Multinational Production Networks and the New Geo-economic Division of Labour in the Pacific Rim

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Abstract: This paper examines the implications of international fragmentation of production for trade patterns in the Pacific Rim, with special emphasis on regional and global integration of countries in East Asia. The analysis reveals that the degree of dependence of East Asia on this new global division labour is much larger compared to the other countries in the Pacific Rim and Europe. Network- related trade in parts and components has certainly strengthened intra-regional economic interdependence among the East Asian countries, but this has not lessoned the dependence of growth dynamism of these countries on the global economy. The operation of cross-border production networks depends inexorably on trade in final goods with North America and the European Union. The paper also probes the challenges posed by the fragmentation-based international division of labour for the 'flying geese' approach to the analysis of growth patterns in East Asia.

JEL classification: F15, F23, O53

Key words: production fragmentation, multinational production networks, economic transition in China

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International fragmentation of production, the splitting of production process into discrete activities which are then allocated across countries, has been an increasingly important facet of economic globalization over the past three decades. With a modest start in electronics and clothing industries in the late 1960s, multinational production networks have gradually evolved and spread into many industries such as sport footwear, automobile, televisions and radio receivers, sewing machines, office equipment, power and machine tools, cameras and watches, and printing and publishing. At the formative stage, the process involved locating small fragments of the production process in a low cost country and reimporting the assembled components to be incorporated in the final product. Over time, production networks have begun to encompass many countries which are engaged in the assembly process at different stages, resulting in multiple-border crossing of product fragments before getting incorporated in the final product. Recent years have witnessed two other important developments in the process, setting the stage for rapid expansion in the share of fragmenta ion-based trade in world trade. First, some fragments of the production process in certain industries have become 'standard fragments' which can be effectively used in a number of products.[1] Second, as international networks of parts and comments supply became firmly rooted, producers in advanced countries have begun to move final assembly of an increasing range of consumer durables (for example, computers, cameras, TV sets and motor cars) to overseas locations in order to be physically closer to their final users and/or to take advantage of cheap labour.

The expansion of fragmentation-based international exchange has been underpinned by three mutually reinforcing developments. First, rapid advancements in production technology have enabled the industry to slice up the value chain into finer, 'portable', components. Second, technological innovations in communication and transportation have shrunk the distance that once separated the world's nations, and improved speed, efficiency and economy of coordinating geographically dispersed production process. This has facilitated establishment of 'services links' to combine various fragments of the production process in a timely and cost efficient manner. Third,

liberalisation policy reforms in both home and host countries have considerably removed barriers to trade and investment (Jones 2000, Jones and Kierzkowski 2001).

Conventionally, international fragmentation of production took the form of a multinational enterprise (MNE) building a subsidiary abroad to perform some of the functions that it once did at home. Thus there was a close relationship between foreign direct investment (FDI) and trade in parts and components (henceforth referred to as 'fragmentation-based trade' within vertically integrated manufacturing industries (Helleiner 1989). However, in recent years, fragmentation practices have begun to spread beyond the domain of MNEs. As production operations in host countries have become firmly rooted, MNE subsidiaries have begun to subcontract some activities to local (host-country) firms to which they provide detailed specifications and even fragments of their own technology. At the same time, many firms which are not parts of MNE networks have begun to procure components globally through arm's-length trade. Moreover, many MNEs in electronics and related industries have begun to rely increasingly on independent contract manufacturers for the operation of their global-scale production networks—a process that has been facilitated by the standardization of some components and advances in modular technology (Sturgeon 2003, Brown and Linden 2005). These new developments imply that increase in fragmentation-based trade may or may not be accompanied by an increase in the host-country stock of FDI (Brown, Deardoff and Stern 2004, p.305).

There is a sizable literature which points to the growing importance of fragmentation-based specialisation for economic growth and structural transformation in countries in the Pacific Rim.[2] It is clearly evident that while growth in fragmentation-based trade is now a global phenomenon, it is far more important and growing rapidly in the Pacific Rim, particularly in East Asia, than elsewhere in the world. However, the implications of this new form of international specialisation for economic transformation for individual countries in the region and regional economic integration have not yet been systematically examined. The literature on these issues is by and large based on the traditional notion of horizontal specialisation scenario in which countries trade goods that are produced from start to finish in just one country. In a context where fragmentation trade is growing rapidly, this conventional approach can lead to misleading inferences as to the nature and extent of trade integration among countries, for two reasons. First, the total amount of recorded trade could be a multiple of the actual value of final goods, goods-in-

process cross multiple international borders before getting embodied in the final product. Second, and perhaps more importantly, intra/extra regional patterns of fragmentation trade and trade in related final goods ('final trade') are unlikely to follow the same geographic patterns, and hence trade shares calculated using reported data can lead to wrong inferences as to the relative importance of the 'region' and the rest of the world for growth dynamism of a given country/region.

The purpose of this paper is to examine the extent, trends and patterns of international production fragmentation and its implications for trade patterns in the Pacific Rim, with special emphasis on regional and global integration of countries in East Asia. Particular emphasis will be placed on the implications of China's evolving role in the process of international fragmentation of production for trade patterns in the region. The analysis is based on a systematic separation of fragmentation trade from total trade flows using a new data set extracted from the UN trade database. The Pacific Rim experience is examined in the wider global context, focussing specifically on the comparative experiences of the North American Free Trade Asia (NAFTA) and the European Union (EU).

The paper is organised as follows. The next section discusses the procedure followed in extracting data from the UN trade data tapes and data quality. The following section examines the nature and extent of fragmentation trade and the role of Pacific Rim countries in this new global division of labour. The subsequent sections deals in turn with the growing importance of fragmentation-based specialisation for intra-regional trade and forging new supply-side complementariness among countries in the region, with emphasis on the emerging role of China in regional production networks; the implications of the rapid expansion of fragmentation-based trade for intra- versus extra-regional trade patterns; challenges posed by the fragmentation-based international division of labour for the conventional changing comparative advantage ('flying geese') approach to the analysis of growth patterns in the region. The final section presents the key policy inferences.

Data

The data for this paper are compiled over the period from 1992 to 2004 from the UN *Comtrade* database based on the Revision 3 of the Standard International Trade Classification (SITC, Rev 3). The year 1992 was selected as the starting point because by this time countries accounting for over 95 per cent of total world manufacturing trade had adopted the revised data reporting system. The analysis ends in 2004, the most recent year for which data are available for all reporting countries.

In its original form (SITC, Rev 1), the UN trade data reporting system did not provide for separating parts and components from final manufactured goods. The SITC Revision 2 introduced in the late 1970s (and implemented by most countries only in the early 1980s) adopted a more detailed commodity classification, which provided for separation of parts and components within the machinery and transport sector (SITC 7). There were, however, considerable overlap between some advanced-stage assembly activities and related final goods within the sector in the Revision 2, which made it difficult to separate fragmentation trade from total trade (Ng and Yeats 2001)[3]. Revision 3 introduced in the mid-1980s marked a significant improvement over Revision 2. In addition to redressing overlaps within SITC 7, this new version of SITC provided for separation of parts and components trade in the 'miscellaneous goods' sector (SITC 8). These two sectors together accounted for around 70% of total world manufacturing trade (defined as goods belonging to SITC 5 though 8 less SITC 68 (non-ferrous metals)) during the period under study. The list of parts and components identified at the 5-digit level for these two sectors, which provides the basis of our empirical analysis. It contains a total of 225 five-digit products—168 products belonging to SITC 7 and 57 belonging to SITC 8. [4]

It is important to note that, despite its significant improvement over the previous version, SITC Revision 3 does not provide for the construction of data series covering the entire range of fragmentation-based trade. Data reported under SITC 7 do provides a comprehensive coverage of fragmentation trade. But data for SITC 8 does not seem to fully capture fragmentation trade within that commodity category. For instance, for some products such as clothing, furniture, and leather products in which outsourcing is prevalent (and perhaps has been increasing), some of the related components (e.g., pieces of textile,

parts of furniture, parts of leather soles) are presumably recorded under other SITC categories. Moreover, there is evidence that production fragmentation has been spreading beyond SITC 7 and 8 to other product categories such as pharmaceutical and chemical products (falling under SITC 5) and machine tools and various metal products (SITC 6). Assembly activates in software trade, too, have recorded impressive expansion in recent years. These are lumped together with 'special transactions' under SITC 9. So the tabulations presented here of the magnitude of fragmentation-based trade are downward biased. However, the magnitude of the bias is unlikely to be substantial because fragmentation-based international specialisation is predominantly concentrated in machinery and transport equipment category (SITC 7) (Yeats 2001, Feenstra 1998).

