and components are traded across borders several times among fragmented production blocks through the process of fragmentation of production, multi-countable intermediate goods trade may expand total trade values. Conversely, once parts and components trade starts to shrink, total trade can significantly decline. Due to active trade of parts and components within the region through the regional production networks and emergence of the "magnification effect", the V-shape shown by the value of trade would be deeper for parts and components than for final products.

How significantly did machinery trade drop and to what extent did it recover? Who are the major contributors to these changes? The timings of the peak and the trough of trade around the crisis are slightly different among the economies. In addition, the timing seems to be different between intermediate goods and final products in some cases; in the case of machinery imports for the ASEAN4 and the NIEs4, for instance, the timing of the trade recovery for final products lagged behind the timing for parts and components. In order to capture an overall picture, however, this paper consistently regards September 2008 as the peak, February 2009 (five months later) as the trough, and July 2009 (an additional period of five months later) as the recovery (a point on the path of recovery), and calculates (nominal) trade indices (trade values in September 2008 = 100) (Table 2).

(We refer to trade at the peak, trough, and recovery as peak trade, trough trade, and recovery trade, respectively, hereafter.)[4] Note that the trade indices for September 2009, one year later from the peak, are also calculated for China and Japan as the data become available.

[4] The timing of the recovery (a point on the path of recovery) is based on the data available to the author.

Table 2. Trade Index for Machinery Trade in East Asia（2008.9=100)

	Type of products	Destination/origin	China			ASEAN4		NIES4		Japan		
			2009	2009.7	2009.9	2009.2	2009.7	2009	2009.7	2009	2009.7	2009.9
(a) Machinery（HS84-92)												
EX	Parts	World	50	79	90	60	86	60	86	55	82	88
	Parts	East Asia	51	80	91	59	91	60	91	55	88	94
	Parts	US	54	82	85	57	67	61	76	54	72	80
	Parts	EU15	43	67	81	64	80	58	66	52	65	73
	Final	World	56	80	89	61	75	73	86	50	61	68
	Final	East Asia	60	84	90	60	81	79	92	64	78	90
	Final	US	54	86	92	58	80	67	83	42	65	72
	Final	EU15	53	70	86	58	65	66	70	52	62	64
IM	Parts	World	57	86	100	56	85	63	88	53	76	81
	Parts	East Asia	54	84	100	54	88	62	88	49	76	81
	Parts	US	69	91	92	63	87	66	80	64	77	82
	Parts	EU15	69	102	102	58	68	66	87	54	65	75
	Final	World	64	89	101	73	91	67	81	71	84	93
	Final	East Asia	56	89	96	69	85	63	80	71	97	97
	Final	US	80	85	107	72	99	73	76	85	58	90
	Final	EU15	73	90	106	101	119	75	75	57	66	84
(b) Electric machinery（HS85)												
EX	Parts	World	48	78	92	56	85	58	85	49	80	86
	Parts	East Asia	50	80	93	56	90	58	89	49	86	92
	Parts	US	49	78	84	54	68	63	69	52	64	81
	Parts	EU15	37	69	90	59	76	54	64	45	58	61
	Final	World	50	75	86	52	77	66	82	50	65	77
	Final	East Asia	55	77	84	60	77	72	91	60	77	97
	Final	US	43	75	85	45	80	69	87	46	53	69
	Final	EU15	47	66	88	57	75	54	66	46	59	67

Table 2. *Continued*

IM	Parts	World	55	82	96	53	83	60	87	51	82	87
	Parts	East Asia	53	80	96	51	85	61	88	50	82	87
	Parts	US	69	88	93	59	88	53	64	51	81	82
	Parts	EU15	66	92	92	50	71	60	82	55	74	78
	Final	World	64	87	95	63	84	67	85	68	98	106
	Final	East Asia	59	81	96	62	88	63	82	67	102	110
	Final	US	89	76	71	67	70	91	114	84	88	93
	Final	EU15	77	120	102	74	59	88	92	57	60	80
(c) Transport equipment（HS86-89)												
EX	Parts	World	41	77	88	64	81	69	97	52	94	88
	Parts	East Asia	37	72	94	60	81	83	124	64	134	94
	Parts	US	48	87	80	60	76	64	95	47	77	80
	Parts	EU15	47	67	73	99	77	89	99	41	61	73
	Final	World	70	82	68	70	62	95	91	46	64	68
	Final	East Asia	81	124	90	52	76	158	89	67	106	90
	Final	US	42	46	72	119	6	74	74	36	71	72
	Final	EU15	80	79	64	48	46	106	82	52	75	64
IM	Parts	World	72	136	81	51	81	77	88	45	68	81
	Parts	East Asia	77	157	81	47	80	69	93	37	64	81
	Parts	US	96	83	82	56	72	90	82	62	73	82
	Parts	EU15	64	119	75	73	97	74	96	46	73	75
	Final	World	63	114	93	111	128	76	53	63	54	93
	Final	East Asia	46	215	97	102	93	62	75	85	81	97
	Final	US	72	82	90	82	120	72	18	90	27	90
	Final	EU15	66	73	84	191	249	85	40	29	61	84

Data source: Author's calculation, using trade data available from World Trade Atlas.

Note: "EX" and "IM" indicate exports and imports, respectively.

To discover the major factors contributing to the drop and recovery in trade, this paper calculates the contribution ratios of trading partners (regions) to changes in exports to/imports from the world. Table 3 displays the contribution ratios of each region in the drop period (five months from September 2008 to February 2009) and in the recovery period (five months from February 2009 to July 2009).[5] Table 3 also presents trade shares of each region in total trade with the world for one year just before the crisis (from October 2007 to September 2008). Therefore, contribution ratios significantly larger (smaller) than the trade shares of a certain region imply that the corresponding region contributes more (less) significantly to changes in trade with the world than other regions.

[5] Negative contribution ratios in the drop period and in the recovery period imply an increase in trade and a decrease in trade, respectively. In the case of the underlined contribution ratios for the transport equipment sector, total trade increases in the drop period or decreases in the recovery period.

