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Abstract

This paper analyzes trade patterns in East Asia, with special reference to the implications of the development of global production sharing. It examines the nature and extent of global production sharing and the role of East Asian countries within global production networks. It also highlights the rise of China and it's positioning within these production networks, explores the implications of engagement in global production sharing for growth patterns, and analyzes the pattern of trade contraction across countries and types of goods during the global financial crisis (2008-2009).

Keywords: trade patterns, East Asia, China, global production sharing, production networks
JEL codes: F14, F15, O53

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Global production sharing and trade patterns in East Asia

The purpose of this chapter is to examine emerging trends and patterns of merchandise trade in East Asia with special emphasis on forces that mold world trade and the organization of production across national boundaries. A key theme running through the chapter is the implications of global production sharing[1] – that is, the breakup of the production processes into separated stages, with each country specializing in a particular stage of the production sequence – for rapid trade growth in these countries.

Over the past few decades global production sharing has opened up ever-increasing opportunities for countries to specialize in different slices (tasks) of the production process depending on their relative cost advantage and other relevant economic fundamentals. With rapid growth in cross-border dispersion of production, firms' decisions regarding how much to produce and for which target market are increasingly combined with decisions on where to produce and with what degree of intra-product specialization. While trade in parts and components and final assembly within production networks ("network trade") has generally grown faster than total world trade in manufacturing, the degree of dependence of East Asia on this new form of international specialization is proportionately larger than elsewhere in the world. Consequently, trade flow analysis based on data coming from a reporting system designed at a time when countries were trading predominantly only in final goods naturally distorted values of exports and imports and led to a falsification of the nature of emerging trade patterns in the region. The degree of falsification is likely to increase over time as more complex production networks are created with an ever-increasing number of participants.

The chapter begins with a discussion on the procedure followed in delineating network trade from data extracted from the United Nations (UN) trade data reporting system (Comtrade database). This is followed by an overview of East Asia's role in world trade. The next section examines the nature and extent of global production sharing and the role of East Asian countries within global production networks. This section also probes the implications of this new form of international exchange for intra-regional trade and for creating new supply-side complementariness among countries in the region, with emphasis on the emerging role of the PRC in regional production networks. The following two sections deal with two selected themes that are central to the contemporary policy debate on East Asia's

[1] An array of alternative terms have been used to describe this phenomenon, including 'international production fragmentation', 'vertical specialisation', 'slicing the value chain and 'outsourcing'. For a comprehensive survey of the related literature, see Helpman 2011, Chapter 6.

rise in the global economy: challenges posed by global production sharing for the conventional changing comparative advantage ("flying geese") approach to the analysis of growth patterns in the region and the role of network trade in determining the impact of the global crisis on the export performance of East Asian economies. The final section summarizes the main findings and draws out some general inferences.

Data

Previous studies have used two alternative approaches to quantifying the magnitude and pattern of global production sharing.[2] The first approach relies on records kept by OECD countries (in particular the United States and the European Union [EU] in connection with special tariff provisions on overseas processing and the assembly of domestically produced components (outward processing trade [OPT] statistics) (Helleiner 1973; Sharpton 1975; USITC 1999; Gorg 2000). OPT records provide data on parts and components exported from source countries and assembled goods received in turn. However, the OPT schemes only cover a limited range of products, and the actual product coverage has varied significantly, both within and among countries over time. Perhaps more importantly, recent trends in unilateral trade and investment liberalization and the proliferation of bilateral and regional economic integration agreements have significantly reduced the importance of such tariff concessions in promoting global sourcing and, therefore, the actual utilization of these schemes. Moreover, by their very nature, these administrative records leave out cross-border transitions among third countries within global production networks.

The second approach, pioneered by Yeats (2001) and pursued in a number of subsequent studies (Ng and Yeats 2003, Athukorala 2005, Athukorala and Yamashita 2006, Ando and Kimura 2010) involves delineating trade in parts and components by using individual country trade statistics extracted from the UN trade data reporting system (Comtrade database). Compared to the OPT-based trade flow analysis, this approach provides comprehensive and consistent coverage of the parts and components trade, encompassing a large number of countries. But it suffers from two major limitations. First, the commodity coverage is limited to parts and components, which can be directly

[2] A number of recent studies have used imported input content of industrial production, estimated using input-output tables, to measure the growth of global production sharing in world trade at the industry/country level. (Growth in the measured degree of imported-input dependence between two time points is interpreted as an indicator of the growth of global production sharing.)(Campa and Goldberg 1997, Dean et al., 2008; Hummels et al., 2001). This approach is not relevant for the present study, which aims to examine the patterns and determinants of production-sharing-driven trade flows.

identifiable based on the commodity nomenclature of the U.S. Standard International Trade Classification (SITC) system. These items are confined to the product classes of machinery and transport equipment (SITC 7 and SITC 8). However, there is evidence that global production sharing has been spreading beyond SITCs 7 and 8 to other product categories, such as machine tools and various metal products (belonging to SITC 6). Second, and more importantly, even if we ignore the problem of under-coverage, parts and components are only one of the facets of network trade. As noted at the outset, there has been a remarkable expansion of network activities from pure component production and assembly to final assembly. Moreover, the relative importance of these two tasks varies among countries and over time in a given country, making it problematic to use data on the parts and components trade as a general indicator of the trends and evolving patterns of network trade over time and across countries.

The analysis in this paper makes use of data extracted from the U.S. trade data system following a procedure that aims to redress these two limitations to the extent permitted by the nature of data availability. We use a list of parts and components encompassing the entire spectrum of manufacturing trade. The list was compiled by mapping parts and components in the UN Broad Economic Classification (BEC) Registry[3] in the product list of the World Trade Organization (WTO) Information Technology Agreement with the Harmonize System (HS) of trade classification at the 6-digit level. Information gathered from firm-level surveys conducted in Thailand and Malaysia was used to fill gaps in the list.[4] Data compiled at the HS 6-digit level were converted to SITC for the final analysis using the UN HS-SITC concordance.

There is no hard and fast rule applicable to distinguishing between parts/components and assembled products in international trade data. The only practical way of doing this is to focus on the specific product categories in which network trade is heavily concentrated (Krugman 2008). Once these product categories have been identified, assembly trade can be approximately estimated as the difference between parts and components—directly identified based on our list—and recorded trade in these product categories. Guided by the available literature on production sharing, we identified seven product categories: office machines and automatic data processing machines (SITC 75), telecommunication and sound recording equipment (SITC 76), electrical machinery (SITC 77), road vehicles (SITC 78), professional

[3] The BEC registry can be found at http:/www. unstats.un.org/unsd/cr/registry.

[4] The list of parts and components is given in the Appendix in (Athukorala 2010). Total value of parts and components enumerated for the period 1992-2007 based on this list is on average 52 percent higher compared to the value based on the incomplete list used in Athukorala (2005).

and scientific equipment (SITC 87), and photographic apparatus (SITC 88). It is quite reasonable to assume that these product categories contain virtually no products produced from start to finish in a given country. However, admittedly the estimates based on this list do not provide full coverage of final assembly in world trade. For instance, outsourcing of final assembly does take place in various miscellaneous product categories such as clothing, furniture, sporting goods, and leather products. It is not possible to meaningfully delineate parts and components and assembled goods in reported trade in these product categories because they contain a significant (yet unknown) share of horizontal trade. Likewise, assembly activities in software trade have recorded impressive expansion in recent years, but these are lumped together in the UN data system with "special transactions" under SITC 9. However, the magnitude of the bias resulting from the failure to cover these items is unlikely to be substantial because network trade in final assembly is heavily concentrated in the product categories covered in our decomposition (Yeats 2001; Krugman 2008).

Regarding country coverage, East Asia (EA) is defined here to include Japan and developing East Asia (DEA), which covers the newly industrialized economies (NIEs) of North Asia (South Korea, Taiwan and Hong Kong), China and members of the Association of Southeast Asian Nations (ASEAN). Among the ASEAN countries, Myanmar is not covered because of a lack of data and Brunei, Cambodia and Laos are treated as a residual group because of data gaps. The East Asian experience is examined in the wider global context, focusing specifically on the comparative experiences of South Asia, North America and the European Union (EU). Among the ASEAN countries, only the six largest economies—Indonesia, Malaysia, the Philippines, Thailand, Singapore and Viet Nam—are covered in the statistical analysis. Brunei, Cambodia, Lao People's Democratic Republic (Lao PDR), and Myanmar are excluded because of data limitations. The East Asian experience is examined in the wider global context, focusing on the region's performance relative to the North American Free Trade Area (NAFTA) and the EU.