As regards the country coverage/classification, the term Pacific Rim is used to refer to the member countries of the Asia Pacific Economic Cooperation (APEC). These include East Asia, NAFTA, Australia and New Zealand and Peru and Chile.[5] East Asia is defined to include Japan, the newly industrialised economies (NIEs) in North Asia (South Korea, Taiwan and Hong Kong), China and members of the Association of Southeast Asian Nations (ASEAN) Free Trade Area (AFTA). Among the AFTA member countries, only the six largest economies— Indonesia, Malaysia, the Philippines, Thailand, Singapore and Vietnam— are covered; Brunei, Cambodia, Laos and Myanmar are ignored because of lack of data.

The data are tabulated using importer records, which are considered to more appropriate compared to the corresponding exporter records for analysing trade patterns for a number of reasons (Ng and Yeats 2003, Appendix 1, Feenstra et al 1999 and 2005). Importer records are admittedly less susceptible to double counting and erroneous identification of the source/destination country in the presence of entrepot trade compared to data based on reporting country records (eg. China's trade through Hong Kong and Indonesia's through Singapore). Also, some countries fail to properly report goods shipped from their own export processing zones. These exports are simply lump these exports into one highly aggregated category of 'special transactions' under SITC 9. While no fully satisfactory solutions exist for these problems, it is generally believed that data compiled from importer records are less susceptible to recording errors and reveal the origins and composition of trade more accurately since there normally are important legal penalties for incorrectly specifying this information on customs declarations. Among the countries

covered in this study, Taiwan is not covered in the UN data system and Vietnam has not yet begun to make data available according to the standard UN format. Singapore was not reporting data on its bilateral trade with Indonesia because of political reasons. [6] In these cases, the data gaps were filled using the corresponding trading partner records.

Trends and Patterns of Product Fragmentation

Table 1 summarises data on the growing importance of trade in parts and components[7] in world manufacturing trade. Value of total world component trade increased from about $403 billion in 1992 to over 1250 in 2004, at a compound annual rate of 13.6% compared to a 12.4% growth in total manufacturing exports. The share of components in total world manufacturing exports increased from 21% to over 26% between these two years. Components accounted for over a third of the total increment in world manufacturing exports between these two years.

Table 1 about here

Countries in the Pacific Rim (APEC countries) account for the bulk of world trade in component trade. Their share in total world exports of components increased from 52.9% in 1992 to 62.3% in 2004. The share of East Asia (including Japan) increased faster rate, from 29.6% to 43.6% between these two years. This was in spite of a notable decline in the share of Japan, the dominant economy in the region. The share of developing East Asia (East Asia excluding Japan) increased from 14% to 31.9%. Within that group, all reported countries have recorded increases in world market shares. Interestingly, the significant increase in the relative importance of East Asia in fragmentation trade has taken placed against the backdrop of a notable decline in the shares of NAFTA and EU.

The degree of dependence of East Asian countries as a group on component trade is much higher compared to all other regions in the world. In 2004, components accounted for 33.5% of total manufacturing exports of these countries, 20.9% in EU and 30.7% in NAFTA and a world average of 26.3%. Within East Asia, countries belonging to AFTA, in particular Malaysia, Philippine, Singapore and Thailand, stand out for their heavy

dependence on product fragmentation for export dynamism. In 2004, components accounted for 47.8% of total manufacturing exports in AFTA, up from 31.9% in 1992. The growing importance of China is component trade is particularly noteworthy. It share in total world exports increased from one per cent in 1992 to nearly 8.3% in 2004. The share of components in manufacturing exports of china increased from 4.8% to 19% between these two years. On the import-side, the increase was from 21.5% to 42.1%. The share of Hong Kong in world component trade has eroded persistently as a result of the dramatic relocation of manufacturing ventures to the mainland China during this period.

Some observers had predicted that the formation of NAFTA and the integration of some of the new countries emerged from the former Soviet Union with the rest of the Europe could adversely affect the developing East Asia's relative position in world assembly activities (USITC 1999, Kierzkowski 2001, Kaminski and Ng 2005). In addition to the anticipated positive impact of significant tariff reduction, proximity to industrial countries and relatively low wages by regional standard (though not compared to some of the East Asian countries) are considered as important specific advantages of Mexico (in penetrating the US market) and the countries in the European periphery (in penetrating the EU) compared to countries in East Asia. Interestingly, this prediction does not seem to have materialized. World market share of developing East Asia in fragmentation-based trade has increased at a much faster rate compared to that of both NAFTA and the EU.

The explanation for the continued pre-eminence of East Asia in component trade seems to lie in a number of powerful supply-side factors. Despite rapid growth, manufacturing wages in China and other latecomers to export-oriented industrialisation in East Asia (Malaysia, Thailand, Viet Nam and the Philippines) still remain lower than or comparable to those in countries in the European periphery and Mexico.[8] Moreover, significant differences in wages among the countries within the East Asia region have provided the basis for rapid expansion of intra-regional product sharing systems, giving rise to increased cross-border trade in parts and components. Second, the relative factor cost advantage has been supplemented by a relatively more favourable trade and investment policy regimes, and better ports and communication systems that facilitate trade by reducing the cost of maintaining 'services links' (Baldwin 2006, Jones *et al*. 2004, Athukorala and Yamashita 2005).

Third, rapid economic expansion for over three decades in a number of countries in the region seems to have brought about 'market thickness' (the economic depth of trading nations) which positively impact on the location of outsourcing activity (Grossman and Helpman 2005). Finally, part of the explanation also seems to lie in economic history, the early choice of the region (firstly Singapore and subsequently Malaysia and other countries) by MNEs as a location of outsourcing activities. There is a general tendency for MNE affiliates to become increasingly embedded in host countries the longer they are present there and the more conducive the overall investment climate of the host country becomes over time (Rangan and Lawrence 1999). Also, as firstcomers in this area of international specialisation, countries in East Asia (particularly Singapore, Korea, Taiwan and Malaysia) offer considerable agglomeration advantages for companies that are already located there. Site selection decisions of MNEs operating in assembly activities are strongly influenced by the presence of other key market players in a given country or neighbouring countries. Against the backdrop of a long period of successful operation in the region, many MNEs (particularly US-based MNEs) have significantly upgraded technical activities of their regional production networks in East Asia and assigned global production responsibilities to affiliates located in more mature countries (Singapore and Taiwan in particular, and also Malaysia in recent years) (Borrus *et al.* 2000; McKendrick, Doner & Haggard 2000).

Production Networks

The discussion is based on data on regional bilateral trade flows reported in Tables 2, 3 and 4. Tables 2 and 3 give data on the geographic profile of manufacturing trade and trade in parts and components respectively. Reported in Table 4 are percentage shares of parts and comments in bilateral flows of manufacturing trade. The data reported in these tables vividly shows the gowning importance of component trade in intraregional trade flows in the Pacific Rim, particularly among countries in East Asia. Intra-regional trade accounts for a much larger share in component exports and imports in East Asia compared to the comparable share in total exports and imports. Moreover, share of components in intra-regional imports is much larger and has increased at a faster rate in total import compared to exports, reflecting the greater reliance of the region on the rest of the world as a market for final goods.