Table 3. Contribution of Each Region to Changes in Machinery Trade in East Asia

	Type of products	Destination/ origin	China			ASEAN4			NIEs4			Japan		
			Trade share (2007.10 -2008.9)	Contribution ratio		Trade share (2007.10 -2008.9)	Contribution ratio		Trade share (2007.10 -2008.9)	Contribution ratio		Trade share (2007.10 -2008.9)	Contribution ratio	
				Drop (2008.9-2009.2)	Recovery (2009.2-2009.7)		Drop (2008.9-2009.2)	Recovery (2009.2-2009.7)		Drop (2008.9-2009.2)	Recovery (2009.2-2009.7)		Drop (2008.9-2009.2)	Recovery (2009.2-2009.7)
(a) Machinery (HS84-92)														
EX	Parts	East Asia	52.7	51.1	53.2	62.6	64.6	77.7	72.4	72.3	83.6	55.1	54.9	69.2
	Parts	US	12.6	10.8	11.3	11.7	12.4	4.3	8.1	7.4	4.2	17.3	17.6	11.5
	Parts	EU15	14.7	16.6	12.0	13.5	12.1	8.7	7.4	7.3	2.1	13.7	13.7	6.1
	Final	East Asia	30.4	27.5	30.5	37.9	39.0	54.5	32.7	24.3	32.1	21.7	14.7	24.1
	Final	US	21.7	22.8	29.0	22.5	21.9	31.4	16.8	21.0	21.4	25.5	26.9	46.5
	Final	EU15	21.7	22.6	14.9	15.2	15.9	6.9	17.4	19.2	4.2	15.6	13.6	12.4
IM	Parts	East Asia	81.2	87.2	83.2	71.6	73.0	81.6	74.6	78.1	80.7	63.2	70.4	76.9
	Parts	US	5.4	3.7	3.8	12.8	11.2	10.8	11.6	10.8	6.9	18.6	13.8	10.2
	Parts	EU15	10.1	7.1	11.1	11.0	12.3	4.8	9.5	8.2	7.7	12.7	11.3	6.0
	Final	East Asia	55.2	68.3	73.0	68.3	79.0	59.5	69.0	78.0	86.1	56.4	58.9	121.2
	Final	US	11.8	6.6	2.1	9.1	10.2	14.4	11.1	8.2	2.2	17.8	9.0	-37.8
	Final	EU15	27.1	19.9	18.1	15.8	-0.5	14.1	13.4	10.9	0.5	17.7	25.5	12.8
(b) Electric machinery (HS85)														
EX	Parts	East Asia	61.4	57.4	59.0	65.7	66.4	79.9	79.6	80.1	91.1	70.1	69.4	83.9
	Parts	US	9.1	8.7	8.6	11.3	10.6	5.1	6.3	5.1	1.3	10.6	9.6	4.1
	Parts	EU15	14.4	17.7	15.3	14.1	13.9	8.9	6.3	6.4	2.2	9.2	9.8	3.9
	Final	East Asia	33.4	30.7	29.6	40.5	32.6	26.7	36.9	28.0	38.8	35.4	27.5	39.5
	Final	US	23.7	27.5	30.3	22.5	25.5	31.0	22.6	21.7	27.1	25.4	27.5	12.1
	Final	EU15	18.2	17.8	12.5	15.8	13.7	10.8	19.9	25.3	14.0	22.4	24.1	19.4
IM	Parts	East Asia	86.7	90.1	88.7	70.8	71.8	78.1	83.0	83.8	88.8	77.1	79.0	78.7
	Parts	US	4.5	2.9	3.0	14.7	13.6	14.9	7.9	8.8	3.1	12.3	12.7	12.4
	Parts	EU15	5.6	4.0	5.2	10.9	11.7	7.7	5.3	4.8	4.0	5.6	4.7	3.0
	Final	East Asia	71.4	82.9	71.3	77.0	78.4	93.9	85.6	95.9	88.0	81.9	86.4	99.4
	Final	US	8.7	2.5	-4.7	5.6	4.6	0.7	5.4	1.3	6.3	8.9	3.7	1.0
	Final	EU15	15.3	8.9	26.8	11.1	7.5	-7.2	5.4	2.0	1.2	5.8	7.9	0.6

Table 3. *Continued*

(c)Transport equipment（HS86-89)														
EX	Parts	East Asia	26.4	28.6	26.2	53.7	61.8	65.5	30.0	15.2	41.2	32.4	22.4	49.7
	Parts	US	25.2	20.2	24.7	7.5	8.7	7.0	21.2	23.7	22.8	29.7	34.3	22.3
	Parts	EU15	16.4	15.0	9.1	15.3	0.2	-14.3	10.4	3.8	4.1	14.3	19.0	7.3
	Final	East Asia	26.3	15.9	96.4	28.8	44.3	78.9	12.4	-108.0	-168.7	8.9	5.1	18.3
	Final	US	9.3	18.0	3.4	1.8	-1.1	-24.0	10.6	49.9	1.0	29.0	30.3	49.9
	Final	EU15	20.7	13.9	-0.8	9.3	15.9	-2.9	17.1	-13.6	-73.8	12.8	9.9	14.6
IM	Parts	East Asia	48.6	40.5	61.2	79.2	87.1	88.4	40.7	53.8	81.6	40.7	52.8	52.2
	Parts	US	8.8	1.1	-1.8	5.3	6.6	3.9	31.5	13.1	-23.6	24.8	16.1	11.0
	Parts	EU15	38.0	51.4	34.4	7.9	4.0	5.7	21.4	22.5	38.2	24.5	21.2	24.9
	Final	East Asia	23.2	37.7	85.9	57.9	-12.0	-31.4	40.1	55.0	19.8	11.5	5.7	-6.2
	Final	US	23.0	19.1	4.9	12.2	31.2	42.8	23.4	23.5	-48.0	36.6	10.7	-257.1
	Final	EU15	47.5	38.6	5.7	21.7	-145.3	59.9	31.0	23.2	-74.8	42.2	75.1	136.1

Data source: Author's calculation, using trade data available from World Trade Atlas.

Notes: Trade shares show trade of each destination/origin as a share of total trade with the world for the corresponding country/region. Contribution ratios during the drop period and recovery period express contribution ratios to a decrease in trade with the world during the period between September 2008 and February 2009 and contribution ratios to an increase in trade with the world during the period between February 2009 and July 2009, respectively. In the cases of underlined figures for the transport equipment sector, trade with the world increased during the dropping period and decreased during the recovering period. "EX" and "IM" indicate
exports and imports, respectively.

These tables provide several interesting insights. First, for both exports and imports, while machinery final goods trade shrank to a level of 60 percent to 70 percent of peak trade during five to six months, and machinery parts and components trade dropped to 50 percent to 60 percent of peak trade, both types of trade recovered to the level of 80 percent to 90 percent within one year, except in the case of machinery final goods exports for the ASEAN4 and Japan. For instance, trade indices for parts and components (final goods) at the trough level in China, the ASEAN4, the NIEs4, and Japan are 50 (56), 60 (61), 60 (73), and 55 (50) for exports and 57 (64), 56 (73), 63 (67), and 53 (71) for imports. These figures confirm the fact that machinery parts and components trade shrank to a level of close to one half of the peak level, and the drop in trade values in general was greater for parts and components than for finished products.

Second, a large part of the trade change (increase or decrease) was induced by East Asia and, in addition, the recovery in intra-regional trade at a higher pace than in other regions contributed to the rapid recovery in East Asia's total trade; on the export side, trade moved back almost to the peak trade level. The large contribution ratios of East Asia are, of course, partly due to the high trade shares of East Asia (the proportion of total trade due to East Asia), particularly for parts and components , but this apparently differs from the case of machinery final goods trade. Moreover, after the start of recovery, for both exports and imports, the contribution ratios of East Asia are greater than the trade shares of East Asia. Therefore, the recovery in intermediate goods trade within the region at such a relatively high speed drives a dynamic recovery as a whole. On the export side, the trade indices of East Asia for the recovery trade are higher than those for the world, amounting to over 90 percent of peak trade. In other words, machinery intermediate goods trade moved back to almost the same level as before the crisis. [6]

Third, although intra-regional exports of final goods slightly decreased, the size of the drop was relatively small, and they recovered to the level of around 90 percent of peak trade within one year from the occurrence of the crisis. The trade shares of East Asia are much smaller for final goods than for intermediate goods, but the contribution ratios of East Asia to the drop in machinery final goods exports are smaller than the trade shares of East Asia, except in the case of the ASEAN4. Moreover, the contribution ratios of East Asia in the recovery period are almost the same as or even higher than the trade shares of East Asia. This suggests that intra-regional final goods exports indeed decreased to some extent, but not by a significant amount. The trade indices of East Asia (intra-regional exports) for the recovery trade are higher than those of the world (East Asia's total exports to the world): around 80 percent of peak trade for the ASEAN4, and over 90 percent for China, the NIEs4, and Japan. In the case of imports, the contribution ratios of East Asia are smaller than the trade shares in some cases, but trade for the ASEAN4 and the NIEs4 is over 80 percent of trade at the peak, and trade for China and Japan moved back to as high as 96 percent and 97 percent of peak trade in September 2009, respectively.

