

Decomposing Trade Flows: the Case of China in Global Markets

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Introduction

China has now emerged as one of world's largest trading nations for both agricultural and non-agricultural commodities. However, China's trade is unique in many respects. The country is noted for its outstanding activities in "processing trade" that involves importing inputs, which are assembled in China and then re-exported. This activity plays an important role in China's changing trade composition and patterns. China is one of the world's largest importer of raw materials and intermediate inputs. The country's processing trade impacts its trading partners, both exporting and importing countries. China might be viewed as a competing threat with other labor-abundant developing countries that trade with developed country markets. In most recent years, however, the country's direct trade with developing countries, for example with India, Southeast Asia, and African countries, has intensified dramatically (Somwaru et al., 2008). In just 5 years, China's exports to India increased from \$2 billion to over \$20 billion in 2007.

China competes world-wide not only in labor cost and availability (quantity) but also in having the advantage of its proximity to capital-rich East Asian economies and rapidly growing developing Asia-Pacific region's markets. Geographic proximity in theory often explains why neighboring countries trade disproportionately, as Krugman (1991) suggests that neighborhood trade is so strong as to create natural trading blocs. But such explanations provide little insight into the sources of rapid growth in China's trade. To provide a better understanding trade growth should be viewed in a broad context by analyzing the complete bilateral make-up of exported and imported goods with China's

main trading partners, both developed and developing countries (see Somwaru et al., 2007).

Much recent theory assumes (Grossman and E. Helpman 1989, and Hausmann, Hwang and Rodrik, 2005) that imitation by developing countries of goods invented in developed countries is always equally possible, *ceteris paribus*. However, the speed at which countries can transform their productive structure and upgrade their exports depends on having already acquired knowledge of products and manufacturing technologies from neighboring partners. China has entered a growth phase in its industrial development for producing and exporting technology goods on the so-called intensive margin-type products or products with similar exporting varieties. Many papers though highlight a strong positive correlation between the number of export varieties a country produces and its living standard. Hummels and Klenow (2005) find that larger and richer countries export more varieties of goods. Schott (2008) and Rodrik (2008) argue that China's exports are in high-quality sectors similar to highly-developed country. Amiti and Freund (2008) however find that China's growth of export varieties over the 1992-2005 has been modest. Our analysis of China's export growth patterns between 1978 and 2005 based on statistical decomposition tests indicates that most of China's export growth has been in existing varieties or an intensive margin trade.

The rest of the paper is organized as follows. In the next section, we present a snap-shot of China's economy and trade, followed by the method to decompose trade flows margin. The results supporting our analysis indicate export varieties on intensive trade margin.

Structural Shifts in China's Economy and Trade—Overview from an Aggregate Perspective

China has the most persistent economic growth among developing countries. The annual growth rate in the country's real gross domestic product (GDP) averaged around 10 percent per annum from 1990 to 2005. The country's per capita GDP¹ was \$1,099 in 1990 and \$4,076 in 2005. The importance of agricultural sector's value added continued to decrease over the past decades (figure 1), but the importance of service sector increases while the manufacturing sector shares almost remained the same. The agricultural share of GDP decreases from 28.2% to 11.3% over the 1978 to 2005 period while the share of the service sector increases from 23.9% in 1978 to 40.1% in 2005.

As expected the share of the workforce employed in agriculture decreases while employment share in services increase (figure 2). Many economists maintain the hypothesis that a fundamental feature of growth and development is the decline in the share of the workforce employed in agriculture. China has experienced a similar trend, starting from 1987 to present.

In terms of the broader economy, agricultural exports are playing a smaller role. Since the middle 1980's, the share of agriculture in total merchandise exports has declined slowly, from 15.2% in 1984 to 2.7% in 2007 (figure 3). Manufacturing exports continue to grow and currently account for 48% of total merchandise exports in 1984 to an astonishing

93% in 2007. Manufacturing also accounts for the largest and growing share of total imports, while agriculture's share declined to reach about 4% in recent years (figure 4).