Table 2 about here

Table 3 about here

Table 4 about here

Within East Asia, countries in AFTA stand out for the high share of components in intra-regional trade flows.[9] The share of components in total intra-regional exports in AFTA increased from 98% in 1992 to 92.3% in 2004. On the import side, the increase was from 75.3% to 84.4%. According to country-level data (not reported here for brevity), the share of component in manufacturing exports and imports amounted to over 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 the other countries in the region. East Asia's intra-regional share of trade in components (both in exports and imports) of all East Asian countries have increased at a much faster rate (from 48% to 67.4% in exports and from 62.7% to 73.6% in imports) compared that in trade with any other region (Table 3). The intra-regional share of component trade (both in exports and imports) is also much larger in Pacific Rim region compared to EU, as an outcome of the heavy concentration of component trade within East Asia.

As already noted, China, in spite of the late entry into fragmentation-based global division of labour, has begun to replicate the overall regional patterns.[10] The shares of Chinese imports of total manufacturing coming from East Asia increased from 64.3% in 1992 to 76.2% in 2004 (Table 5). This increase was dominated by components. The regional share of total Chinese imports of components increased from 30.3% to 77.7% between these two years. Component accounted for over 90% of the total increment in Chinese intra-regional manufacturing imports between 1992 and 2004. Japan has continued to remain the major regional source country, but there has been a notable diversification of source country composition between 1992 and 2004. The most notably development is the rapid growth of the combined share of AFTA, from a mere 0.9% in 1992 to 19.3% 2004. Within AFTA, import shares of Malaysia and the Philippines have increased at a faster rate compared to that of Singapore. By 2004, Malaysia's share in total Chinese imports of components stood at 7.9% compared to Singapore's share of 3.5%. Import shares of Taiwan and Korea also have increased persistently. However, the share of Hong Kong has declined persistently as much of manufacturing activities carried out by

Hong Kong businesses relocated to Mainland China. Overall, the data clearly suggest that China's trade integration through fragmentation trade is not predominantly a phenomenon limited to Greater China (or the 'China Circle', *a la* Haughton 1997). The procurement network has rapidly expanded to cover other countries in the region.

Table 5 about here

On the exports side, China's aggregate intra-regional share has declined persistently in both total manufacturing as well as component exports. Overall, China's evolving export patterns exhibit a clear extra-regional bias (the degree of which has increased over the year), in contrast to greater regional integration on the import side. This difference reflects the increasingly important role of China as a final product assembler for advanced-country markets using middle-products procured from the region. For about the mid 1990s, China has maintained a widening net importing position (trade deficit) with the region (Figure 1). The prime source of the widening deficit has been increasing reliance on countries in the region for sourcing parts and component for fuelling booming domestic final good assembly activities. Net part and component trade with the region increased persistently from about US$ 2 billion in 1997 to over U$50 billion in 2004.

Figure 1 about here

So far we have examined the growing importance of fragmentation trade for the emerging economic interdependence among countries in the Pacific Rim, East Asia and the other subregions. With this background, we now proceed to examine the implications of this new form of international specialisation for two key themes central to the contemporary debate on growth dynamism and the process of intra- versus inter-regional economic integration in East Asia, namely the relative importance of intra-regional versus global economic integration and catching-up in the growth process of latecomers in the region through economic globalization.

Production Fragmentation and Regional versus Global Economic Integration

There is a vast literature based on the standard trade data analysis (which is essentially based on the traditional notion of horizontal specialisation scenario in which trade is essentially an exchange of goods that are produced from start to finish in just one country) that unequivocally points to a persistent increase in intra-regional trade in East Asia (including as well as excluding Japan) form about the early 1980s (e.g., Kwan 2001, Drysdale and Garnaut 1997, Frankel and Wei 1997, Petri 1993, Pearson 1994, Ng and Yeats 2003). This evidence figures prominently in the current regional debate on forming regional trading arrangements covering some or all countries in East Asia. In particular, the proponents of the proposal to expand AFTA to encompass Japan, China and Korea ('ASEAN + 3' proposal) often refer to deepening economic interdependence reflected in intra-regional trade among these countries as evidence of its likely success (Ng and Yeats 2003, Baldwin 2005). Increasing trade integration is also cited as an indicator of the potential benefits of monetary integration in the region (Kwan 2001).

The discussion in the previous section on the emerging patterns of intra-regional component trade however casts doubts on the validity of these inferences. We have noted two important peculiarities of trade patterns in East Asia compared to total global trade and trade of EU and NAFTA. First, component trade has played a much more important role in trade expansion in East Asia relative to the overall global experience and experiences of countries in other major regions. Second, trade in components accounts for much larger share in intra-regional trade compared to region's trade with the rest of the world. Given these two peculiarities, trade flow analysis based on reported trade data is bound to yield a misleading picture as to the relative importance of intra-regional trade relations (as against global trade) in the growth dynamism of East Asia (and AFTA and other subregional groupings therein). This is because the growth dynamism based on assembly activities eventually depend on demand for final goods which depends increasingly on extra-regional growth dynamism.

Alternative estimates of intra-regional trade shares reported in Table 6 help illustrate this argument. Reported in panel A and B are the interregional trade shares estimated using data on total (reported) trade and trade in components (which are directly obtained

from Tables 4 and 5). Intra-regional shares of 'net trade' (that is, total trade minus components) are reported in panel C.

Table 6 about here

There is no notable difference between the intra-regional trade shares in all countries in APEC calculated on the basis of data on total or final trade. However, the alternative estimates are vastly different for East Asia, particularly for developing Asia and AFTA: Both the level in the two given years and the change over time of intra-regional trade shares are significantly lower in terms of estimates based on final trade. For instance, intra-regional share of total trade in developing Asia increased from 58% in 1992 to 65% in 2004. However, in terms of estimates based on final trade, the share increased from 33% to 36%. While the difference between intra-regional shares of final and total trade is observable for both exports and imports, the magnitude of the difference is much larger on the export side. In 2004 only 32% of final goods exported from developing Asia found markets within the region, compared to 40% in total exports. For AFTA the relevant figures were 20% and 24% respectively. Moreover, for all East Asian countries Japan is a much smaller market for final goods exports, accounting for less than 10% in all cases in 2003, compared to the USA and the EU. It is also interesting to note that, unlike in the case of East Asia (or developing East Asia and AFTA), the estimated intra-regional trade share for NAFTA, the EU and the other regional groupings are remarkably resilient to the inclusion or exclusion of component trade.

In sum, the estimates presented in this section support our hypothesis that, in a context where fragmentation based trade in expanding rapidly, the standard trade flows analysis can lead to misleading inferences regarding the on-going process of economic integration through trade. When data on assembly trade are excluded from trade flows, our estimates suggest that extra-regional trade is much more important than intra-regional trade for continued growth dynamism of East Asia, both including and excluding Japan. Thus, the ongoing process of product fragmentation seems to have strengthened the case for a global, rather than a regional, approach to trade and investment policymaking.