Fourth, the recovery in trade with the US and Europe lagged behind the recovery in intra-regional trade for machinery parts and components and for final goods. In particular, the recovery in trade with Europe was significantly delayed for machinery final goods exports, compared with intra-regional trade. Note that the proportions of US and Europe in final goods trade for East Asia are much smaller than is generally thought. In the case of intermediate goods, the shares of US and Europe in trade with the world are around 10

[6] See Obashi (2009) for stability of parts trade in East Asia.

percent for both exports and imports, probably reflecting magnification effects of intermediate goods trade within East Asia. The corresponding shares of US and Europe for machinery final goods are higher than those for intermediate goods, but they are still around 20 percent; in the case of exports, for instance, the shares of the US and the EU are 22 percent and 22 percent for China, 23 percent and 15 percent for the ASEAN4, 17 percent and 17 percent for the NIEs4, and 26 percent and 17 percent for Japan. They are much lower than generally thought. Therefore, the US and Europe are indeed important markets for products produced through the production networks in East Asia, but the networks are not necessarily dependent only on these markets. Rather, the significance of East Asia as a market for final goods is increasing, and expansion and further activation of intra-regional demand are essential for the production networks in East Asia in the future.

The trade indices of the recovery in trade for the US and the EU are smaller than those for East Asia, indicating delayed recovery. In the case of final goods, in particular, the delay in recovery of exports to US and Europe, particularly Europe, is dominant; the trade indices at the trough for East Asia, the US, and Europe are 60, 54, and 53 for China, 60, 58, and 58 for the ASEAN4, 79, 67, and 66, and 64, 54, and 53 for Japan. Similarly, the trade indices in the recovery period are also higher for East Asia than for the US and Europe, except in the case of China. In particular, compared with the high trade indices of East Asia, the NIEs4 and Japan (over 90 percent), those for US are around 70 percent to 80 percent and those for Europe are about 60 percent to 70 percent, suggesting slow recovery in these regions. The contribution ratios in Table 3 also confirm such a delayed recovery. While the contribution ratios of the EU and the trade share of the EU are more or less similar in the drop period, the former are much smaller than the latter in the recovery period: the contribution ratios and trade share of the EU in the recovery period are 15 and 22 for China, 7 and 15 for the ASEAN4 , 17 for the NIEs4, and 12 and 16 for Japan, implying how significantly the recovery in exports of final goods to the EU lagged behind.

So far, we have discussed features of machinery trade as a whole. In the following, let us focus on differences in the electrical machinery and transport equipment sectors. As Figure 2 (b) clearly shows, a deep V-shape is apparent in the electrical machinery sector. The trade indices at the trough for both parts and final goods are smaller in the electrical machinery sector than in the machinery sector as a whole, suggesting that the drop in trade as a result of the financial crisis was larger than in other machinery sectors. The contribution ratios in the recovery period demonstrate that though the trade shares of East Asia in the recovery period are high for parts and components trade (61 percent of total exports and 87 percent of total imports for China, 66 percent and 71 percent for the ASEAN4, 80 percent and 83 percent for the NIEs4, and 70 percent and 77 percent for Japan), the contribution ratios, 80 percent to 90 percent (60 percent only for exports of China), are much higher than the trade shares. This clearly shows how significant were the drop and recovery in the parts and components trade within the region.

On the other hand, the transport equipment sector shows a quite different picture from the electrical machinery sector, and the trade in this sector fluctuates. For instance, the trade values themselves are much smaller, and the effects of the financial crisis *per se* may be ambiguous (particularly intra-regional demand), which would be a major reason for such differences. Even in the transport equipment sector, the V-shape can be observed for both exports and imports of machinery intermediate goods, but it is not apparent for those of final goods. Note that Thailand accounts for a large proportion of ASEAN's transport equipment exports (Figure 2 (c)). When we look at the figures for Thailand and Japan, similarly to their parts trade, final goods in the transport equipment sector or CBU (Complete Build Up) also show the V-shape.[7] Indeed, many Japanese automobile assemblers have invested in Thailand and, when we had the opportunity of an interview during a factory visit, we heard that the financial crisis had significantly affected the transport equipment sector in Thailand. All of these factors suggest that while the financial crisis hit the transport equipment sector in Thailand and Japan, which have a significant amount of the inter-regional exports of CBU, transport equipment trade declined only to some extent, reflecting the Asian economy's slowdown.

In sum, the sector-by-sector features of machinery trade are as follows: first, electrical machinery trade, with high intra-regional shares, dropped significantly and rapidly recovered. Second, the recovery in trade, particularly in the electrical machinery sector, was rapid, and a certain level of solid development of production/distribution networks would have helped industries avoid becoming destabilized. Third, the crisis particularly hit the economies of Thailand and Japan, which account for a significant amount of the exports of CBU from the region. Fourth, transport equipment trade in other countries declined, simply reflecting the Asian economy's shrinkage as a whole, without significant effects. Note that the significant trade drop and delayed trade recovery in Japan might be explained in that Japanese firms may adopt a strategy of

[7] The reason why the timing of the recovery for CBU lagged behind that for parts (that is, the timing of the trough of the V-shape is later for CBU than for parts) is that there are time lags between production/purchase of parts and completion of assembly and manufacture in CBU.

lowering the weightings of production within Japan in the production/distribution networks in East Asia.

Figure A.1 and Table A.2 in the Appendix are based on estimated trade values which were obtained by employing one of the models for seasonal adjustment, namely the X-12 model. These values suggest that when we consider seasonality, the magnitudes of changes in trade in the drop and recovery periods become much smaller, and the above-mentioned effects mean, in particular, that the extent to which trade drops and recovers would also become much smaller.

4. Policy implications

This paper has focused on machinery sectors, which are major sectors of international production/distribution networks in East Asia, and has analyzed the effects of the global financial crisis from the perspective of international trade. More specifically, the paper has examined machinery trade patterns, with a distinction between machinery intermediate goods and machinery final products, and also with a distinction among trading partners (regions), so as to see whether there were any differences in reactions between machinery final products and parts and components, between intra-regional trade and inter-regional trade, and among machinery sectors. Moreover, in order to consider seasonality, the paper has estimated trade values with seasonal adjustment by applying the X-12 model and has also discussed features of trade patterns based not only on actual trade values but also on estimated trade values with seasonal adjustment.

As our results demonstrate, effects of the financial crisis do indeed exist but at the same time East Asia's trade has rapidly recovered within the regional production/distribution networks. Such a surprising recovery suggests that the existence of dense industrial clusters and international production/distribution networks helps industries to remain stable; they are strong toward external shock, even if there may be short-term effects, so that it is beneficial for East Asian countries to be involved in the production networks. Just after the occurrence of the crisis, the author often heard it emphatically pointed out that it might have been better for countries that had already become engaged in the networks not to have been involved (it would be better for countries that might become involved in the future not to enter). Trade did indeed temporarily drop significantly but it started to recover within a half year from the occurrence of the crisis. Rather, we should say that the existence of dense production/distribution networks in East Asia helped industries to avoid becoming destabilized.