One of the distinguishing features of China's trade growth is the persistent diversification of partners and products over time (table 1). The ongoing global relocation of labor-intensive manufacturing has accommodated China's trade growth while the transition to a more market-based economy has helped diversify its product mix. This however has not necessarily meant that China's trade growth has limited developing country export opportunities from direct competition in similar products. In fact, developing country import growth to China has generally outpaced developed country growth (table 1). In the most recent decade, China's import growth is greater than its export growth, an acceleration of China's trade with developing countries that has often been overlooked.

While the growth rates of total trade flows with India were unstable in the early 1980s in the last 15 years China's trade growth with India is steadily increasing (table 1). This growth coincides with India's liberalizing in industrial sectors and India's income and consumer purchasing power growing at a more sustained pace.

Numerous studies have analyzed the importance of trade in intermediate goods and the influence of geographic proximity on production on countries sharing between borders (Naughton, 1997, Gupta, 1997, Ng and Yeats, 1999). China's trade performance

¹Purchasing Power Parity adjusted in constant 2000 international dollars.

indicates that geographic proximity is a factor enhancing the value-added processing chain observed in the country. China's rise in international processing activities reflects the strategies of Asian firms to relocate their industries to China to take advantage of China's comparative advantage in production processing due mostly to low labor cost. Moreover, China's trade policy has favored assembly and processing operations, through tariff exemption on intermediate goods, and set off expansion of China's trade in intermediate goods in Foreign-invested enterprises (FIEs) and economic and technological development zones (ETDZs). These selective trade policies have accelerated China's international processing activities, the engine of rapid diversification of its manufacturing exports, well beyond geographic proximity regions.

Data

China's trade data at 4-digit Standardized International Trade Classification (SITC) level are used for trade pattern analyses. The data source is the United Nations Commodity Trade Statistics Database (UNCOMTRADE) maintained by the Statistic Division of United Nations. China did not share public trade statistics with international organizations until 1984 (trade data in SITC from 1984 to 1991 and in HS from 1992 to present) and even then the validity of some reported trade flows remained questionable. Thus we draw upon data providing China reporting partners compiled by the UN starting from 1978.

National income data from the World Development Indicator (WDI) (2010) are also used to obtain the overall picture of China's growth, trade, and economy. Although our trade

data are in nominal terms, our analyses focus mainly on shares and growth rates of these values where real and nominal price make little difference.

The time series data of agricultural trade flows from and to China are analyzed to better understand the changes and trends in China's trade growth along with policy decisions.

The growth rates of aggregate trade by the United Nations Broad Economic Classification (BEC) system as well as export and import flows are calculated and analyzed. Special focus is given to the bilateral agricultural trade between China and major trading partners. Growth in trade is also decomposed into intensive and extensive margin.

We organize the trade data using the BEC system into six broad product categories: (1) capital goods, (2) consumer durable goods, (3) consumer non-durable goods, (4) intermediate goods, which includes broad categories of processed goods, parts and accessories mainly for industrial use, technological independent but produced in order to be assembled into final goods, primary (5) energy goods, and, finally, (6) primary goods, such as raw mineral and agricultural commodities.

Intermediate products while amounting to almost two-thirds of China's total imports display China's comparative advantage in production 'by stage.' China's processing trade pattern or in terms of growth rates is characterized by strong import growth of intermediate goods while in the later years China's import growth of primary goods, such as raw grains, soybeans, iron ore, and other minerals dominates the series. These findings

tend to weaken the Krugman-Bhagwati debate, that is whether neighborhood determines the direction of trade or geographic proximity is irrelevant.

In the late 1970s and 1980s, China's export growth surged from consumer goods but in the 1990s China's export growth of capital goods took the lead indicating that China trade growth was broad-based and not fueled by a few products (see Somwaru et al., 2008).

Figure 5 depicting the export shares of selected commodities clearly indicates that China has entered a growth phase in its industrial development for producing broad-based exporting goods. China's exports of apparel, textiles, and footwear have heavily shifted towards electrical machinery and other "processing" trade.