Production Fragmentation and Growth Patterns: Preliminary Observations

The received view on growth patterns in countries in the Aisia-Pcific 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 from labour-intensive to more capital and technology-intensive sectors. This sequential growth pattern have been described as the 'flying geese pattern' of development by the Japanese economists (Akamatsu 1961, Kojima 2000) and 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 sequential growth hold remarkably well in East Asia.[11] Specifically, Japan was found to have begun to compete with the USA in technologically sophisticated products from about early 1980s, with NIEs following Japan in export structure with a lag of 15 to 20 years, the economies in Southeast Asia are ten years further behind, and China trailing the Southeast Asian countries by another few years (Petri, 1993). This view of orderly, sequential economic transformation has profound implications for trade and industrial policy. The rapidly changing structure of exports implies competitive pressure experienced by countries at lower rugs of the ladder, but it also means new export opportunities for new comers, as countries at higher rugs vacate export markets. For importing countries, the source of competitive pressure in traditional labour intensive products would shift. But to the extent that imports from one country merely displace imports from another, no new domestic resource adjustment cost arise. For instance, the United State and Japan at the top rungs 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 on-going process of production fragmentation? The flying geese pattern of growth is based on the conventional (product-based) division of labour among economies. It assumes a competitive, rather than a complementary, relationship among countries in the growth process, which permits countries to climb the growth ladder on the basis of their own

competitiveness achieved though policy reforms. The process of fragmentation-based international specialisation, which permits firms to relocation of each stage of production process in places where they can be conducted at lowest cost could well disturb this sequential process of economic transformation. This process permits firms in countries at 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 various head-quarter functions) even when rising incomes and the related domestic cost pressure begin to erode their competitiveness in integrated production of the whole product at home. This, in turn, could constrain the growth process of countries at the middle rungs, while countries at the lower rungs still benefit from their relative labour cost advantages. In other words, in face of rapid expansion of fragmentation-based specialisation in the world economy, countries at the middle are confronted with an increasingly challenging task of finding ways to 'tech up' and enter the global knowledge economy, so as to escape the trap of having to dumb down to compete in standardised manufacturing (and, increasingly standardised services) (Garrett 2004).

The implications of growing complementarity of production processes across countries resulting from production fragmentation for latecomers in catching up in the growth process is an important subject for further research. Recent studies which have done some useful ground-clearing work in this direction include Lall and Albaladejo (2004), Rodrik (2006) and Schott (2006). The primary focus of these studies is on the implications of China's rise as a major trading nation for the global economy, but the findings have important general implications for the subject at hand.

Lall and Albaladejo (2004) examine changing technological sophistication of Chinese exports from a comparative regional perspective by disaggregating export data on the basis of a commodity classification that reflects factor intensity properties of *end products*. Rodrik (2006) undertakes a comparative analysis of the sophistication of the export profile of China relative to its income level based on a newly constructed index that measures the productivity level associated with a country's export basket. Schott (2006) examines the relative sophistication of Chian's exports to the USA by comparing China's export bundle and prices (unit values) within broader product categories to those of the

relatively skill- and capital-abundant members of the OECD as well as to similarly endowed US trading partners.

The findings of Rodrik (2006) and Lal and Albaladejo (2004) suggest that, within a period of about one-and-a-half decades, China has ended up with an export basket that is significantly more sophisticated than what would be normally indicated for a country at its income level. Put differently, taken at face value these results seem to suggest that the complementarity in specialisation patterns dictated by the ongoing process of product-fragmentation-based specialisation does not seem to have created an unsurmountable constraint for China's economic transition. These authors combine their findings with some (selective) impressionistic accounts of China's industrial policy to suggest that China's activist policy has played a pivotal role in China's export success by nurturing domestic capabilities in consumer electronics and other advanced product lines.

The findings of these studies, however, need to be treated with caution because the authors have failed to take into account the on-going process of product fragmentation in the analysis. This is a serious limitation because, although the *end products* of electronics, electrical items, automobile and other related products belonging to medium and high-tech products categories are obviously capital/technology intensive, assembly activities within the production process (both component assembly and final assembly) are generally low-tech and highly labour intensive. In other words, the mere fact that a given country is exporting final goods (end products) in a highly fragmented high-tech industry does not necessarily imply the domestic *production* of those goods. Therefore the classification of final commodities by factor intensity is not the same as the classification of the production process occurring in these countries by factor intensity. Put simply, any analysis of technology structure of exports (as in Lall and Albaladejo 2004) or technological sophistication of products (Rodrik 2006) based on the readily-available data on total (reported) trade data is likely to come up with an exaggerated picture of the technological sophistication of China's exports.

Over the past ten years China's export composition has undergone a dramatic shift away from the conventional labour intensive product lines and towards more sophisticated ones (Table 7). For instance, between 1994/5 and 2003/4 the share of miscellaneous manufactured products (SITC 8) (consisting predominantly of clothing, footwear, toys and

sport good, and other labour intensive products) declined from 55.6% to 37.4%. This was mirrored in an increase in the share of machinery and transport equipment (SITC 7) (consisting predominantly of various capital- and technology- intensive product) from 24.7% to 46.3%. This increase was underpinned by China's highly-publicized export success in a wide range of electronics and electrical products (falling under SITC 75, 76 and 77). However, data on the relative importance of parts and components in machinery and transport equipment trade (reported in Panels B, C and D in the table) clearly suggest that, the role of Chinese firms (most of which are subsidiaries of MNEs) in the global production chain of these products mostly limited to final assembly. China's total imports of machinery and transport equipment are dominated my parts and components. The share of parts and components accounted for 62% of total imports of this product category in 2003/4, up from 40.3% in 1994/5. By contrast final goods (total exports minus parts and components still accounts from two thirds of total export (65% in 2003/4). Trade balance in machinery and transport equipment increased from -9.7% of exports to over 35% in 2003/4. This was the outcome of a dramatic increase in the trade surplus in final goods, while trade deficit in parts and components widened from -8.3% to -15.1%. Given the fact that production of parts and component is generally more capital- and technology-intensive compared to final assembly, the basic message conveyed by these figures is that China's export success has so far been underpinned by and large by its comparative advantage in international production arising from labour abundance rather than increased sophistication of the export mix.[12]

Table 7 about here

This inference is consistent with the findings of Schott (2005) who examines the relative 'sophistication' of China's exports to the United States during the period fom 1972 to 2001. By comparing China's export bundle to that of the relatively skill- and capital-abundant members of the OECD as well as to similarly endowed US trading partners Schott (2005) finds that China's export bundle increasingly overlaps with that of more developed countries, rendering it more sophisticated compared to 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' (p. 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 specialisation in global manufacturing trade. China is engaged in labour intensive stages of production (mostly final assembly) in otherwise advanced industries.

Concluding Remarks

There is clear evidence that the fragmentation-based specialisation has become an integral part of the economic landscape of East Asia. Trade in components has been expanding more rapidly than conventional final-good trade. The degree of dependence on this new form of international specialisation is proportionately larger in East Asia compared to North America and Europe. This seems to have been the outcome of the relatively more favourable policy setting for international production, agglomeration benefits arising from the early entry into this new form of specialisation, and considerable inter-country wage differential in the region.

A notable recent development in international fragmentation of production in the region has been the rapid integration of China into the regional production networks. This development is an important counterpoint to the popular belief that China's global integration would crowd out other countries' opportunities for international specialization. The estimates presented in this paper support our hypothesis that, in a context where fragmentation based trade in expanding rapidly, the standard trade flows analysis can lead to an understatement of the trading significance of China in the process of economic integration through trade. China's imports of components from East Asia have grown rapidly, in line with rapid expansion of manufacturing exports mostly to North America and the European Union.

Production fragmentation has certainly played a pivotal role in continuing dynamism of the East Asian economies and increasing intra-regional economic interdependence. This does not, however, mean that the process has contributed to lessoning the regions dependence on the global economy. The high intra-regional trade shares reported in recent studies largely reflect rapidly expanding intra-regional trade in components. There is no evidence of rapid intra-regional trade integration in terms of final products. In fact, the region's growth dynamism based on vertical specialisation depends

inexorably on its extra-regional trade in final good, and this dependence has in fact *increased* over the years. The growing importance of China both as a regional exporter and importer has begun to change the picture in recent years, but extra-regional trade is likely to remain the engine of growth of the region in the foreseeable future. Put simply, growing trade in components has made the East Asia region increasingly reliant on extra-regional trade for its growth dynamism. In this context, these countries would be better off by upholding universal principles of economic openness.