From the viewpoint of strength and stability of the production/distribution networks, the key would be whether they are dense and solid or not. Further improvement of trade and investment facilitation is required in order to make the networks more solid and more competitive. In addition, while the US and Europe are still important destinations for exports from East Asia, the importance of the intra-regional market has risen and further activation and expansion of intra-regional demand is essential.

Table 4 summarizes the results of analysis of the investment climate in 2008 in East Asian countries other than Japan, using the survey compiled by the Japan Machinery Center for Trade and Investment (JMC) (JMC survey 2008 hereinafter); this shows indices corresponding to the problems and obstacles faced by Japanese firms operating in specific countries according to ten categories. The ten categories are divided into two groups, one consisting of four categories of problems related to FDI liberalization and the other consisting of six categories of problems related to FDI facilitation.[8] The categories with the five highest indices all concern facilitation measures, except "restrictions on foreign entry". Due to the nature of the survey, the countries in which Japanese firms are more active in trade and investment or those to which Japanese firms pay considerable attention as new investment locations may tend to have a larger number of incidents, since they are more likely to face various problems through their operations. However, this table clearly suggests that further efforts to reduce such problems by these countries are required. Although this table includes 13 countries (countries in East Asia in this paper other than Japan plus Cambodia, Laos, Myanmar, and Vietnam (CLMV)), the shares of each category only for the CLMV countries show that the ratio of "underdeveloped infrastructure, shortages of human resources, and insufficient investment incentives" is much higher, compared with those for the 13 countries, suggesting that the development of infrastructure and so on is indispensable in these countries.

[8] This classification, which has been proposed by Urata, *et al.* (2007), is based on a literature survey and discussions among the members of a committee including representatives of the APEC Business Advisory Council (ABAC) Japan, the Japan Machinery Center for Trade and Investment (JMC), the Ministry of Trade, Investment, and Industry (METI) Japan, and university professors.

Table 4. Major Impediments to Trade and Investment Liberalization and Facilitation in East Asia (2008)

		China	Indonesia	Philippines	Malaysia	Thailand	Hong Kong	Korea	Taiwan	Singapore	Cambodia	Laos	Myanmar	Vietnam	Total	Share (%)	Share for CLMV(%)
	FDI liberalization	**27**	**14**	**9**	**11**	**15**	**1**	**8**	**8**	**1**	**0**	**0**	**7**	**9**	**110**	**21.0**	**15.1**
i	Restrictions on foreign entry	11	10	6	5	8	0	4	1	0	0	0	2	4	51	9.7	5.7
ii	Performance requirements	3	2	0	3	2	0	0	1	0	0	0	0	2	13	2.5	1.9
iii	Restrictions on overseas remittances and controls on foreign currency transactions	12	0	2	1	3	1	2	3	0	0	0	5	2	31	5.9	6.6
iv	Restrictions on the movement of people and employment requirements	1	2	1	2	2	0	2	3	1	0	0	0	1	15	2.9	0.9
	FDI facilitation	**107**	**28**	**48**	**33**	**45**	**12**	**24**	**22**	**6**	**16**	**4**	**21**	**49**	**415**	**79.0**	**84.9**
v	Lack of transparency in policies and regulations concerning investment (institutional problems)	43	5	11	8	14	4	5	10	0	5	1	8	12	126	24.0	24.5
vi	Complicated and/or delayed procedures with respect to investment-related regulations (implementation problems)	44	11	16	10	20	3	5	9	0	5	1	7	18	149	28.4	29.2
vii	Insufficient protection of intellectual property rights	9	2	3	3	2	3	4	3	0	0	0	0	1	30	5.7	0.9
viii	Labor regulations and related practices excessively favorable to workers	6	2	10	5	3	1	10	0	3	0	0	0	4	44	8.4	3.8
ix	Underdeveloped infrastructure, shortages of human resources, and insufficient investment incentives	4	6	8	7	5	1	0	0	3	6	2	5	11	58	11.0	22.6
x	Restricted competition and price controls	1	2	0	0	1	0	0	0	0	0	0	1	3	8	1.5	3.8
	Total	**134**	**42**	**57**	**44**	**60**	**13**	**32**	**30**	**7**	**16**	**4**	**28**	**58**	**525**	**100**	**100**

Data source: Author's preparation based on Ando (2009).

Note: "CLMV" expresses Cambodia, Laos, Myanmar, and Vietnam.

Tariffs and non-tariff measures (NTMs) would be further reduced with various channels of trade liberalization such as AFTA and other bilateral and multilateral/regional trade agreements. From the perspective of each individual country in the region, operations that are preserved by imposing high tariffs at the moment would be difficult to maintain in the future. Therefore, the economic future of a country would depend on whether it could form an industrial cluster and establish industries which can be facilitated by the improvement of the business environment, including logistics.

References

Ando, Mitsuyo（2009） “Survey on Issues to Improve Trade and Investment Liberalization and Facilitation in APEC Member Economies.” *Japan Machinery Center for Trade and Investment*. In Japanese.

Ando, Mitsuyo (2006) “Fragmentation and Vertical Intra-industry Trade in East Asia.” *North American Journal of Economics and Finance*, **17** (3): 257-281.

Ando, Mitsuyo, and Fukunari Kimura (2005) The formation of international production and distribution networks in East Asia. In T. Ito & A. Rose (Eds.), *International trade (NBER-East Asia seminar on economics, volume 14)*, Chicago: The University of Chicago Press.

________ (2010) “Fragmentation in East Asia: Further Evidences” The Rise of Asia: Trade and Investment in Global Perspective, Routledge Studies in the Growth Economies of Asia.

Arndt, Sven. W. and Henryk Kierzkowski (2001) *Fragmentation: New Production Patterns in the World Economy*. Oxford: Oxford University Press.

Deardorff, Alan. V (2001) “Fragmentation in Simple Trade Models.” *North American Journal of Economics and Finance*, **12**: 121-137.

Japan Machinery Center for Trade and Investment (JMC) (2008) Issues and Requests for Trade and Investment Activities by Country/Region in 2008. Available from http://www.jmcti.org/mondai/top.html.

Jones, Ronald W. and Henryk Kierzkowski (1990) "The Role of Services in Production and International Trade: A Theoretical Framework," in Ronald W. Jones and Anne O. Krueger (eds.), *The Political Economy of International Trade: Essays in Honor of Robert E. Baldwin*, Oxford, Basil Blackwell.

________ (2001) “A Framework for Fragmentation.” In Sven W. Arndt and Henryk Kierzkowski, eds., *Fragmentation: New Production Patterns in the World Economy*. Oxford: Oxford University Press.

Kimura, Fukunari, and Mitsuyo Ando (2005)“Two-dimensional Fragmentation in East Asia: Conceptual Framework and Empirics”. *International Review of Economics and Finance*, 14: 317-348.

Obashi, Ayako (2009) “Resiliency of Production Networks in Asia: Evidences from the Asian Crisis.” Presented at the ARTNeT 5th Anniversary Conference held in Bangkok, Thailand on November 2-3 2009.