The data are tabulated using importer records, which are considered to be more appropriate for analyzing trade patterns than the corresponding exporter records. Compared to country records, importer records are also presumably less susceptible to double-counting and erroneous identification of the source/destination country in the presence of entrepôt trade (e.g., the PRC's trade through Hong Kong, and China's and Indonesia's trade through Singapore) (Ng and Yeats 2003; Feenstra et al. 1999). Some countries also fail to properly report goods shipped from their own export-processing zones as these tend to be grouped into one highly aggregated category of "special transactions" under SITC 9. It is difficult to find a

satisfactory solution for these problems. However, it is generally believed that data compiled from importer records are less susceptible to recording errors and reveal the origin and composition of trade more accurately than other records because there are normally important legal penalties for incorrectly specifying this information on customs declarations. Data for Taiwan, which is not covered in the UN data system, are obtained from the trade database (based on the same classification system) of the Council for Economic Planning and Development, Taipei. The analysis covers 1992 to 2008. 1992 was selected as the starting point because by this time countries accounting for over 95% of total world manufacturing trade had adopted the revised data reporting system. The year 2008 is used as the end point of time coverage given massive disruption in trade follows during the ensuing years due to the global financial crisis.

East Asia in World Trade: An overview

Rapid export expansion growth has been the prime mover of East Asia's rise in the global economy. The combined share of East Asian countries in world non-oil exports recorded a three-fold increase, from 11% to 33%, between 1969-1970 and 2007-2008 (Table 1).[5] The region accounted for over 40% of the total increase in world exports over this period. In the 1970s and 1980s, Japan dominated the region's trade, accounting for nearly 60% of exports (and imports). The picture has changed dramatically over the past two decades with the share of developing East Asian countries increasing rapidly in the face of a relative decline in Japan's position in world trade. By 2007-08, these countries together accounted for almost 80% of total regional trade.[6]

Table 1 about here

The rise of China has been a dominant factor behind the share increase in DACs' world market shares from about the early 1990s, but the other countries in the region have also increased their world market shares (Table 1). In the global context, East Asia market share gains have come predominantly at the expense of developed countries. The combined share of other developing countries (that is, all developing countries less Asian developing

[5] Trade magnitudes throughout the paper are measured in current U.S. dollars unless otherwise indicated. Inter-temporal comparison calculations are made for the two-year averages relating to the end points of the period under study, so as to reduce the impact of year-to-year fluctuations of trade flows. All data reported, unless otherwise stated, are compiled from the UN Comtrade database.

[6] In this and other trade data tables, Data are presented as two-year averages to smooth out the impact of yearly fluctuations in trade.

countries) has increased throughout the period, although of course at a slower rate than DEA. Thus, on first inspection, there is no indication of China "crowding out" its neighbors—China's market share gains have been at the expense of that of the rest of the world, not from the rest of Asia. This observation is consistent with the inferences that can be derived from a number of recent studies that have systematically examined the impact of China's rise on exporter performance of the other countries in the region (Athukorala 2009, Greenaway at al. 2008; Eichengreen et al. 2007)

Rapid export growth in East Asia has been underpinned by a pronounced shift in export structure away from primary commodities and toward manufacturing. By 2007-2008, manufacturing accounted for 92% of total exports from Asia, up from 78% four decades earlier (Table 1). From about the early 1990s, manufactures accounted for over a four-fifths of total merchandise exports from these countries, up from 84% four decades ago. Given the nature of their resource endowments, the four Asian newly-industrialized economies (NIEs) (Hong Kong, Taiwan, Korea, and Singapore) relied very heavily on manufacturing for export expansion from the outset. However, beginning in the 1970s, a notable shift toward manufacturing is observable across all countries, at varying speeds and intensity. The combined shares of the ASEAN countries other than Singapore increased from a mere 11% to 71.0% between these two time points. Among individual countries Indonesia and Vietnam have a significantly lower share of manufactures in their exports, reflecting both their comparative advantage and their later adoption of export-oriented industrialization strategies.

Table 2 about here

Within manufacturing, machinery and transport equipment (SITC 7) have played a pivotal role in the structural shift in the export composition of DACs (Table 2). The share of machinery and transport equipment in the export structures of some of the more industrialized economies of East Asia is particularly high. By contrast, that for Indonesia, Vietnam and all of South Asia is much smaller. Within the machinery and transport equipment category, ICT products have been the most dynamic component of Asian export expansion. By 2007-08, over 58% of total world ICT exports originated from Asia, up from 30.8% in 1994/5; China accounted for 25.4% of total world ICT exports, up from 4.2% in 1994-05.[7] In electrical goods, China's world market share increased from 3.1% to 20.6% between these two years. As we explain in the next section, export dynamism in these

[7] All data reported in this paper, unless otherwise stated, have been compiled from the UN Comtrade database.

product lines has been driven by the ongoing process of global production sharing and the increasingly deep integration of East Asian countries into global production networks.

Global production sharing and trade patterns

Linking East Asia to the global electronics production networks began in 1968 with the arrival of two US companies, National Semiconductors and Texas Instruments, when they set up plants in Singapore to assemble semiconductor devices (Athukorala 2008). From about the late 1970s, the MNEs with production facilities in Singapore began to relocate some low-end assembly activities in neighboring countries (particularly in Malaysia, Thailand and the Philippines) in response to the rapid growth of wages and land prices. Many newcomer MNEs to the region also set up production bases in these countries, bypassing Singapore. From about the early 1990s the emergence of China as the "global factory" of electrical and electrical goods assembly based on parts and component imported from other countries has contributed to rapid expansion of production networks in the region. More recently regional production networks have begun to expand to Vietnam. Over the past three decades, the process of global production sharing has created a new division of labor among countries in the region, based on skill differences involved in different stages of the production process and relative wages, and improved communication and transport infrastructure (Ando and Kimura 2010). As we will see below, the formation of production networks has dramatically transformed the spatial patterns of international trade in the region, with a notable "magnification" effect on recorded trade flows operating through multiple border-crossing of parts and components on the expansion of intra-regional trade.

Table 3 presents data on world trade based on global production sharing (network trade) and East Asia's relative position in this new international exchange. World network trade increased from US$ 1207 billion (about 23.8% of total manufacturing exports) in 1992-1993 to US$ 4850 billion (45.7%) in 2006-2008, accounting for nearly two-thirds of the total increment in world manufacturing exports during this period. This increase was underpinned by a palpable shift in global production sharing away from mature industrial economies toward developing countries and in particular toward East Asia. The share of developing countries in total network exports increased from 22.0% in 1992-93 to 46.1% in 2007-2008, driven primarily by the growing importance of East Asian countries in global production sharing. The share of East Asia (including Japan) increased from 32.2% in 1992-1993 to 40.3% in 2007-2008, despite a notable decline in Japan's share, from 18.4% to 9.5%. The

major driving force has been China, whose share increased from 2.1% to 15.3%. Within East Asia, world market shares of ASEAN countries, with the exception of Singapore, have grown faster than the regional average. The mild decline in Singapore's share reflects a marked shift in its role in global production networks for high-tech industries away from the standard assembly and testing activities to oversight functions, product design, and capital and technology-intensive tasks in the production process. Some, if not most, of these new activities are in the form of services and are, therefore, not captured in merchandise trade data (Wong 2007; Athukorala 2008).

There has been a sharp increase in the share of parts and components (henceforth referred to as 'components' for brevity) in network trade across all countries in the region. In all countries except the PRC and Thailand components accounted for well over half of total network export (and imports) by 2007-2008. Components' share is particularly high among ASEAN countries. There is a remarkable similarity in components' share figures on the export and import sides across countries, reflecting overlapping specialization patterns in component assembly and testing among countries in the region.

Table 4 presents comparative statistics on the share of network trade in total manufacturing exports and imports at the country and country group levels. It is evident that the share of network trade is much higher in East Asia than in all other regions of the world. In 2007-2008, exports within production networks accounted for over 60% of total manufacturing trade in East Asia, compared to the world average of 51%. Within East Asia, ASEAN countries stand out for their heavy dependence on production fragmentation trade, which is a critical part of their export dynamism. In 2007-2008, network exports accounted for over two-thirds of total manufacturing exports in ASEAN, up from 57% in the early 1990s. The patterns observed on the export and import sides of the ASEAN are strikingly similar, reflecting growing cross-border trade within production networks.