Finally, what are the implications of these findings for the contemporary policy debate on regional economic corporation? In particular, is the new-found fondness in countries in the region for free trade agreements (FTAs) is consistent with the objective of maximising gains from the ongoing process of international product fragmentation?

Trade in components and final assembly is postulated to be relatively more sensitive to tariff changes compared to final trade (or total trade as captured in published trade data) ((Yi 2003). Normally a tariff is incurred each time a good-in-process crosses a border. Consequently, with one percentage point reduction in tariff, the cost of production of a vertically-integrated good declines by a multiple of this initial reduction, in contrast to a one percent decline in the cost of a regular traded good. Moreover, because of tariff reduction may also make more profitable for goods that were previously produced in entirely in one country to now become vertically specialised. Consequently, in theory, the trade stimulating effect of FTA would be higher for parts and component trade than for normal trade, other things remaining unchanged. However, in reality, much would depend on the nature of 'rules or origin'(ROOs) built into FTAs (Garnaut 2003). Trade distorting effects of ROOs are presumably more detrimental to fragmentation-based trade than for conventional final good trade, because of the inherent difficulties involved in defining the 'product' for giving duty exception and the transaction costs associated the bureaucratic supervision of the amount of value added in production coming from various sources. Moreover, maintaining barriers to trade against non-members (while allowing free trade among members) can thwart 'natural' expansion of fragmentation trade across countries.

Thus, in terms of benefiting from the new opportunities for trade expansion through the fragmentation-based division of labour, the ideal (first best) policy choice appears to be multilateral liberalisation through the WTO process; the ongoing process of product

fragmentation seems to have strengthened the case for a global, rather than a regional, approach to trade and investment policymaking. The APEC-wide approach to regional trade liberalization, with a firm commitment to open regionalism, remains the only second best strategy. Our findings do not lend support to the case recently put forward by Baldwin (2006) for a 'New East Asia Regional management Effort' with a reinforced ASEAN+3, with a view to ensuring smooth functioning of the process of fragmentation-based specialisation (which he bubs 'Factory Asia'). Baldwin has correctly identified the importance of fragmentation-based specialisation for economic growth in these countries, but unfortunately he has completely overlooked the important fact that the growth dynamism based on this new form of specialisation depends inexorably on extra-regional trade in final good, and this dependence has in fact *increased* over the years.

Notes

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[1] Examples include long-lasting cellular batteries originally developed by computer produces and now widely used in cellular phones and electronic organisers; transmitters which are used not only in radios (as originally designed) but also in PCs and missiles; and electronic chips the use of which have spread beyond the computer industry into consumer electronics, motor vehicle production and many other product sectors (Jones 2000; Jones and Kierzkowski 2001a; Brown, Deardroff and Stern 2003).

[2] Key contributions to this literature include Borrus 1997, Naughton 1999, McKendrick *et al.* 2000, Ng and Yeats 2001 and 2003, and Dobson and Chia 1997.

[3] For instance 'television tubes' were not separable from 'TVc' and ' computer processors' were lumped together with 'computers'.

[4] The list is available in Athukorala (2003), Appendix A-5.

[5] The terms, Pacific Rim countries and APEC countries are used interchangeably in the remainder of the paper.

[6] In 2005 Singapore started releasing data on trade with Indonesia, after being pressured for decades by the Indonesian government.

[7] Henceforth we used the term 'components' in place of 'parts and components' for brevity.

[8] Average annual compensation **(**Salary/wage plus other remuneration) per worker (US$) in selected countries: China 1835 (2001), Indonesia 880 (2000), Philippines 2965 (2000), Thailand 3345 (1994), Malaysia 4380 (2000), Vietnam 650 (2000), Taiwan 14420 (1997), Korea 15780 (2000), Singapore 20440 (2000), Poland 2502 (2000), Hungary 2898 (2000), Czech Republic 4150 (1998), Mexico 8050 (2000) (Source: China: China Statistical Press (2003) (average wage for Beijing, Tianjin, Shanhai, Zhejiang, Liaoning and Guangdon); Vietnam, General Statistical Office 2000; other countries: Nicita and Olarreage 2006, Statistical Appendix).

[9] Rapid growth of intra-regional fragmentation trade in AFTA countries clearly pre-dates the formation of AFTA in 1994. Whether the formation of AFTA would have provided further impetus for the expansion of this trade remains an unresolved issue that warrants further study. From the inception in the early 1960, this form of international exchange in these countries took place under virtual free-trade conditions as part of the policy emphasis on export-led industrialization. Trade liberalization under AFTA could well have simply substituted for the existing tariff concessions rather that generating new incentives (Athukorala and Yamashita 2006).

[10] It is important to note that cross-border production networks in East Asia had already become well-rooted by the time China's rapid penetration in world manufacturing trade began in the early 1990. This form of new division of labour could have sustained even without China's entry.

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

[12] The data reported in Table 8 (Panel B) do point to a modest increase in the share of parts and components in exports. This share in total export of machinery and transport equipment increased from 26.8% in 1994/5 to 35% in 2000/04. The increased is particularly notable for electrical machinery and parts (from 30.4% to 47%) and road vehicles (from 34.6% to 51.6%). However, it is not possible to interpret these increases as an indication of increase in production sophistication (a shift from labour intensive final assembly to capital- and technology-intensive component production) because parts and components in export records include both domestically 'designed and produced' components as well as those simply 'assembled and/or tested' . The available evidence on global production chains in electronics components suggest that activities undertaken in China still largely (if not totally) confined to simple assembly and testing (See Brown and Linden 2005 and the works cited therein). Further research into the extent to which China's involvement in fragmentation-based specialisation has evolved from mere assembly to local production of intermediate skill- and technology intensive products certainly warranted.

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Table 1: World Trade in Parts and Components, 1992-2003 (%)

	Exports				Imports			
	Country/regional Composition		Share in total manufacturing exports		Country/regional Composition		Share in total manufacturing imports	
Country/Region	1992	2004	1992	2004	1992	2004	1992	2004
APEC	52.9	62.3	25.8	32.5	43.2	57.6	25.9	33.0
East Asia	29.6	43.6	23.3	33.5	18.9	35.3	25.2	39.7
Japan	15.6	11.7	28.9	37.5	3.8	3.9	21.1	28.7
Developing East Asia	14.0	31.9	19.1	32.2	15.1	31.5	26.5	41.7
China	1.0	8.3	4.8	18.8	2.5	9.8	21.6	42.1
Hong Kong SAR	2.1	1.1	21.1	32.9	2.2	5.5	14.9	38.6
Taiwan	3.2	6.2	22.2	46.3	2.0	3.2	32.6	38.8
Korea, RP	1.9	4.9	19.7	35.6	1.4	3.0	27.0	36.3
AFTA	5.9	11.6	31.9	47.8	7.1	10.0	36.2	46.4
Indonesia	0.1	0.3	2.6	14.2	0.5	0.6	20.0	28.1
Philippines	0.5	2.3	34.1	74.8	0.5	1.4	33.0	55.9
Malaysia	2.0	4.3	38.3	58.1	1.6	3.0	42.8	58.1
Singapore	2.6	3.1	43.9	53.2	3.4	3.3	43.6	48.3
Thailand	0.7	1.5	21.5	32.6	1.0	1.6	28.3	40.0
Vietnam	0.0	0.1	1.0	6.0	0.0	0.2	7.7	17.8
Oceania	0.2	0.3	13.3	16.5	1.2	0.9	20.1	18.0
Australia	0.2	0.2	14.7	18.3	1.0	0.8	20.3	18.5
New Zealand	0.0	0.0	9.1	11.7	0.2	0.1	19.1	15.6
NAFTA	22.9	18.3	30.4	30.7	22.6	20.8	26.9	26.3
USA	17.4	13.4	30.7	32.3	13.0	14.0	23.2	24.4
Canada	3.6	2.3	28.5	23.9	6.0	3.7	32.4	27.9
Mexico	1.8	2.5	31.2	30.7	3.6	3.2	37.5	36.8
Other APEC	0.0	0.0	5.6	3.8	0.3	0.2	17.0	15.4
Chile	0.0	0.0	7.2	4.5	0.2	0.1	16.6	15.5
Peru	0.0	0.0	2.2	1.9	0.1	0.1	18.3	15.1
European Union 15	41.1	29.0	18.8	20.9	16.0	13.7	7.7	10.2
Other	6.0	8.7	12.4	17.3	40.8	28.8	47.1	38.9
World	100.0	100.0	21.2	26.3	100.0	100.0	21.7	26.2
US$ billion[1]	403.8	1257.8			386.4	1241.7		

Note:

1. By definition percentage shares in exports and imports for a given year should be identical. The minor differences seem to reflect recording errors and differences in merriment arising from the use of CIF price for reporting imports and FOB price for most reporting exports.