Urata, Shujiro, Mitsuyo Ando, and Kazuyori Ito (2007) Survey on Investment Liberalization and Facilitation ‘Obstacles to FDI in the APEC Economies: A Study Based on the JMC Firm Survey (APEC#207-CT-01.10), available at http://www.apec.org/apec/publications/free_downloads/2007.html.

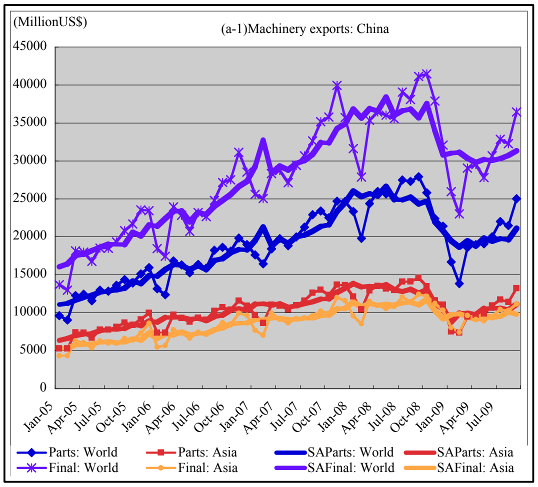
Yi, K-M. (2003) “Can Vertical Specialization Explain the Growth of World Trade?“, *Journal of Political Economy* **111**: 52-102.

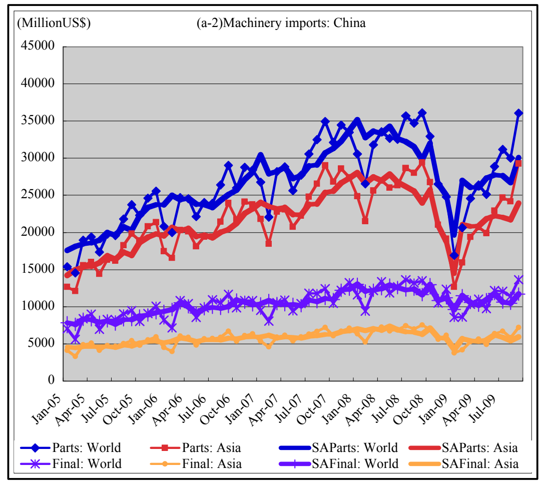
Table A.1. Definition of Machinery Parts and Components: Version of HS2002 and HS 2007

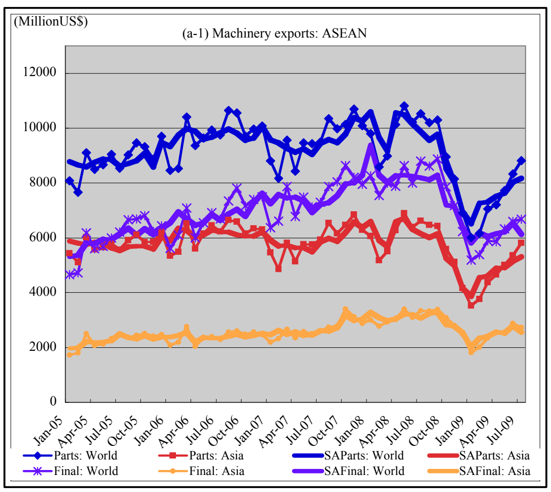
(I) HS2002														
8406	8407	8408	8409	8410	8411	8412	8413	8414	8416	8417	8431	8448	8466	8473
8480	8481	8482	8483	8484	8485	8503	8505	8507	8511	8512	8522	8529	8531	8532
8533	8534	8535	8536	8537	8538	8539	8540	8541	8542	8544	8545	8546	8547	8548
8607	8706	8707	8708	8714	8803	8805	9001	9002	9003	9013	9014	9033	9104	9110
9111	9112	9113	9114	9209										
840140	840290	840390	840490	840590	841520	841590	841891	841899	841990	842091	842099	842123	842129	842131
842191	842199	842290	842390	842490	843290	843390	843490	843590	843691	843699	843790	843890	843991	843999
844090	844190	844240	844250	844390	845090	845190	845240	845290	845390	845490	845590	846791	846792	846799
846890	847490	847590	847690	847790	847890	847990	850490	850690	850990	851090	851390	851490	851590	851690
851790	851840	851850	851890	853090	854390	870990	871690	900590	900691	900699	900791	900792	900890	900991
900992	900993	900999	901090	901190	901290	901590	901790	902490	902590	902690	902790	902890	902990	903090
903190	903290													
(II) HS2007														
8406	8407	8408	8409	8410	8411	8412	8413	8414	8416	8417	8431	8448	8466	8473
8480	8481	8482	8483	8484	8486	8487	8503	8505	8507	8511	8512	8522	8529	8531
8532	8533	8534	8535	8536	8537	8538	8539	8540	8541	8542	8544	8545	8546	8547
8548	8607	8706	8707	8708	8714	8803	8805	9001	9002	9003	9013	9014	9033	9104
9110	9111	9112	9113	9114	9209									
840140	840290	840390	840490	841520	841590	841891	841899	841990	842091	842099	842123	842129	842131	842191
842199	842290	842390	842490	843290	843390	843490	843590	843691	843699	843790	843890	843991	843999	844090
844190	844240	844250	844391	844399	845090	845190	845240	845290	845390	845490	845590	846791	846792	846799
846890	847490	847590	847690	847790	847890	847990	850490	850690	850870	850990	851090	851390	851490	851590
851690	851770	851840	851850	851890	852352	853090	854390	870990	871690	900590	900691	900699	900791	900792
900890	901090	901190	901290	901590	901790	902490	902590	902690	902790	902890	902990	903090	903190	903290

Source: Ando and Kimura (2005) and the revision.