Table 4 about here

China in global production networks

China's phenomenal export expansion over the past two decades has been underpinned by a shift in the commodity composition of exports away from primary products and toward manufacturing. The share of manufactures in China's total merchandise exports increased from less than 45.1% in the late 1970s to nearly 83.6% in the early 1990s and to 93.4% in 2007-2008 (Table 13.1). Until about the early 1990s, traditional labor-intensive manufactures

──in particular, apparel, footwear, toys and sport goods──were the prime movers of export expansion. Since then, there has been a notable shift in the export composition away from conventional labor-intensive product lines and toward more sophisticated product lines──in particular, those within the broader category of machinery and transport equipment (SITC 7) (henceforth referred to as "machinery"). China's phenomenal export expansion has been underpinned by a shift in the commodity composition of exports away from primary products and toward manufacturing. The share of manufactures in China's total merchandise exports increased from less than 40% in the late 1970s to nearly 80% in the early 1990s and to 92% in 2005-2006. Until about the early 1990s, traditional labor-intensive manufactures──in particular, apparel, footwear, toys, and sporting goods──were the prime movers of export expansion. Since then, there has been a notable shift in the export composition away from conventional labor-intensive product lines and toward more sophisticated product lines──in particular, those within the broader category of machinery and transport equipment (SITC 7) (henceforth referred to as "machinery") (Athukorala 2009).

The expansion of machinery exports from China has been brought about by its highly publicized export success in a wide range of "information and communication technology" (ICT) products (falling under SITC categories 75, 76 and 77). China's world market share of ICT products recorded a five-fold increase from 5% in 1992/3 to over 25% in 2005-06 (Athukorala 2009). Trade data showing this phenomenal structural shift have been used widely—not only in the popular press and policy reports of agencies involved in promoting R&D activities but also in some scholarly writings—to argue that China is rapidly becoming an advanced-technology superpower and the sophistication of its export basket is rapidly approaching the levels of those of most advanced industrial nations (e.g., Rodrik 2006, Yusuf et al. 2007). A closer examination of data, however, suggests that such an inference is fundamentally flawed. In reality, what we observe is the rapid consolidation in China of final assembly stages of East Asia-centered global production networks of these products. Ample supply of relatively cheap and trainable labor and the scale economies arising from China's vast domestic market (which enables firms to achieve low unit costs) are contributory factors to China's attractiveness as a global assembly center. China's so-called "high-tech" exports (such as notebook computers, display units, mobile phones, and DVD and CD players) are simply "mass-market commodities" produced in huge quantities and at relatively low unit cost using imported high-tech parts and components; they are not "leading edge-technology products."

The share of parts and components in total machinery imports of China increased from 32.5% in 1992-2003 to 64% in 2007-2008, with the import shared of the three ICT products (SITC 75, 76 and 77) recording a much faster growth. By contrast, final goods (total exports minus components) have continued to dominate the export composition. Over the past decade the share of final goods in total machinery exports has remained around 75%, with only minor year-to-year changes. Given the fact that the production of parts and component is generally more capital- and technology-intensive than final assembly, these figures clearly suggest that China's export success has so far been underpinned largely by its comparative advantage in international production arising from labor abundance. When components are netted out, more than 80% of total Chinese manufacturing exports from China can still be treated as labor-intensive products.

This inference is consistent with the findings of unit-value-based export quality analysis undertaken by Schott (2007) and Hallak and Schott (2010). Schott (2007) examines the relative "sophistication" of China's exports to the United States in 1972–2001. By comparing China's export bundle to that of the relatively skill- and capital-abundant members of the OECD as well as to that of similarly endowed US trading partners, he finds that China's export bundle increasingly overlaps with that of more developed countries, rendering it more sophisticated than that of the other countries with similar factor endowments. By contrast, his comparison of prices (unit values) within product categories reveals that China's exports "sell at a substantial discount relative to its level of GDP and the exports of the OECD countries" (Schott 2007: 15). Schott stops short of probing this rather puzzling contrast between the observed product sophistication and price trends, but it is certainly consistent with the nature of China's participation in fragmentation-based specialization in global manufacturing trade. China is engaged in the labor-intensive stages of production (mostly final assembly) in otherwise advanced industries. In an inter-temporal comparison by Hallak and Schott (2010) of change in quality of exports to the US from 43 countries between 1989 and 2003, China was found to be at the bottom 10% of the ranking with a modest move *down* the quality ladder between the two years (moved from rank 35 to 37).[8]

China's rise as a final assembler of a wide range of electrical and electronics goods has enhanced its trade complementarity with the other countries in East Asia that are involved in component assembly in the global value chain. The data on geographical profile of China's network trade (not reported here for brevity) point a persistent "component bias" in China's

[8] It is important to note that as an indicator of export quality unity values have a built in measurement error whose extent is as yet now known (Helpman 2011, p. 170)

intra-East manufacturing trade**.** The intra-regional share in total component imports to China increased from 16% in 1992-1993 to 47% in 2007-2008. By contrast, the intra-regional share of China's final goods exports continued to remain less than 20% through this period.

Production networks and regional versus global economic integration

There is a vast literature on what may be termed standard trade data analysis based on the traditional notion of horizontal specialization in which trade is an exchange of goods that are produced from start to finish in just one country. This literature unequivocally points to a persistent increase in intra-regional trade in East Asia, whether or not Japan is included, from about the early 1980s.[9] This evidence figures prominently in the current regional debate concerning the establishment of regional trading arrangements covering some or all countries in East Asia. Another implication of the highly publicized trade integration in the region was the so-called decoupling thesis, which was a popular theme in Asian policy circles in the first decade of the new millennium until the onset of the recent financial crisis.[10] This thesis held that East Asia had become a self-contained economic entity with the potential for maintaining its own growth dynamism independent of the economic outlook for the traditional developed market economies.

The discussion in the previous section on the emerging patterns of network trade casts doubts on the validity of these inferences. We have seen that component trade has played a much more important role in trade expansion in East Asia compared to the rest of the world. Conventional trade flow analysis can yield an unbiased picture of regional economic integration only if component trade and final trade follow the same geographic patterns. If component trade has a distinct intra-regional bias, as one would reasonably anticipate in the context of growing network trade in the region, then the conventional trade flow analysis is bound to yield a misleading picture in regard to the relative importance of intra-regional trade versus global trade for growth dynamism in the region. This is because growth based on assembly activities depends on the demand for final goods, which in turn depends on extra-regional growth.

Data on component intensity (percentage shares of parts and components) in bilateral flows of manufacturing trade are reported in Table 5. The data vividly show that components accounts for a much larger share of intra-regional trade in East Asia compared to these

[9] See for example Drysdale and Garnaut 1997; Frankel and Wei 1997; and Park and Shin 2009.
[10] See Yoshitomi (2007) and Park and Shin (2009) and the works cited therein.

countries world trade and trade with the EU and NAFTA. Moreover, the share of components in total intra-regional imports is much larger than in exports and has increased at a faster rate. This reflects the fact that the region relies more on the rest of the world as a market for final goods than as a market for components. Within East Asia, ASEAN countries stand out for the high share of components in their intra-regional trade flows. The share of components in total intra-regional exports in ASEAN countries increased from 34.6% in 1992-93 to 56.0% in 2007-08. On the import side, the increase was from 50.4% to 55.9% from 75.3% to 84.4%. According to country-level data (not reported here, for brevity), the share of components in manufacturing exports and imports amounted to more than four-fifths in Singapore, Malaysia, and the Philippines and over two-thirds in Thailand. Korea and Taiwan are also involved in sizable trade in components with other countries in the region.

Table 5 about here
Table 6 about here

Intra-regional trade shares estimated separately for total manufacturing trade, component trade, and final manufacturing trade (that is, total manufacturing trade less component trade) are reported in Table 6. The table covers trade in East Asia and three of its sub-regions, which relate to contemporary Asian policy debates on regional integration. Data for NAFTA and the EU are reported for comparative purposes. Estimates are given for total trade (imports + exports) as well as for exports and imports separately to illustrate possible asymmetry in trade patterns resulting from East Asia's increased engagement in fragmentation-based international exchange. Trade patterns depicted by the unadjusted (standard) trade data affirm the received view that Asia, in particular East Asia, has become increasingly integrated through merchandise trade.