Source: Compiled from UN *Comtrade* database.

Table 2: Direction of Manufacturing Trade: Total Manufacturing

		Exports									Imports								
Exporter		APEC	EA	Japan	DEA	CH	AFTA6	NAFTA	EU	Other	APEC	EA	Japan	DEA	China	AFTA	NAFTA	EU	Other
APEC	1992	69.0	32.6	3.9	28.7	9.8	11.9	36.4	18.0	13.1	80.3	50.0	26.9	23.1	6.5	8.7	30.3	16.8	2.9
	2004	75.7	44.4	5.5	38.9	18.6	12.7	31.3	13.9	10.4	83.4	57.0	17.3	39.7	13.7	13.4	26.4	13.8	2.9
East Asia (EA)	1992	70.3	41.7	3.0	38.7	14.5	15.7	28.6	17.2	12.5	80.5	60.7	30.7	30.0	9.9	11.1	19.8	16.5	2.9
	2004	76.1	56.3	6.2	50.1	25.6	15.5	19.8	13.9	10.0	85.7	71.2	21.0	50.2	15.3	18.4	14.4	12.4	2.0
Japan	1992	66.1	35.5	---	35.5	9.2	14.2	30.7	19.4	14.5	74.8	31.7	---	31.7	4.6	13.2	43.1	21.9	3.3
	2004	74.0	49.8	---	49.8	20.7	15.3	24.3	15.0	11.0	87.1	62.8	---	62.8	23.6	20.5	24.3	12.5	0.4
Developing	1992	75.2	49.1	6.5	42.5	20.7	17.5	26.1	14.6	10.2	81.3	64.7	34.9	29.8	10.7	10.8	16.6	15.8	2.9
East Asia (DEA)	2004	76.9	58.8	8.6	50.2	27.5	15.6	18.0	13.5	9.6	85.5	72.4	24.0	48.4	14.2	18.1	13.1	12.3	2.2
China (CH)	1992	79.3	63.1	3.3	59.9	45.0	9.2	16.2	11.9	8.8	81.5	71.7	28.6	43.1	24.2	6.2	9.8	15.1	3.4
	2004	76.4	57.5	8.2	49.3	33.9	8.7	18.9	14.3	9.3	83.7	76.2	23.0	53.2	16.2	14.7	7.4	13.5	2.8
AFTA6	1992	77.0	47.6	8.4	39.3	7.3	26.8	29.4	15.5	7.5	80.9	63.4	34.3	29.2	3.8	16.7	17.5	16.7	2.4
	2004	80.0	63.8	10.2	53.6	15.8	27.9	16.2	12.9	7.1	87.1	69.5	21.5	48.0	11.4	24.2	17.6	11.8	1.1
EU	1992	18.1	7.9	1.3	6.5	2.2	2.8	10.2	62.5	19.5	26.4	15.3	9.6	5.6	1.3	2.1	11.2	67.3	6.3
	2004	21.5	10.0	1.3	8.6	4.2	2.8	11.5	51.6	26.9	31.8	21.1	6.5	14.6	6.3	4.2	10.6	58.9	9.3
NAFTA	1992	66.9	18.5	5.2	13.3	2.6	5.9	48.4	19.1	14.0	80.1	39.7	23.3	16.4	3.1	6.5	40.5	17.0	2.9
	2004	75.0	20.3	4.1	16.2	4.4	6.9	54.7	13.9	11.1	80.5	38.9	12.5	26.4	11.5	7.0	41.6	15.5	4.0
World	1992	44.4	20.3	2.6	17.7	5.8	7.4	24.1	38.7	16.9	52.9	31.3	17.5	13.9	3.7	5.1	21.5	42.2	5.0
	2004	51.4	28.2	3.5	24.7	11.4	8.2	23.2	30.7	17.9	59.8	40.0	12.0	28.0	10.3	8.7	19.8	32.0	8.2

Note: --- Not applicable.

Source**:** Complied from *UN Comtrade* Database.

Table 3: Direction of Manufacturing Trade: Parts and Components

		Exports									Imports								
		APEC	EA	Japan	DEA	GCH	AFTA	NAFTA	EU	Other	APEC	EA	Japan	DEA	CH	AFTA	NAFTA	EU	Other
APEC	1992	74.5	36.1	4.9	31.1	8.3	14.3	38.4	16.9	8.6	84.4	51.2	25.8	25.4	5.6	11.1	33.2	13.3	2.3
	2004	81.2	54.4	6.1	48.3	22.9	16.1	26.9	12.1	6.7	86.3	61.5	17.5	44.0	11.2	18.0	24.8	11.1	2.6
East Asia (EA)	1992	79.6	48.0	4.1	43.9	12.9	19.8	31.6	15.2	5.1	86.1	62.7	28.8	33.9	9.2	15.0	23.3	12.3	1.6
	2004	83.9	67.4	6.8	60.6	31.1	18.8	16.5	11.2	4.8	88.9	73.6	19.7	53.9	13.1	22.6	15.3	9.5	1.6
Japan	1992	77.8	40.3	---	40.3	6.9	17.2	37.5	17.0	5.2	83.0	33.4	---	33.4	4.0	13.8	49.6	14.7	2.3
	2004	83.3	58.5	---	58.5	24.3	19.3	24.8	12.9	3.8	90.1	66.4	---	66.4	19.0	22.1	23.6	9.5	0.4
Developing	1992	81.3	55.1	7.8	47.3	18.5	22.2	26.2	13.6	5.0	86.5	67.0	33.0	34.0	9.9	15.1	19.5	12.0	1.5
East Asia (DEA)	2004	84.1	70.2	9.0	61.2	33.3	18.6	13.9	10.7	5.2	88.8	74.5	22.1	52.3	12.3	22.7	14.3	9.5	1.8
China	1992	86.4	74.2	4.2	70.0	45.4	13.3	12.1	7.9	5.7	85.0	72.0	25.1	46.8	22.4	9.5	13.1	13.2	1.7
	2004	86.0	74.4	7.8	66.6	47.3	10.4	11.6	8.8	5.2	88.4	81.0	22.5	58.6	13.6	20.0	7.3	9.3	2.3
AFTA+6	1992	81.5	53.1	9.1	44.0	7.2	30.1	28.4	13.7	4.8	85.9	65.5	31.1	34.3	4.0	21.5	20.4	12.5	1.6
	2004	82.8	68.2	9.5	58.7	17.9	29.1	14.5	12.5	4.7	88.5	68.6	20.1	48.6	10.2	26.6	19.9	10.3	1.1
EU	1992	17.3	7.5	1.3	6.2	2.0	2.9	9.8	66.1	16.7	25.5	13.3	7.5	5.8	0.7	2.5	12.2	69.0	5.5
	2004	22.4	11.5	1.5	10.1	4.4	3.9	10.9	53.0	24.6	31.6	19.8	5.6	14.2	4.4	5.8	11.8	60.0	7.8
NAFTA	1992	68.2	21.5	6.0	15.5	2.7	7.5	46.6	19.0	12.9	82.7	39.5	22.8	16.7	1.9	7.3	43.2	14.3	3.1
	2004	75.5	26.4	4.5	21.9	5.3	10.2	49.1	13.9	10.6	81.7	39.8	13.5	26.3	8.0	9.7	41.9	14.0	4.3
World	1992	48.8	22.9	3.3	19.6	5.1	9.1	25.9	38.5	12.7	55.1	31.0	15.7	15.3	3.0	6.5	24.1	40.7	4.2
	2004	58.9	37.2	4.1	33.1	14.9	11.4	21.7	27.8	13.3	64.4	44.2	12.5	31.7	8.5	12.5	20.2	28.8	6.8

Note: --- Not applicable.