Figure A.1 (a) East Asia's Trade with Seasonally Adjustment: Machinery Sectors







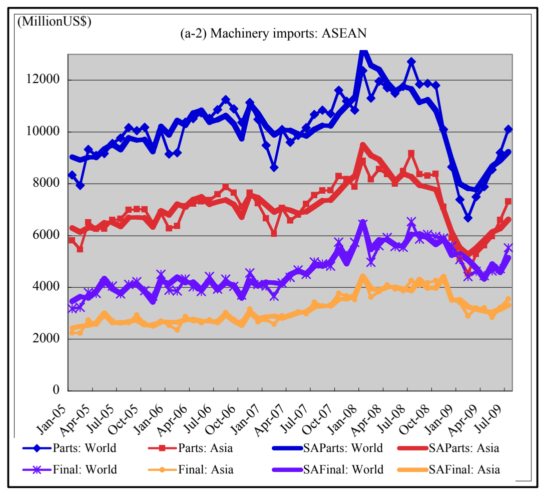
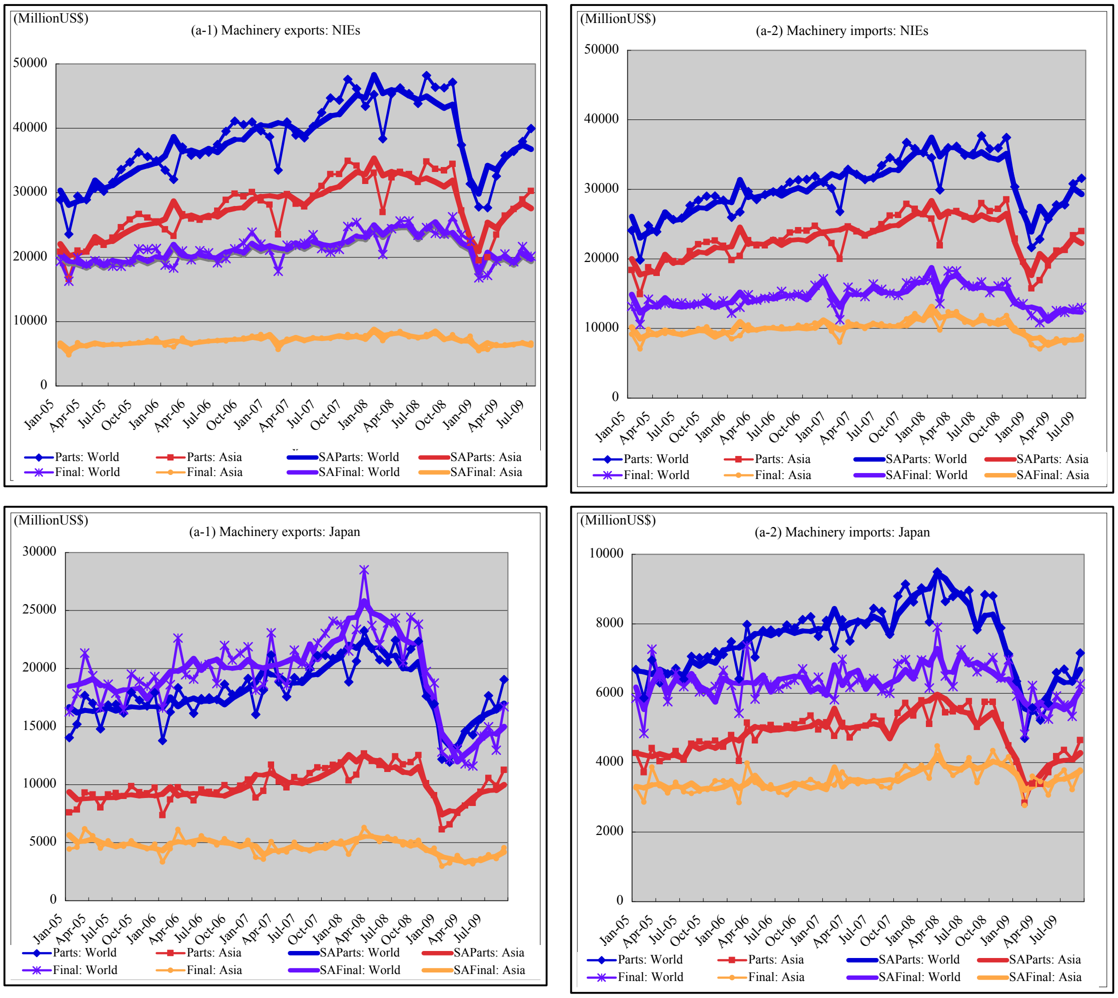


Figure A.1 (a) ***Continued***



Data source: Author's estimation, using trade data available from World Trade Atlas.

Note: "SAParts" and "SAFinal" display the trend of trade with seasonal adjustment, based on the X-12 model.

Figure A.1 (b). East Asia's Trade with Seasonally Adjustment: Electric Machinery Sectors

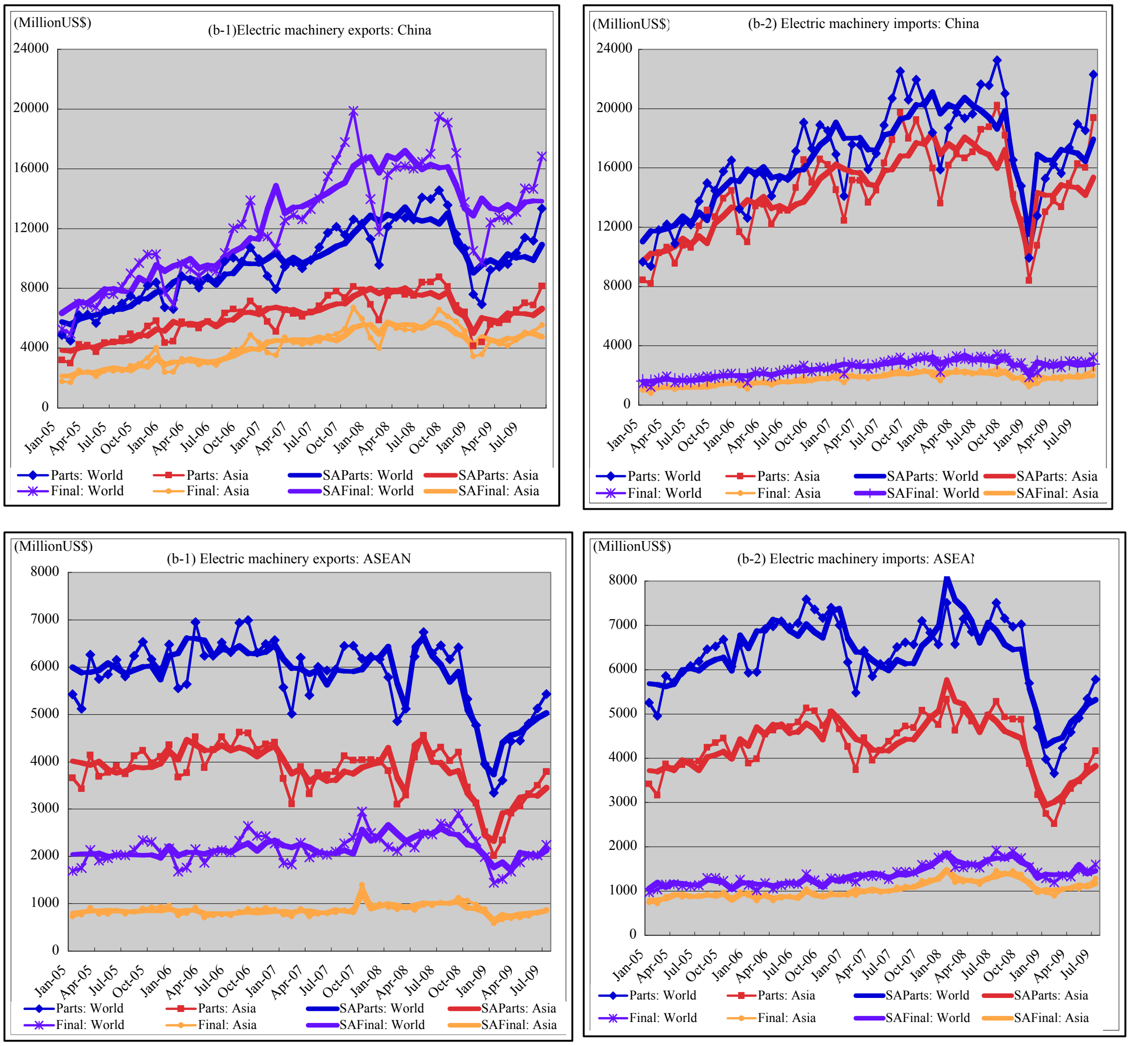
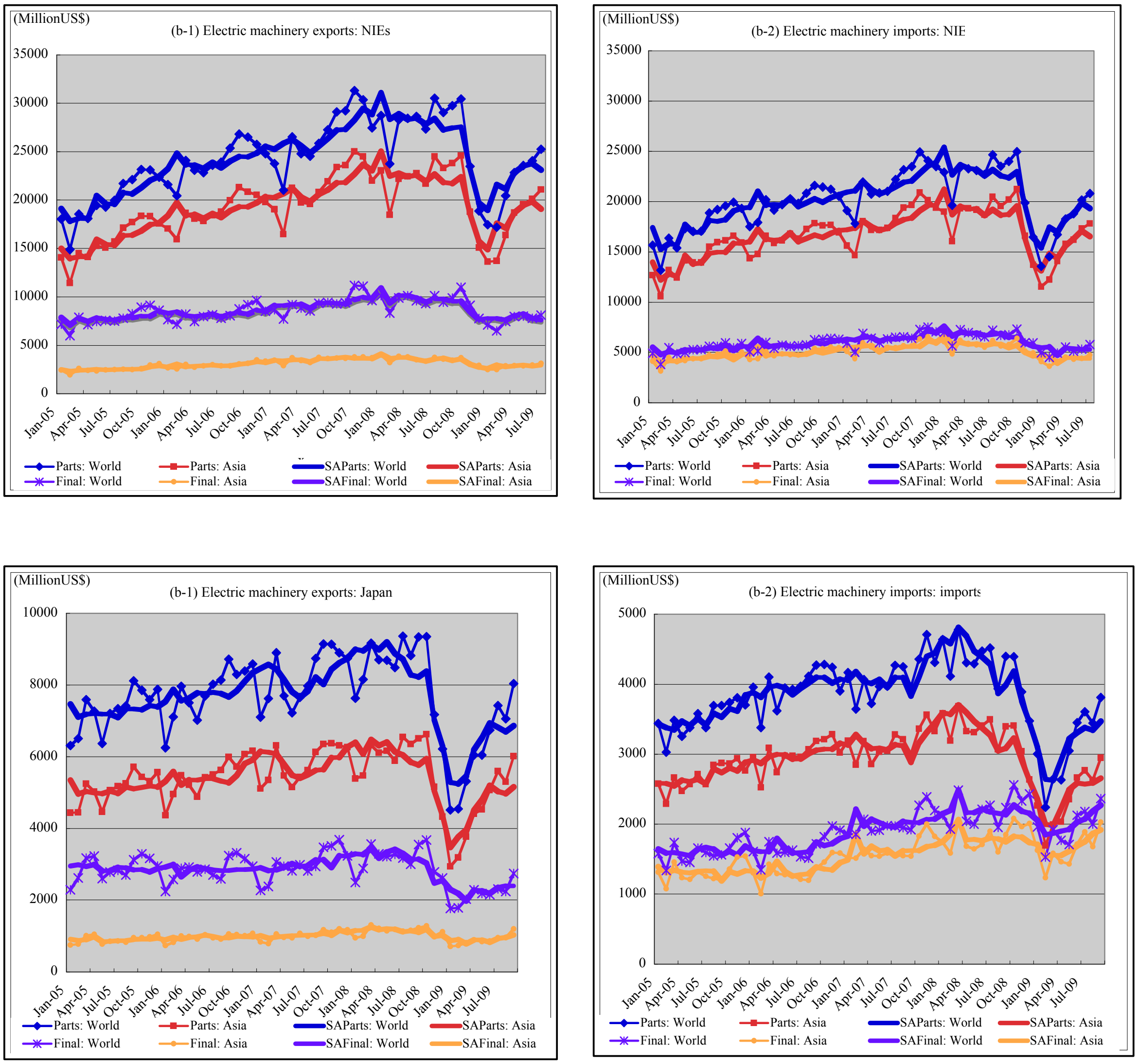