In 2007-2008, intra-regional trade accounted for 55.2% of total manufacturing trade in East Asia, up from 53.2% in 1992-1993. The level of intra-regional trade in East Asia was higher than that of NAFTA throughout this period and was rapidly approaching the level of the EU. For DEA and ASEAN, the ratios are lower than the aggregate regional figure, but they have increased at a much faster rate. The intra-regional trade share of ASEAN has been much lower compared to the other two sub-regions. This asymmetry in intra-regional trade in East Asia reflects the unique nature of the involvement of Japan and the PRC in regional production networks. From about the late 1980s, Japan's manufacturing trade relations with the rest of East Asia have been predominantly in the form of using the region as an assembly base for meeting demand in the region and, more importantly, for exporting to the rest of the

world (Athukorala and Yamashita 2008). The emergence of the PRC as a leading assembly center within regional production networks since the early 1990s further amplified this trade asymmetry. That is, the PRC is importing parts and components from the other East Asia countries to assemble final products, which are predominantly destined for markets in the rest of the world (Athukorala 2009).

However, the picture changes significantly when parts and components are netted out: the share of intra-East-Asian final trade (total trade—parts and components) in 2007-2008 was 44.2%, down from 50.3% in 1992-1993. The estimates based on unadjusted data and data on final trade are vastly different for East Asia, particularly for DEA and ASEAN. Both the level of trade in the given years and the change over time in intra-regional trade shares are significantly lower for estimates based on final trade. Interestingly, we do not observe such a difference in estimates for NAFTA and the EU.

The intra-regional shares calculated separately for imports and exports clearly illustrate the risk of making inferences about regional trade integration based on total (imports + exports) data. There is a notable asymmetry in the degree of regional trade integration in East Asia. Unlike in the EU and NAFTA, in East Asia the increase over time in the intra-regional trade ratio (both measured using unadjusted data and data for final trade) has emanated largely from a rapid increase in intra-regional imports as the expansion in intra-regional exports has been consistently slower. The dependence of East Asia (and East Asian country sub-groups) on extra-regional markets, in particular those in NAFTA and the EU, for export-led growth is far greater than is revealed by the standard intra-regional trade ratios commonly used in the debate on regional economic integration. For instance, in 2007-2008 only 43.9% of total East Asian manufacturing exports were absorbed within the region, compared to an intra-regional share of 64.4% in total manufacturing imports. For DEA, the comparable figures were 33.4% and 46.7%, respectively. This asymmetry is clearly seen across all sub-regions within East Asia. The asymmetry between intra-regional shares of imports and exports is therefore much sharper when components are netted out. This is understandable given the heavy component bias in Asian intra-regional trade and the multiple border-crossing of parts and components within regional production networks. On the export side, the intra-regional share of final goods declined continuously from 46% in 1995 to 37% in 2007, whereas the intra-regional import share increased from 56% to 63% between these two time points. The observed asymmetry in intra-regional trade in East Asia reflects the unique nature of the involvement of Japan and the PRC in regional production networks.

Production sharing and growth patterns

The received view on growth patterns in countries in the Asia Pacific region stipulates a dynamic process of changing comparative advantage, a process in which each country rapidly shifts its output from raw materials to manufactures, and within manufactures shifts from labor-intensive to more capital- and technology-intensive sectors. The Japanese economists Akamatsu (1961) and Kojima (2000) described this sequential growth pattern as the *flying geese* pattern of development; it is consistent with the Hecksher–Ohlin explanations of how trade patterns are likely to change with the accumulation of human and physical capital (Balassa 1979). A large number of studies carried out in the 1980s and early 1990s have shown that the flying geese pattern of growth holds remarkably well in East Asia.[11]

This view of orderly, sequential economic transformation has profound implications for trade and industrial policy. The rapidly changing structure of exports implies that competitive pressure is experienced by countries at lower levels on the ladder, but it also means that there are new export opportunities for newcomers, as countries at higher rungs vacate export markets. For importing countries, according to this view, the source of competitive pressure in traditional labor-intensive products is expected to shift; however, to the extent that imports from one country merely displace imports from another, no new domestic resource adjustment costs arise. For instance, at the top levels of the ladder the United States and Japan find themselves in direct competition in technologically sophisticated products, but the competitive pressure is tolerable because most of these products create their own markets.

Has this sequential process of economic transformation been disturbed by the ongoing process of global production sharing? The flying geese growth paradigm is based on the conventional (product-based) division of labor among economies. It assumes a competitive relationship among countries in the growth process, rather than a complementary one. This permits countries to climb the growth ladder on the basis of their own competitiveness achieved through policy reforms. By contrast global production sharing permits firms to relocate at each stage of the production process to places where production can be conducted at the lowest cost. This process could well disturb the sequential process of economic transformation. It permits firms in countries on the upper rungs of the growth ladder to remain internationally competitive in some segments of the production process (such as in product/component design, production of skill- and technology-intensive components, and

[11] See Petri (1993), Pearson (1994) and the works cited therein.

various headquarter functions) even when rising incomes and related domestic cost pressures begin to erode their competitiveness in integrated production of the whole product at home. This, in turn, could constrain the growth process of countries on the middle rungs of the ladder, while countries on the lower rungs still benefit from their relative labor cost advantages. In other words, in the face of rapid expansion of fragmentation-based specialization in the world economy, countries at the middle levels are confronted with the increasingly challenging task of finding ways to "tech up" and enter the global knowledge economy, so as to escape from being trapped in standardized manufacturing segments in the manufacturing value chain (and, increasingly, in standardized services) (Garrett 2004).

In sum, the growing complementarity of production processes across countries resulting from global production sharing has implications for latecomers wishing to catch up in the growth process. This is an important subject for further research.

Production networks and trade flows in Global Financial Crisis

A striking feature of the global economy following the onset of the global financial crisis (GFC) in late 2007 has been the precipitous drop in global trade at a faster rate than during the Great Depression (Almunia et al. 2010, Krugman 2009). From April 2008 to June 2009 world trade contracted by about 20% which amounted to almost the total contraction in world trade during the first 30 months of the Great Depression (starting in April 1929).[12] Interestingly, the trade contraction experienced by the East Asian countries during this period has been even greater than the contraction in total world trade (Table 7).

Table 7 about here

Krugman (2009) points to the increased vertical integration of global production (the rise of globe production sharing) as a possible explanation for the surprisingly large trade contraction in the present crisis compared to the Great Depression. Vertical integration of production implies that a given degree of contraction in demand for a final (assembled) product has ramifications over trade flows between the many countries involved in the production chain. Also, demand for components is susceptible to rapid stock adjustment by producers compared to final goods. Given that global production sharing is much more important for trade expansion in East Asia, this explanation also seems relevant for East

[12] Numbers derived from Figure 5 in Almunia et al. (2010).

Asia's greater trade contraction compared to overall trade contraction at the global level. However, a number of other factors are also relevant for explaining the larger contraction in trade volume in the current crisis. These include the much larger contraction of trade credit, a greater share of consumer durables in contemporary world trade compared to the 1930s, and the effect of recent advances in communication technology on inventory cycle and just-in-time procurement practices. The current state of data availability does not permit us to systematically delineate the impact of production sharing on trade contraction while appropriately controlling for these other possible factors. Instead, this section puts together some readily available data that have some bearing on this issue in order to set the stage for further analysis.

All major East Asian countries (including China, which was expected by the decoupling enthusiast to cushion the rest of East Asia against a global economic collapse) experienced a precipitous trade contraction from about the last quarter of 2008 (Table 4). The remarkably synchronized nature of the trade contraction across countries in the region, both in imports and exports, is generally consistent with the close trade ties among the East Asian countries forged within regional production networks and the unique role of the region within global production networks.[13]

Among the East Asian countries, Japan has been by far the worst hit. A large share of Japan's exports consists of capital goods and high-end durable consumer goods, such as cars and electrical machinery, machine tools and their components. Exports of capital goods and high-end consumer durables are heavily concentrated in the United States and other developed-country markets and are therefore directly exposed to the global economic decline. On the other hand, contrary to the predictions of the decoupling enthusiasts, Japan's growing exports to China have been indirectly affected by declining final (assembled) exports from China (Fukao and Yuan 2009). The degree of export contraction suffered by Taiwan and Korea has been smaller compared to Japan but, on average, notably higher compared to the other East Asian countries. As in the case of Japan, growing exports to China do not seem to have provided a cushion against collapse in world demand for these two countries. The relatively lower degree of export contractions experienced by Korea, Taiwan, and the second-tier exporting countries in the region compared to Japan could possibly reflect consumer preferences for price-competitive low-end products in the crisis context.