Source**:** Complied from *UN Comtrade* Database.

Table 4: Share of Parts and Components in Bilateral Trade Flows (%)

		Exports									Imports								
		APEC	*EA*	*Japan*	*DEA*	*GCH*	*AFTA*	*NAFTA*	*EU*	*Other*	APEC	*EA*	*Japan*	*DEA*	*GCH*	*AFTA*	*NAFTA*	*EU*	*Other*
APEC	1992	49.1	52.2	39.8	55.9	34.9	79.5	47.0	38.6	31.5	52.1	48.2	58.1	39.6	19.9	67.9	57.7	35.4	29.7
	2004	57.6	80.5	52.1	87.4	81.3	103.4	39.4	44.1	32.9	63.0	63.5	74.6	59.5	36.3	82.9	62.1	41.5	37.9
East Asia (EA)	1992	51.4	53.2	39.2	55.4	34.1	83.9	49.3	35.1	18.8	54.6	52.5	65.2	44.4	24.5	83.1	60.3	34.6	17.8
	2004	68.2	83.9	55.8	89.4	84.5	87.3	40.5	45.4	24.2	70.7	70.1	80.2	67.0	42.2	81.2	73.3	46.4	44.0
Japan	1992	44.8	46.6	---	46.6	28.8	57.8	43.4	30.9	30.1	65.5	47.7	---	47.7	17.3	74.2	82.2	27.5	36.6
	2004	57.8	70.1	---	70.1	67.3	80.7	42.4	42.6	34.4	63.8	62.4	---	62.4	36.7	89.4	67.2	30.2	70.6
Developing	1992	58.4	63.1	51.0	65.9	41.9	65.2	50.5	35.9	22.3	52.4	50.5	59.2	43.7	24.6	85.7	59.6	39.3	17.7
East Asia (DEA)	2004	72.3	89.6	59.1	98.0	91.0	75.3	37.7	46.0	27.4	72.0	70.8	73.2	69.6	45.4	87.3	77.4	51.1	34.8
China	1992	43.7	47.2	51.7	46.9	40.5	58.1	30.1	26.7	25.9	42.6	41.0	35.9	44.3	37.8	62.6	54.3	35.7	20.7
	2004	59.8	68.7	50.8	71.7	74.2	63.6	32.6	32.8	29.5	67.2	67.6	62.1	70.0	53.2	86.7	62.6	44.0	51.1
AFTA+6	1992	69.3	75.4	60.0	80.3	58.7	89.1	61.1	40.8	38.5	58.6	59.2	55.5	63.6	41.9	75.3	56.9	36.7	30.9
	2004	82.1	84.6	70.4	86.2	71.2	92.3	53.0	66.1	58.0	76.8	73.9	71.7	75.1	60.1	84.4	86.8	58.2	63.2
EU	1992	47.0	50.5	40.1	57.3	38.3	71.1	45.8	41.2	38.4	50.5	44.5	53.6	33.8	12.4	54.0	56.8	35.8	32.7
	2004	45.2	68.8	45.2	79.1	60.4	98.2	38.9	42.3	41.0	53.9	50.5	64.5	44.5	26.9	76.5	57.2	37.3	36.2
NAFTA	1992	61.4	60.2	35.0	72.5	66.6	83.2	62.2	53.7	56.7	53.1	44.5	54.3	33.2	12.6	58.6	64.9	47.3	34.8
	2004	61.4	82.0	45.7	94.4	87.6	96.1	49.2	53.7	55.2	55.2	53.3	60.6	50.4	31.8	86.0	58.3	46.9	38.5
World	1992	56.0	56.4	41.9	60.5	38.8	85.0	55.7	39.9	40.9	54.8	49.8	58.5	41.7	21.0	70.5	61.8	40.9	31.8
	2004	64.0	86.8	55.2	65.2	86.5	78.2	45.6	41.6	41.3	62.0	64.4	73.2	60.8	36.7	99.6	58.0	41.7	43.1

Note: --- Not applicable.

Source**:** Complied from *UN Comtrade* Database.

Table 5: Direction of China's Manufacturing Trade 1992, 1996 and 2004 (%)

	Exports			Imports		
	1992	1996	2004	1992	1996	2004
(a) Total manufacturing						
Japan	9.2	18.2	12.7	20.5	28.7	26.6
Hong Kong	53.1	23.7	18.5	27.9	8.4	4.3
Taiwan	0.6	1.6	2	9.9	17	17.3
Korea, Rep of	1.4	3.5	3.7	3.1	12.1	14.6
AFTA	3.2	5.7	6.2	2.6	5.7	13.7
Indonesia	0.4	0.7	0.8	1.1	0.7	1.0
Malaysia	0.5	0.9	1.4	0.4	1.3	3.9
Philippines	0.2	0.5	0.6	0.1	0.1	2.1
Singapore	1.4	2.4	2.0	0.6	2.0	3.1
Thailand	0.6	0.7	0.8	0.2	0.9	2.3
Vietnam	0.1	0.5	0.5	…	…	0.1
Total East Asia	67.6	52.7	43.0	64.3	71.8	76.2
Rest of the world						
Total	100	100	100	100	100	100
(b) Parts and components						
Japan	8.6	18.8	11.1	24.2	35.0	25.3
Hong Kong	61.0	22.9	27	5.3	8.6	4.2
Taiwan	1.7	3.7	3.6	5.3	10.4	16.9
Korea, Rep. Of	1.5	5.4	4.3	1.9	7.6	12.2
AFTA	4.8	10.4	11.2	0.9	7.5	19.3
Indonesia	0.7	1.4	0.8	0.0	0.1	0.5
Malaysia	1.0	2.4	3.8	0.1	1.7	7.9
Philippines	0.3	0.7	1.1	0.0	0.3	4.7
Singapore	2.4	5.2	3.9	0.7	4.2	3.5
Thailand	0.5	0.8	1.6	0.1	1.3	2.7
Vietnam	0.1	0.3	0.3	…	…	…
Total East Asia	77.6	61.1	57.2	30.3	69.1	77.7
Other countries						
Total	100	100	100	100	100	100

Notes: --- Not applicable.… Zero or negligible.

Source**:** Complied from *UN Comtrade* Database.