Figure A.1 (b). *Continued*



Data source: See Figure A.1 (a).

Note: See Figure A.1 (a).

Figure A.1 (c) East Asia's Trade with Seasonally Adjustment: Transport Equipment Machinery Sectors

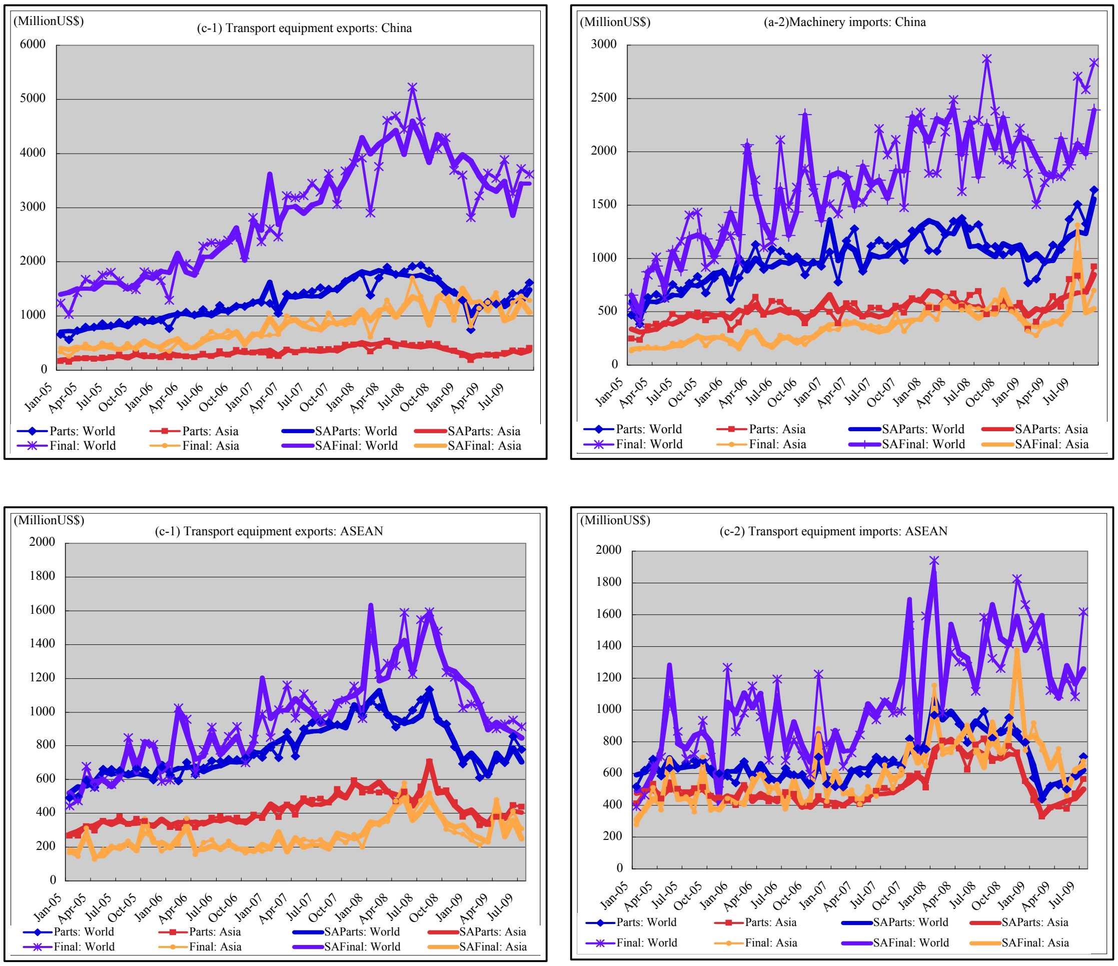
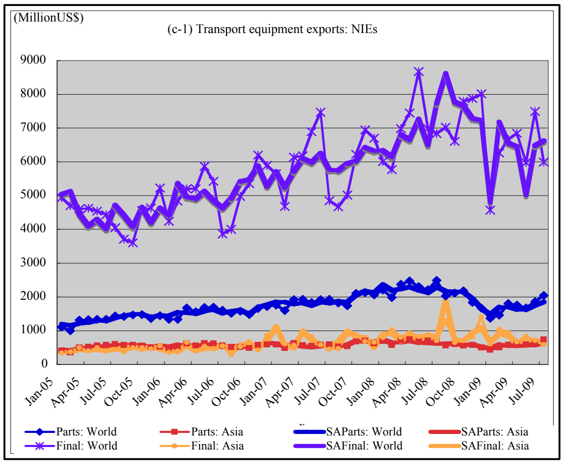
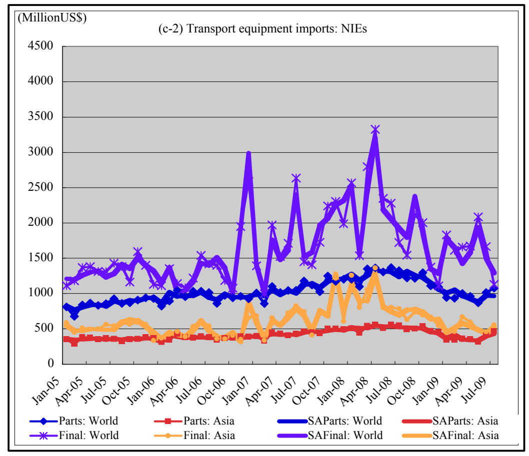
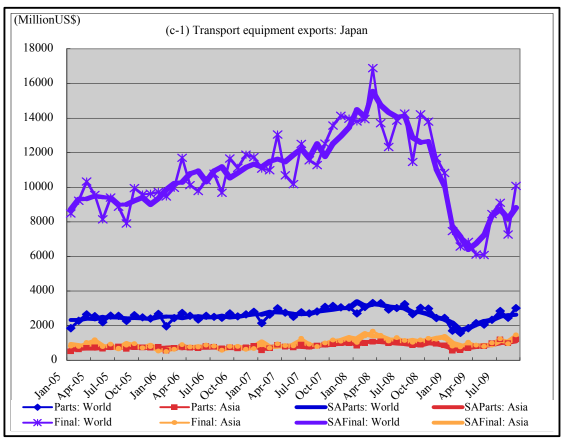
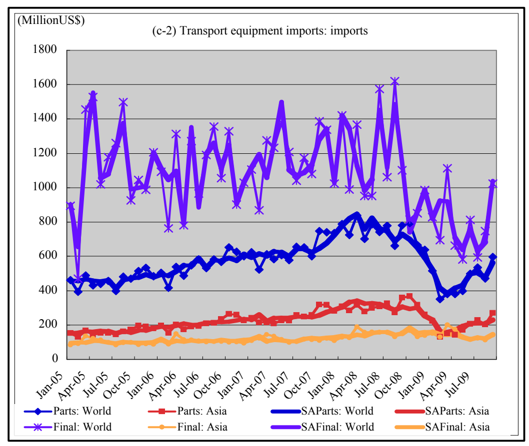