[13] Discussion on export performance of individual countries in this section is based on monthly exports data extracted from the CEIC database (not reported here for want of space).

An inspection of growth rates of exports of individual East Asian countries by destination provides no support for the view that East Asian economies have become less susceptible to the world-wide trade contraction because of regional growth dynamism.[14] Intra-East Asia trade flows have in general contracted at a faster rate compared to these countries exports to the USA and EU.

A notable pattern in China's foreign trade following the onset of the crisis is the relatively sharper contraction in the category of machinery exports (in which network trade is heavily concentrated) compared to other product categories, in particular traditional labor-intensive products (textile and garments, footwear, and other miscellaneous manufactures). Exports belonging to the machinery category, in particular ICT products and consumer electronics are also predominantly consumer durables which, as already noted, are generally more susceptible to income contraction. In traditional labor-intensive products, developing country producers have the ability to perform better purely on the basis of cost competitiveness, even in a context of depressed demand.

Exports to China from most countries in the region have contracted at a much faster rate compared to their imports from China, perhaps an indication of destocking of components by Chinese firms, given the gloomy outlook for exports. China's imports from Japan, Korea, and Taiwan have shrunk more rapidly (at an average rate of 23.5%) than imports from other countries. This is not surprising, given the dominant role played by the former countries in the supply of components to ICT assembly activities in China, which are heavily exposed to contractions in import demand in the United States and other developed countries. Overall, China's imports from countries in the region intra-regional imports have contracted at a much faster rate compared to her imports from the United States and EU.

Data on the growth of manufacturing imports to the United States are summarized in Table 8. A common pattern observable across the 10 source countries covered is that component imports have generally contracted at a faster rate compared with total imports and final goods imports. This pattern is consistent with the view that in the face of contraction in world demand, stock adjustment takes place at a faster rate in intermediate goods compared to final goods. The data also shows that the rate of contraction in final imports from the PRC has been much smaller compared to the dramatic contraction in imports from Japan. This perhaps reflects the fact that under depressed market conditions, consumers tends to substitute low-end products for high-end products.

[14] This inference is based on monthly exports data extracted from the CIEM database (not reported here for brevity).

Table 8 about here

Concluding Remarks

Global production sharing has become an integral part of the economic landscape of East Asia. Trade within global production networks has been expanding more rapidly than conventional final-goods trade. The degree of dependence on this new form of international specialization is proportionately larger in East Asia (particularly ASEAN) than in North America and Europe. The rapid integration of China into regional production networks is a critically important recent development in the international fragmentation of production. China's imports of components from ASEAN countries and other DEA countries have grown rapidly, in line with the equally rapid expansion of manufacturing exports from China to extra-regional markets, mostly in North America and Europe. The migration of some production processes within vertically integrated high-tech industries to China has opened up opportunities for producing original, equipment-manufactured goods and back-to-office service operations in other countries. In sum, China's emergence as a major trading power and an investment location has not been a zero-sum proposition from the perspective of the region. Rather, it seems to have added further dynamism to East Asia's role within global production networks.

Global production sharing has certainly played a pivotal role in the continued dynamism of East Asia and its increasing intra-regional economic interdependence. This does not, however, mean that the process has contributed to lessening the region's dependence on the global economy. A notable outcome of the rapid expansion of production networks has been the rapid growth of cross-border trade in parts and components within the regions; component share in intra-DAC trade is much higher compared to that of intra-regional trade in NATA and EU15. Driven largely by cross-border component trade, the share of intra-regional non-oil trade in total world trade of DACs increased significantly. However, there is no evidence of rapid intra-regional trade integration in final products. On the contrary, the region's growth based on vertical specialization depends inexorably on its extra-regional trade in final goods, and this dependence has increased over the years. This inference is basically consistent with the behavior of trade flows following the onset of the global financial crisis. The remarkably synchronized nature of trade contraction across countries in the region is generally consistent with close trade ties among East Asian countries forged within regional production networks. In addition, the PRC failed to provide a cushion against this export contraction as postulated by the decoupling thesis.

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Table 1: East Asia in World Trade (%)

	Total (non-oil) trade (%)			Manufacturing trade (%)			Manufacturing share in total exports (%)		
	1969/70	1989/90	2007/8	1969/70	1989/90	2007/8	1969/70	1989/90	2007/8
(a) Exports									
East Asia	11	23.8	30.7	12	26.7	34.8	72.5	90.3	86.6
Japan	6.3	10.4	4.6	8.9	12.7	7.4	93.4	98	93.2
Developing East Asia	4.7	13.4	24.4	3.1	14	27.4	44.3	84.3	84.9
China	0.8	2.9	12.7	0.5	3	14.9	45.1	83.6	93.4
Hong Kong, China	0.9	1.7	0.6	1.3	2	0.6	95.1	96.5	89.3
South Korea	0.3	2.2	3.0	0.3	2.6	3.5	75.4	93.6	87.6
Taiwan	0.6	2.7	2.0	0.6	3.1	2.4	71.5	91.9	91.8
ASEAN	2.1	3.7	6.0	0.3	3.3	5.8	21.1	72.0	73.2
Indonesia	0.3	0.5	0.9	---	0.4	0.6	3.8	55.6	41.5
Malaysia	0.8	1.0	1.6	0.1	0.7	1.6	7.2	60.4	70.9
Philippines	0.5	0.3	0.6	0.1	0.3	0.6	10.3	62.8	83.8
Singapore	0.2	1.1	1.2	0.1	1.3	1.4	45.9	91.2	70.6
Thailand	0.3	0.8	1.3	---	0.6	1.3	7.7	59.6	76.5
Vietnam	…	…	0.4	…	0	0.3	…	13.5	59.2
Memo items									
South Asia	1.1	0.8	1.2	0.9	0.7	1.2	72.1	71.6	69.2
India	0.9	0.6	1.1	0.7	0.5	1.1	71.8	71.5	67.7
NAFTA	25.5	17.5	13.8	24.1	16.2	13.6	62.8	74.5	71.1
EU15	46.3	41.1	34.3	53.4	42.2	34.9	76.6	82.7	77.4
Developing countries	14.7	20.9	44.4	5.9	19.3	44.0	26.8	74.2	61.2
Developed countries	85.3	79.1	55.6	94.1	80.7	56.0	73.3	82.2	75.2
World	100	100	100.0	100	100	0.0	66.5	80.6	68.3
US$ billion	205	2386	12056	137	1922	9766			
(b) Imports									
East Asia	11.6	19.9	24.4	8.3	18.3	24.6	47.6	74.1	67.0
Japan	6.5	7	0.6	3	5	3.6	30.4	57.7	49.3
Developing East Asia	5.1	12.9	20.4	5.3	13.3	21.1	69.7	83	71.4
China	0	2.3	7.8	0	2.3	7.7		81	70.0
Hong Kong, China	1.3	3.1	3.4	1.3	3.4	3.9	69.5	87.5	90.2
South Korea	0.9	2.3	2.2	0.8	2.2	2.2	59.9	74.8	59.2
Taiwan	0.6	1.7	1.4	0.6	1.7	1.4	69.7	80.1	76.2
ASEAN	2.8	5.1	5.6	3.2	5.3	5.8	74.0	85.0	68.1
Indonesia	0.4	0.7	0.6	0.5	0.8	0.6	80.7	83	57.7
Malaysia	0.5	1	1.1	0.5	1	1.1	63.9	85.6	72.3
Philippines	0.5	0.4	0.4	0.6	0.3	0.4	77.3	76.4	65.3
Singapore	0.9	1.9	1.9	0.9	2.1	2.1	63.7	87.4	68.6
Thailand	0.5	1.1	1.1	0.7	1.1	1.1	85.9	84.1	68.5
Vietnam	…	…	0.5	…	…	0.5	…	60.3	69.3
Memo items			0.0			0.0			0.0
South Asia	1.9	0.9	1.5	1.6	0.9	1.4	93.4	76.7	47.3
India	1.2	0.7	1.3	1.6	0.7	1.2	94.9	77.7	46.6
NAFTA	25	17.4	20.0	20.9	15.8	19.1	55.5	73.1	66.0
EU15	45.5	40.8	35.4	46.2	41.1	34.5	67.7	81.1	67.9
Developing countries[1, 2]	16.5	21.6	40.1	18.6	21.4	40.2	74.9	80	68.3
Developed countries[2]	83.5	78.4	59.9	81.4	78.6	59.8	64.8	80.7	67.4
World	100	100	100.0	100	100	0.0	66.5	80.6	67.8
US$ billion	205	2386	12056	137	1922	9766			