Table 6: Intra-Regional Trade Shares: Total Manufacturing, Parts and Components, and Final Trade (%), 1992 and 2004

A: Total Manufacturing		APEC	East Asia[1]	Developing East Asia[2]	AFTA	NAFTA[3]	EU[4]
Exports (X)	1992	69.0	41.7	42.5	26.8	48.4	62.5
	2004	75.7	56.3	50.2	27.9	54.7	51.6
Imports (M)	1992	80.3	60.7	29.8	16.7	45.5	67.3
	2004	83.4	71.2	48.4	24.2	41.6	58.9
Trade (X+M)	1992	74.2	49.4	35.3	20.6	44.3	64.8
	2004	79.4	62.8	49.4	26.1	47.5	52.7
B: Parts and Components							
Exports(X)	1992	74.5	48.0	47.3	30.1	46.6	66.1
	2004	81.2	67.4	61.2	29.1	49.1	53.0
Imports (M)	1992	84.4	62.7	34.0	21.5	43.2	69.8
	2004	86.3	73.7	52.3	26.6	41.9	60.0
Trade (X+M)	1992	79.0	54.4	39.8	25.1	44.5	67.5
	2004	83.7	70.3	56.8	27.9	45.4	58.2
C: Final goods							
Exports(X)	1992	63.8	36.7	37.8	22.2	50.6	59.6
	2004	68.2	40.4	32.3	24.1	61.8	53.6
Imports (M)	1992	76.6	58.7	25.8	11.6	38.0	65.8
	2004	79.4	56.6	40.4	17.6	41.4	56.4
Trade (X+M)	1992	69.7	45.2	30.9	15.3	43.5	62.6
	2004	73.5	45.2	35.9	20.8	49.7	54.4

Notes:
1. Including Japan 2. Including AFTA

Source: Source**:** Complied from *UN Comtrade* Database.

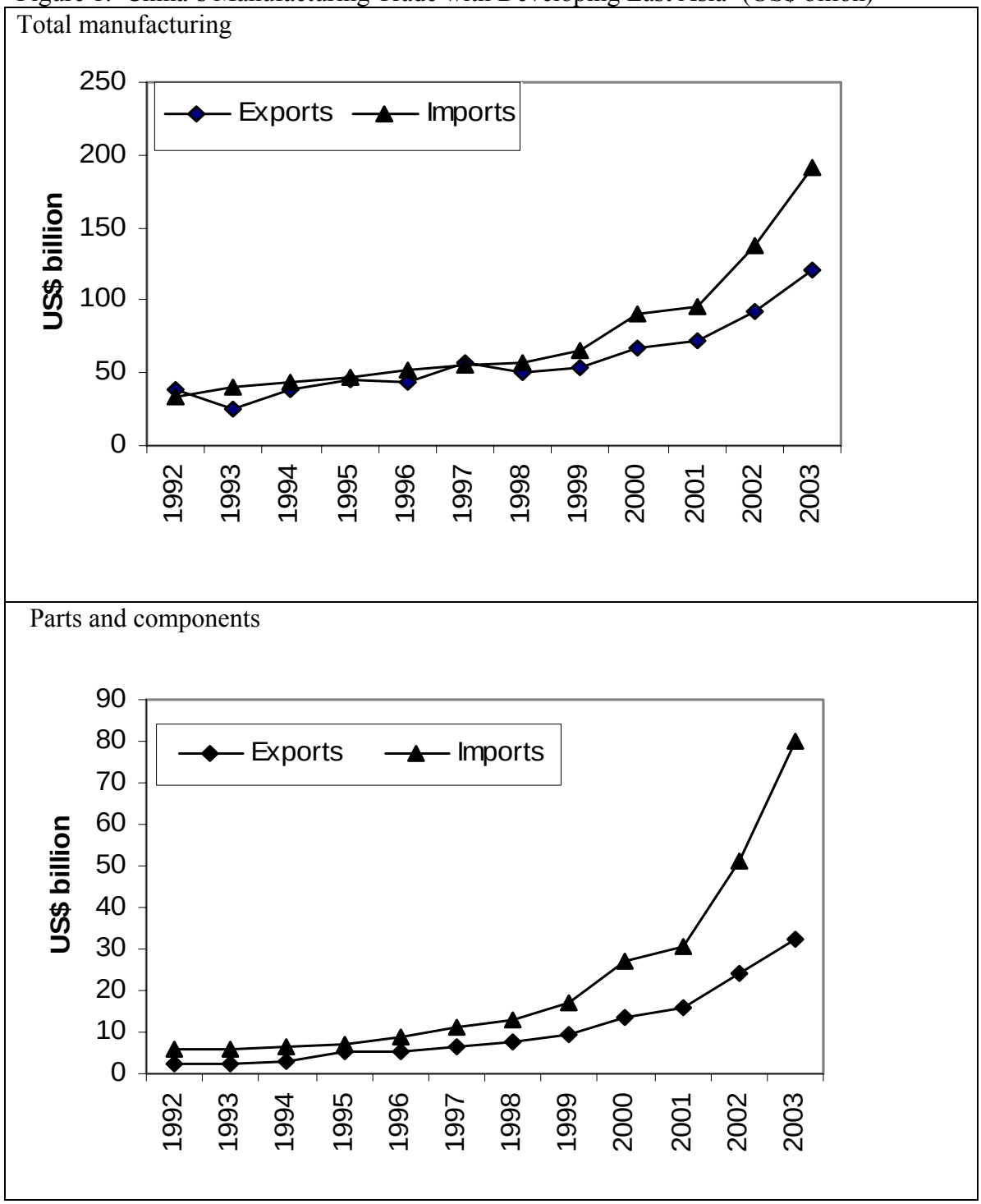
Table 7: The structure of manufacturing exports from China

SITC code	Commodity category	1994/5[2]	1999/0[2]	2000/4[2]
	(a) Export composition			
5	Chemicals and related products	4.1	3.5	3.5
6	Manufactured goods classified by material[2]	15.6	13.1	12.8
7	Machinery & transport equipment	24.7	35.0	46.3
71	Power generating machinery	1.1	1.3	1.0
72	Special industrial machinery	0.5	0.5	0.8
73	Metalworking machinery	0.2	0.2	0.2
74	General industrial machinery	1.7	2.1	2.9
75	Office machines	4.1	9.3	15.5
76	Telecomm. And sound recording equipment	9.3	9.5	12.7
77	Electrical machinery and parts	6.8	10.7	11.7
78	Road vehicles	0.9	1.2	1.3
79	Other transport equipment	0.2	0.2	0.2
8	Miscellaneous manufactured goods	55.6	48.4	37.4
84	Clothing and accessories	20.2	15.4	11.5
85	Footwear	8.6	6.2	4.1
894	Toys, games etc.	9.5	9.4	6.7
	Total	100	100	100
	(b) Share of parts and components in machinery & transport equipment exports			
71	Power generating machinery	15.0	27.9	32.2
72	Special industrial machinery	23.4	27.5	26.9
73	Metalworking machinery	19.7	29.2	38.1
74	General industrial machinery	27.5	35.5	35.8
75	Office machines	44.3	42.6	35.4
76	Telecomm. And sound recording equipment	17.4	23.9	22.5
77	Electrical machinery and parts	30.4	38.7	47.0
78	Road vehicles	34.6	38.3	51.6
79	Other transport equipment	16.4	18.4	19.4
7	Total	26.8	34.7	35.0
	(c) Share of parts and components in machinery & transport equipment imports			
71	Power generating machinery	58.7	69.7	68.1
72	Special industrial machinery	16.9	22.2	20.5
73	Metalworking machinery	19.2	23.4	23.0
74	General industrial machinery	26.1	38.9	40.0
75	Office machines	64.0	63.6	65.3
76	Telecomm. And sound recording equipment	54.9	72.4	76.5
77	Electrical machinery and parts	68.6	80.7	84.6
78	Road vehicles	32.1	55.1	53.1
79	Other transport equipment	8.0	13.4	13.3
7	Total	40.3	59.9	62.5
	(d) Trade balance in machinery & transport equipment			
	Total trade	-9.7	35.8	35.6
	Trade in parts and components	-8.3	-10.7	-15.1
	Trade in final products	2.4	60.6	62.9

Note: 1 SITC 6 net of SITC 68 (non-ferrous metals)
2 Tow-year averages.

Source: Source**:** Complied from *UN Comtrade* Database.

Figure 1: China's Manufacturing Trade with Developing East Asia[1] (US$ billon)



Note: 1 East Asia excluding Japan
Source: Based ob data compiled from UN *Comtrade* database.