Figure A.1 (c) ***Continued***









Data source: See Figure A.1 (a).

Note: See Figure A.1 (a).

Table A.2. Trade Index for Machinery Trade in East Asia with Seasonal Adjustment (2008.9=100)

	Type of products	Destination/origin	China			ASEAN4		NIES4		Japan		
			2009.2	2009.7	2009.9	2009	2009.7	2009	2009.7	2009.2	2009.7	2009.9
(a) Machinery（HS84-92)												
EX	Parts	World	77	81	87	74	84	79	85	67	81	85
	Parts	East Asia	79	85	89	74	86	82	89	70	86	91
	Parts	US	76	82	83	78	80	75	75	59	71	78
	Parts	EU15	65	70	80	76	82	69	72	56	68	71
	Final	World	87	85	88	75	74	87	83	61	65	68
	Final	East Asia	89	86	89	71	78	92	87	77	79	88
	Final	US	92	93	91	78	86	87	87	48	71	72
	Final	EU15	80	81	85	71	72	80	76	55	65	63
IM	Parts	World	91	93	101	70	82	80	86	68	77	81
	Parts	East Asia	88	92	100	67	84	81	87	64	77	81
	Parts	US	97	92	95	77	86	76	78	76	78	83
	Parts	EU15	97	97	103	67	68	77	77	61	62	75
	Final	World	99	91	101	85	87	80	78	85	82	91
	Final	East Asia	90	93	94	82	83	82	79	82	91	96
	Final	US	108	78	106	74	80	76	70	94	69	92
	Final	EU15	109	88	106	115	98	92	71	73	74	86
(b) Electric machinery（HS85)												
EX	Parts	World	78	82	89	75	85	79	84	64	83	83
	Parts	East Asia	81	85	89	77	91	81	88	65	87	89
	Parts	US	74	82	82	78	82	79	71	61	68	80
	Parts	EU15	63	71	87	76	83	64	71	52	62	60
	Final	World	87	86	86	76	87	81	80	70	75	76
	Final	East Asia	83	87	84	73	82	86	86	83	85	94
	Final	US	87	89	85	75	95	95	91	62	62	69
	Final	EU15	78	81	88	80	83	72	74	64	70	66
IM	Parts	World	91	91	96	68	83	78	86	66	85	87
	Parts	East Asia	90	92	96	66	84	79	88	65	83	86
	Parts	US	94	91	93	74	90	68	69	63	82	83
	Parts	EU15	91	87	90	62	74	74	80	65	73	81
	Final	World	99	93	95	76	81	86	82	87	97	107
	Final	East Asia	95	91	97	75	86	84	80	88	100	109
	Final	US	118	70	72	79	71	98	90	92	84	96
	Final	EU15	120	122	108	91	68	100	80	68	65	81
(c)Transport equipment（HS86-89)												
EX	Parts	World	60	76	88	74	74	78	86	62	91	95
	Parts	East Asia	58	80	80	71	78	93	102	76	115	127
	Parts	US	63	79	91	59	72	71	78	53	76	82
	Parts	EU15	61	74	87	88	55	90	94	49	69	67
	Final	World	101	74	90	74	60	92	85	57	69	70
	Final	East Asia	150	118	128	62	61	123	89	79	107	125
	Final	US	64	46	61	110	12	84	86	41	74	78
	Final	EU15	120	72	84	53	48	107	85	53	73	71

Table A.2. ***Continued***

IM	Parts	World	102	123	153	52	73	69	54	57	69	77
	Parts	East Asia	109	141	176	48	72	66	65	53	68	75
	Parts	US	108	85	111	65	66	49	18	73	73	84
	Parts	EU15	95	118	119	80	94	121	53	58	74	79
	Final	World	96	102	118	110	87	83	77	81	55	91
	Final	East Asia	75	223	112	112	93	82	84	95	84	96
	Final	US	104	83	123	46	38	92	68	99	28	96
	Final	EU15	113	75	108	196	126	81	81	45	70	88

Data source: author's calculation, using trade data available from World Trade Atlas.

Note: "EX" and "IM" indicate exports and imports, respectively

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