Notes:
1 Including Asian developing countries. 2 Based on the UN country classification.
--- negligible (less than 0.05 percent) … Data not available
Source: Compiled from UN Comtrade database, and Trade Data CD-ROM, Council for Economic Planning and Development, Taipei (for data on Taiwan)

Table 2: Commodity Composition of Manufacturing Exports, 2007/8 (percent)

	Chemicals (SITC 5)	Resource based products (SITC 6 - SITC 68)		Machinery and transport equipment (SITC 7)				Miscellaneous manufacturing (SITC 8)	
		Total	Textiles	Total	ICT products [4]	Electrical goods[5]	Road vehicles (SITC 78)	Total	Apparel (SITC 84)
East Asia	6.9	11	2.1	50.3	30.9	5.2	6.4	18.3	4.4
Japan	9.6	10.3	0.9	63.4	20.1	5	20.7	10	0.1
Developing Asia	6.3	11.2	2.4	47.1	33.6	5.3	2.9	20.4	5.5
China	4.4	13.7	3.1	46.6	32.5	6.9	1.6	28.8	8.4
Hong Kong, China	5.0	15.8	4.3	39.9	30.5	5.4	0.6	28.6	9.9
Taiwan	9.1	12.5	3.0	55.0	43.4	5.3	2.2	15.6	0.5
South Korea	10.4	11.2	2.2	57.2	33.3	3.9	10.2	8.9	0.5
ASEAN	7.2	6.3	1.1	42.8	33.7	3.0	2.2	11.0	3.2
Indonesia	4.7	9.7	2.3	15.0	9.0	2.8	1.4	12.2	5.2
Malaysia	4.8	5.2	0.6	53.0	47.5	2.7	0.6	7.8	1.7
Philippines	1.5	3.0	0.5	70.9	62.3	5.6	1.3	8.3	3.3
Singapore	15.8	2.9	0.2	45.6	36.3	1.9	0.5	6.4	0.1
Thailand	7.4	9.6	1.5	48.1	30.4	3.8	7.9	11.5	3.1
Vietnam	1.7	7.2	2.1	11.4	6.1	2.5	0.7	39.1	15.4
Memo items									
South Asia	11.6	29.6	9.5	11.3	2.4	1.6	2.3	16.5	9.6
India	12.5	27.8	6.2	12.3	2.6	1.8	2.5	15.1	8.1
NAFTA	12.2	8.3	0.8	41.5	11.4	3.3	10.4	9.1	0.5
EU 15	17.2	13.6	1.4	37.1	7.2	2.9	11.9	9.6	1.4
Developed countries[3]	15.4	11.6	1.2	38.8	8.8	2.9	11.5	9.4	0.9
Developing countries[1, 3]	5.9	10.9	1.9	31.6	17.8	3.5	3.7	12.9	3.9
World	10.7	11.3	1.6	35.2	14.0	3.2	7.7	11.1	2.4

Notes:
1 Excluding Asian developing countries.
3 Based on the UN country classification.
4. ICT Information and communication technology products (SITC 75+76+772+776)
5. SITC 77 - 772 – 776
--- Data not available

Source: Compiled from UN Comtrade database, and Trade Data CD-ROM, Council for Economic Planning and Development, Taipei (for Taiwanese data)

Table 3: Geographic profile of world manufacturing trade: Total trade and network trade (percent)
(a) Exports

	Total Manufacturing		Network Products						Share of parts and components in network products	
			Parts and components		Final assembly		Total			
	1992-3	2007-8	1992-3	2007-8	1992-3	2007-8	1992-3	2007-8	1992-3	2006-7
East Asia	28.3	34.0	29.6	42.8	34.1	37.5	32.2	40.3	39.0	56.5
Japan	12.3	7.2	15.2	9.1	20.8	9.9	18.4	9.5	35.0	51.3
Developing East Asia (DEA)	16.0	26.8	14.4	33.7	13.3	27.6	13.8	30.9	44.3	58.1
China	4.5	14.3	1.7	13.5	2.4	15.7	2.1	14.5	35.0	49.4
Hong Kong, China	1.8	0.7	1.5	0.8	1.2	0.5	1.3	0.7	46.8	65.2
Taiwan	2.9	2.5	3.7	4.0	2.0	2.2	2.7	3.2	58.4	67.2
South Korea	2.3	3.4	2.2	5.6	2.0	3.7	2.1	4.7	45.0	63.5
ASEAN	4.5	6.0	5.2	9.8	5.8	5.5	5.6	7.8	39.9	66.9
Indonesia	0.6	0.6	0.1	0.5	0.1	0.5	0.1	0.5	40.3	56.1
Malaysia	1.2	1.7	1.7	3.4	1.9	1.8	1.8	2.6	40.5	68.1
The Philippines	0.3	0.7	0.5	1.8	0.2	0.4	0.4	1.2	61.6	82.1
Singapore	1.5	1.4	2.3	2.6	2.6	1.0	2.5	1.9	38.7	74.1
Thailand	0.8	1.3	0.6	1.4	0.9	1.8	0.8	1.6	32.7	47.5
Viet Nam	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.1	23.6	59.2
South Asia	0.9	1.3	0.1	0.4	0.1	0.2	0.1	0.3	44.1	72.7
India	0.6	1.0	0.1	0.4	0.1	0.2	0.1	0.3	47.2	73.5
Oceania	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	45.6	51.2
NAFTA	17.2	14.0	25.3	16.2	20.6	16.6	22.6	16.4	47.5	52.6
EU 15	41.3	35.4	39.2	29.3	35.3	31.4	37.0	30.3	44.9	51.5
Developed countries	72.4	56.6	76.7	52.7	78.6	56.1	77.8	54.3	41.8	51.7
Developing countries	27.6	43.4	20.8	46.8	22.9	44.4	22.0	45.7	40.1	54.6
World	100	100	100	100	100	100	100	100	42.4	53.2

(b) Imports

East Asia	21.7	23.7	30.1	36.6	14.3	18.1	21.0	28.1	61.2	70.3
Japan	4.1	3.5	4.0	3.8	3.0	3.3	3.4	3.5	49.9	57.7
Developing East Asia (DEA)	17.6	20.3	26.1	32.8	11.2	14.9	17.6	24.5	63.4	72.1
China	2.9	7.1	3.0	11.5	1.5	6.0	2.2	9.0	59.3	69.0
Hong Kong, China	4.4	3.6	5.4	6.3	2.8	2.1	3.9	4.4	59.4	78.2
Taiwan	2.1	1.6	3.1	2.3	1.4	1.2	2.1	1.8	62.1	69.9
South Korea	2.0	2.2	3.1	2.5	1.1	1.6	1.9	2.1	67.4	64.8
ASEAN)	6.2	5.8	11.5	10.2	4.4	4.0	7.4	7.3	66.1	74.9
Indonesia	0.8	0.4	1.1	0.3	0.3	0.3	0.6	0.3	74.7	58.0
Malaysia	1.4	1.3	3.0	2.4	1.1	1.2	1.9	1.9	66.7	69.4
The Philippines	0.4	0.5	0.6	1.2	0.2	0.4	0.4	0.8	68.6	77.9
Singapore	2.3	2.1	4.8	4.5	2.0	1.5	3.2	3.2	64.6	77.7
Thailand	1.3	1.1	2.0	1.4	0.8	0.6	1.3	1.0	66.2	74.4
Viet Nam	0.0	0.4	0.0	0.3	0.0	0.2	0.0	0.2		66.2
South Asia	0.9	1.3	0.7	1.1	0.4	0.9	0.6	1.0	56.4	59.1
India	0.5	1.1	0.4	0.9	0.2	0.8	0.3	0.8	62.2	57.4
Oceania	16.6	18.6	31.8	19.6	8.5	17.9	18.5	18.8	73.7	56.3
NAFTA	1.8	2.4	2.7	3.2	1.0	2.0	1.7	2.6	67.4	65.5
EU 15	42.0	35.2	45.5	29.9	7.5	15.9	23.8	23.5	81.9	68.8
Developed countries	71.4	61.1	82.7	52.3	68.8	66.8	74.7	59.0	47.3	47.8
Developing countries	28.6	38.9	17.3	47.7	31.2	33.2	25.3	41.0	29.3	62.8
World	100	100	100	100	100	100	100	100	42.8	54.0

Source: data compiled from UN Comtrade database.

Table 4: Share of network products in manufacturing trade, 1992-93 and 2006-08 (percent)

	Parts and components		Final assembly		Total network products	
	1992-93	2007-08	1992-93	2007-08	1992-93	2007-08
(a) Exports						
East Asia	20.2	34.3	31.6	26.4	51.8	60.7
Japan	23.9	34.3	44.5	32.3	68.4	66.6
Developing East Asia (DEA)	17.3	34.0	21.8	25.2	39.1	59.2
People's Republic of China (PRC)	7.4	25.5	13.7	26.6	21.1	52.1
Hong Kong, China	15.8	33.3	18.0	17.8	33.8	51.1
Taiwan	24.7	44.2	17.6	21.5	42.3	65.7
Republic of Korea	18.1	44.2	22.2	25.4	40.3	69.5
ASEAN	22.7	44.2	34.1	22.0	56.8	66.2
Indonesia	3.8	21.5	5.6	16.8	9.3	38.4
Malaysia	27.7	53.6	40.7	25.1	68.4	78.8
The Philippines	32.9	71.7	20.5	15.6	53.4	87.3
Singapore	29.0	49.3	45.9	17.2	74.9	66.5
Thailand	14.1	29.9	29.0	33.0	43.1	62.9
Viet Nam	---	11.0	---	7.6	---	18.5
South Asia	2.3	8.2	2.9	3.1	5.1	11.3
India	3.0	10.4	3.4	3.8	6.4	14.2
North American Free Trade Area (NAFTA)	28.4	31.2	31.4	28.1	59.7	59.3
Mexico	42.1	34.6	30.8	42.1	72.9	76.6
European Union (EU) 15	18.3	22.4	22.4	21.1	40.7	43.5
Developed countries	20.4	25.2	28.5	23.6	48.9	48.8
Developing countries	14.6	29.2	21.8	24.3	36.4	53.6
World	19.3	27.1	26.3	23.8	45.5	50.9

	Parts and components		Final assembly		Total Network products	
	1992-93	2007-08	1992-93	2007-08	1992-93	2007-08
(b) Imports						
East Asia	27.2	42.0	17.2	17.8	44.4	59.8
Japan	19.3	29.2	19.3	21.9	38.6	61.1
Developing East Asia	29.0	44.4	16.7	17.3	45.8	61.7
PRC	20.4	44.0	14.0	19.8	34.4	63.7
Hong Kong, China	24.1	48.5	16.5	13.5	40.6	62.1
Taiwan	29.5	38.9	18.0	16.8	47.5	55.7
Republic of Korea	30.1	31.9	14.6	17.4	44.7	49.3
ASEAN	36.0	47.8	18.4	16.2	54.4	64.0
Indonesia	27.0	21.8	9.2	15.8	36.1	37.7
Malaysia	40.5	50.0	20.2	22.0	60.7	72.0
The Philippines	32.6	61.3	15.0	17.4	47.6	78.6
Singapore	39.9	60.4	21.9	17.3	61.8	77.7
Thailand	30.6	36.1	15.6	12.4	46.2	48.5
Viet Nam	---	19.1	---	9.7	---	28.8
South Asia	16.6	23.8	12.9	16.5	29.5	40.3
India	17.5	22.9	10.6	17.0	28.1	39.9
NAFTA	37.4	28.8	13.4	22.4	50.7	51.2
Mexico	29.4	36.1	14.2	19.0	43.7	55.1
EU15	21.2	23.2	4.7	10.6	25.9	33.8
Developed countries	22.6	23.4	25.2	25.5	47.8	48.9
Developing countries	11.9	33.6	28.6	19.9	40.4	53.4
World	19.6	27.3	26.2	23.3	45.7	50.7

Source: Compiled from UN Comtrade database.
Note: … = data not available

Table 5: Share of parts and components in bilateral trade flows, 2007/8 (percent)

Reporting country	EA	Japan	DEA	PRC	ASEAN	NAFTA	EU15	World
(a) Exports								
East Asia (EA)	47.6	32.9	50.1	51.6	54.5	25.1	24.1	34.1
Japan	42.0	0.0	42.0	41.5	47.9	31.5	30.4	34.4
Developing East Asia (DEA)	48.1	33.4	53.9	0.0	65.2	22.7	21.6	34.0
China (PRC)	36.2	25.2	40.6	0.0	49.1	17.1	16.3	25.6
Korea	61.9	51.5	63.5	57.3	63.7	36.6	26.8	44.2
Taiwan	51.5	59.0	50.5	39.5	61.2	35.0	37.6	44.2
ASEAN10	58.2	39.9	61.4	64.0	56.0	32.1	33.9	44.2
NAFTA	46.7	36.5	49.8	34.8	67.9	28.8	30.6	31.2
EU15	31.4	18.7	34.8	30.4	46.5	22.1	22.0	22.4
(b) Imports								
East Asia (EA)	51.7	48.8	52.8	34.8	68.3	54.7	33.1	42.1
Japan	34.2	0.0	34.2	23.1	44.9	41.0	18.9	29.9
Developing East Asia (DEA)	55.5	47.7	59.5	0.0	74.3	40.3	31.7	44.2
China (PRC)	55.2	47.5	59.2	0.0	74.0	40.1	31.6	44.0
Korea	33.0	26.6	38.1	26.1	55.7	38.9	22.9	31.9
Taiwan	46.7	33.8	58.3	44.1	68.8	40.2	28.0	38.9
ASEAN10	50.3	47.2	51.4	40.1	55.9	67.5	41.7	47.9
NAFTA	29.4	39.3	26.0	17.7	40.5	36.3	25.1	28.8
EU15	25.0	33.6	22.8	14.9	37.9	34.1	22.1	23.4

Note:

1. EA: East Asia, DEA: Developing East Asia; ASEAN6: six main ASEAN countries; EU15: 15 member countries of the European Union; NAFTA: countries in the North American Free Trade Agreement (USA, Canada and Mexico)

Source: Compiled from UN Comtrade database.

Table 6: Intra-regional shares of manufacturing trade: Total, parts and components, and final trade, 1992-93 and 2006-08[1](percent)

	East Asia	Developing East Asia	ASEAN	NAFTA	EU15
(a) Total trade					
Exports					
1992-93	47.2	38.2	20.7	44.4	61.2
2007-08	43.9	33.5	18.4	48.1	56.8
Imports					
1992-93	58.2	34.9	15.5	36.3	64.1
2007-08	64.4	46.6	20.8	32.o	57.8
Trade (exports + imports)					
1992-93	53.2	36.5	17.8	39.9	62.6
2007-08	55.2	40.4	20.1	38.4	57.5
(b) Parts and Components					
Exports					
1992-93	50.2	42.6	30.3	43.5	62.3
2007-08	61.1	53.9	25.4	46.9	55.9
Imports					
1992-93	65.9	35.3	20.2	39.5	58.0
2007-08	66.9	50.9	22.9	39.9	55.2
Trade					
1992-93	57.0	38.7	24.1	41.4	60.1
2007-08	63.0	52.2	23.3	43.2	55.5
(c) Final Goods [3]					
Exports					
1992-93	46.0	36.8	16.1	44.7	60.9
2007-08	36.9	28.3	15.9	48.7	57.0
Imports					
1992-93	55.4	34.7	12.9	35.3	65.6
2007-08	63.0	42.8	20.6	30.2	58.5
Trade					
1992-93	50.3	35.7	14.3	39.4	63.3
2007-08	44.2	34.1	18.1	37.4	57.3

Source: Compiled from UN Comtrade database, and Trade Data CD-ROM, Council for Economic Planning and Development, Taipei (for data on Taiwan)

Note:1. Intra-regional trade shares have been calculated excluding bilateral flows between China and Hong Kong.
2. ASEAN+3=ASEAN+ Japan + Korea +China
3. Total (reported) trade (a) – parts and components (b).

Table 7: East Asia: Growth of total merchandise exports and imports, 2007Q1–2010Q2
(Year-on-year percent change)

	2007q1	2007q2	2007q3	2007q4	2008q1	2008q2	2008q3	2008q4	2009q1	2009q2	2009q3	2009q4	2010q1	2010q2
Exports														
East Asia (EA)	14.3	13.3	11.6	17.4	19.0	20.8	18.1	-7.7	-24.1	-25.3	-20.0	6.0	32.9	35.6
Japan	9.7	6.9	9.1	14.0	20.2	18.0	13.0	-9.6	-41.5	-35.5	-25.5	-6.2	53.2	44.0
Developing EA	14.7	13.9	11.9	17.7	18.9	21.1	18.6	-7.5	-22.4	-24.2	-19.4	7.2	30.9	34.7
Hong k\Kong	8.4	11.1	7.8	8.6	11.0	8.2	6.0	-1.4	-20.9	-12.1	-13.5	-1.9	24.9	24.6
China	27.3	27.6	26.4	25.8	24.6	22.4	19.1	17.6	3.5	-22.2	-18.0	-16.1	-2.3	35.5
Korea	16.4	14.8	11.4	19.4	19.2	22.4	20.7	-14.2	-32.3	-27.6	-22.3	8.9	37.2	35.7
Taiwan	8.6	6.8	9.7	15.2	16.9	18.2	7.5	-25.1	-37.5	-31.9	-20.5	16.9	54.8	45.3
ASEAN	14.5	13.1	10.6	18.1	19.5	23.3	22.1	-8.6	-22.8	-24.7	-20.0	10.7	32.4	34.3
Indonesia	22.2	19.9	8.8	13.1	21.8	18.9	22.4	1.4	-22.3	-14.8	-11.1	17.5	38.9	27.6
Malaysia	7.3	7.4	6.9	16.2	19.5	29.2	21.2	-12.5	-28.9	-33.3	-26.3	9.8	40.5	33.1
Philippines	9.4	4.6	2.3	9.9	2.8	5.5	4.1	-22.3	-36.8	-28.9	-21.5	6.0	42.9	33.3
Singapore	9.9	7.4	8.6	14.7	21.4	26.0	21.4	-13.4	-32.7	-30.6	-22.5	11.5	38.1	36.5
Thailand	16.3	17.4	13.7	25.2	23.7	28.6	26.1	-10.4	-20.1	-26.2	-17.6	12.0	32.1	41.8
Vietnam	21.9	21.9	23.1	29.3	27.8	31.8	37.6	5.7	4.2	-14.7	-20.9	7.2	2.0	33.7
Imports														
East Asia (EA)	11.1	12.5	12.8	19.8	29.7	28.2	25.3	-0.6	-26.9	-26.4	-18.6	4.2	38.6	37.7
Japan	4.0	3.5	3.4	15.6	25.6	29.1	35.2	7.4	-29.1	-37.3	-31.6	-19.2	25.9	40.4
Developing EA	11.8	13.4	13.7	20.2	30.1	28.1	24.3	-1.4	-26.7	-25.3	-17.3	6.5	39.9	37.5
Hongkong	8.7	12.1	8.9	11.3	12.3	9.9	7.6	-3.3	-21.1	-14.1	-9.7	3.2	32.9	31.9
China	19.1	18.0	19.6	20.3	24.0	30.6	22.4	18.7	2.4	-25.2	-15.8	-11.1	6.4	53.3
Korea	14.0	15.2	7.0	26.1	30.0	31.2	43.2	-7.8	-32.6	-35.7	-30.8	0.6	36.6	44.3
Taiwan	2.3	7.3	9.0	13.1	25.9	18.0	19.1	-22.7	-47.8	-37.4	-28.7	18.1	78.9	54.3
ASEAN	12.4	13.6	15.4	21.8	34.8	32.0	25.1	0.3	-28.0	-23.4	-14.6	9.1	40.7	31.8
Indonesia	11.6	19.2	20.6	7.4	41.2	44.1	44.7	31.9	-28.8	-27.0	-24.3	-8.3	42.8	35.9
Malaysia	12.8	9.0	8.6	18.3	15.7	17.5	14.6	-15.8	-36.6	-31.6	-22.6	12.5	45.1	44.0
Philippines	-1.1	12.0	22.4	25.2	13.8	2.9	-5.3	-3.0	5.0	9.3	14.4	13.9	16.4	11.3
Singapore	8.2	7.3	4.9	21.7	33.9	37.2	34.5	-8.0	-32.2	-33.3	-25.0	3.4	34.7	33.2
Thailand	5.4	6.9	7.7	16.1	35.0	30.0	39.4	5.3	-38.3	-33.1	-28.4	1.5	63.6	44.8
Vietnam	37.6	27.5	28.5	42.4	69.0	60.1	22.7	-8.9	-37.2	-24.8	-1.5	31.9	41.5	21.8

Note: Growth rates calculated using current US$ values.
Source: Complied from CEIC Asia database

Table 8: Growth manufacturing imports to the United States, 2008:Q1-2009:Q3 (year-on-year, percent)

	2008q1	2008q2	2008q3	2008q4	2009q1	2009q2	2009q3
East Asia (EA)							
Total manufacturing	2.0	4.1	4.9	-6.8	-22.3	-24.2	-22.0
Parts and components	-2.5	3.9	2.6	-14.3	-29.1	-29.3	-23.9
Assembly	6.0	8.5	4.8	-13.6	-30.6	-25.9	-21.6
Total network trade[1]	2.6	6.7	4.0	-13.8	-30.0	-27.2	-22.4
Developing EA							
Total manufacturing	1.1	4.5	7.5	-3.9	-15.4	-18.7	-19.0
Parts and components	-4.3	4.6	4.2	-12.8	-25.2	-26.1	-22.2
Assembly	5.3	9.8	10.0	-9.5	-17.6	-15.5	-16.1
Total network trade[1]	1.4	7.8	7.9	-10.6	-20.5	-19.4	-18.3
Association of Southeast Asian Nations (ASEAN)							
Total manufacturing	0.4	1.8	-2.3	-15.2	-26.5	-24.1	-16.2
Parts and components	-6.5	4.3	-2.6	-21.2	-32.5	-31.1	-15.8
Assembly	3.0	4.8	-6.3	-25.1	-39.6	-36.5	-26.5
Total network trade[1]	-2.1	4.6	-4.7	-23.5	-36.5	-34.2	-22.1
Japan							
Total manufacturing	4.6	2.9	-4.1	-16.6	-42.3	-42.5	-33.5
Parts and components	1.6	2.1	-1.0	-17.7	-37.1	-37.4	-28.5
Assembly	7.5	6.0	-6.7	-23.2	-55.0	-49.6	-35.2
Total network trade[1]	5.3	4.5	-4.7	-21.4	-49.0	-45.3	-33.0
Republic of Korea							
Total manufacturing	0.4	7.6	11.5	-0.2	-15.1	-23.1	-25.1
Parts and components	-11.3	0.2	1.9	-14.4	-32.1	-33.3	-26.2
Assembly	4.3	13.9	14.4	-2.1	-9.4	-12.6	-17.7
Total network trade[1]	-1.2	9.3	10.0	-5.9	-16.5	-19.0	-20.4
Taiwan							
Total manufacturing	5.8	2.8	4.1	-10.3	-28.5	-32.3	-22.9
Parts and components	11.8	12.1	3.9	-16.4	-30.8	-33.1	-21.2
Assembly	11.0	6.4	12.5	-7.5	-31.4	-32.0	-21.5
Total network trade[1]	11.0	9.3	7.8	-12.4	-31.1	-32.6	-21.3
People's Republic of China (PRC)							
Total manufacturing	1.3	5.3	10.1	-0.6	-11.2	-16.0	-18.4
Parts and components	-1.6	5.9	7.7	-8.7	-20.2	-22.3	-23.6
Assembly	7.0	10.9	14.9	-6.1	-11.7	-9.3	-12.8
Total network trade[1]	3.7	9.0	12.4	-7.0	-14.8	-14.0	-16.5
Mexico							
Total manufacturing	2.8	3.9	-4.2	-11.8	-25.2	-27.6	-17.0
Parts and components	-3.6	-4.3	-7.6	-15.1	-31.0	-32.7	-17.7
Assembly	10.1	12.0	-6.6	-11.8	-21.6	-23.8	-11.3
Total network trade[1]	3.3	4.1	-7.1	-13.2	-26.0	-27.8	-14.1
World							
Total manufacturing	2.9	4.5	3.5	-9.2	-25.4	-29.3	-25.1
Parts and components	-0.3	1.8	0.0	-13.7	-28.4	-31.7	-24.8
Assembly	4.5	7.2	-0.1	-16.5	-31.9	-30.1	-22.6
Total network trade[1]	2.3	4.8	0.0	-15.4	-30.4	-30.8	-23.5

Source: Compiled from US International Trade Commission online database.
*Note:*1. Parts and components plus final assembly.

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