Methodology for Decomposing Trade Growth

This section provides a quick overview of the method adopted. To distinguish between the intensive and extensive margin of China's agricultural exports, we employ the method originated by Feenstra (1995, 1996). We employ this method to decompose export flows into intensive and extensive margin growth for China. The original idea of Feenstra's work is to include new product varieties into an import price index. Denoting I as the set of varieties available in both periods, $I \subseteq (I_t \cap I_{t-1})$, the net variety growth index is defined as the fraction of expenditure in period t-1 on the goods $i \in I$ relative to the entire set $i \in I_{t-1}$ as a ratio of the fraction of expenditure in period t on the goods $i \in I$ relative to the entire set $i \in I_t$, minus one. Let V_{it} be the value of trade at time t in product, $i(V_{it} = p_{it}q_{it})$, then the Feenstra index is defined as follows:

$$(1) \quad \frac{\sum_{i \in I} V_{t-1i} / \sum_{i \in I_{t-1}} V_{t-1i}}{\sum_{i \in I} V_{ti} / \sum_{i \in I} V_{ti}} - 1.$$

Borrowing Feenstra's idea, our analysis centers on whether the products of China's exports fall into existing or new varieties. Using this concept, the volume of trade, V_{it} , for the i^{th} product at time t is decomposed into the volume of existing varieties $V_{it} \cdot D^e$, disappearing varieties $V_{it} \cdot D^d$, and new varieties, $V_{it} \cdot D^n$, where D^e , D^d , and D^n are dummy variables indicating whether the product exist in both period t and 0 , only in period 0 , or only in period t , respectively. Thus, $D^e = 1$ indicates an existing variety, $D^d = 1$ a disappearing variety, and $D^n = 1$ a new variety. The following decomposition expression is then used to identify the presence of new or existing varieties:

$$(2) \quad \frac{\sum_{i=1}^I V_{it} - \sum_{i=1}^I V_{i0}}{\sum_{i=1}^I V_{i0}} = \frac{(\sum_{i=1}^I V_{it} D^e - \sum_{i=1}^I V_{i0} D^e) - \sum_{i=1}^I V_{i0} D^d + \sum_{i=1}^I V_{it} D^n}{\sum_{i=1}^I V_{i0}}$$

In other words, the equation (2) above separates the total growth in exports into growth in existing and disappearing varieties, intensive margin, and growth in new varieties, extensive margin. There is a direct relationship between the Feenstra index of net variety growth and the decomposition in equation (2). The net variety growth index by Feenstra combines new trade and disappearing trade into one.

Results

Applying equation 2 we obtain the intensive and extensive margins along with Feenstra's

index. The decomposing formulas used to analyze China's total exports confirm that the country's exports follow the intensive margin. Using China's export data from 1978 to 2005 and 625 product varieties of exports, we find only 32.1 percent in the 1978-1989 period are existing product varieties while in the 1990 to 2005 period exports in existing product varieties account for 82.7 percent (table 2). In other words, China's exports in the 2000-2005 period intensive margins account for 91.5 percent. The total export growth from 1978 to 2006 is intensive margin growth and only a 17 percent of that export growth was from new product varieties (extensive margin).

Following Kreuger (1999) method, we examine whether these indices (equations 1 and 2) are statistically different. For this reason, we conducted paired t-tests on the Feenstra index and intensive margin as well as Feenstra index and extensive margin for the 1978-2005 years. The Feenstra net variety index is statistically significant at the 1 percent level (using Kalmogorov-Smirnov two-sample test) from the intensive margin and the extensive margin indices indicating that the indices are statistically different.

China's adoption of open foreign direct investment strategies that attracted multinational enterprises has expanded its trade flows in existing goods to an extensive margin growth pattern through growth in the number of trade varieties in the late 1970s. China's spur of export growth in the most recent years however lies in value added goods along the intensive margin. China's rise in international processing activities reflects the strategies of Asian firms to relocate their industries to China to take advantage of China's comparative advantage. Moreover, China's trade policy has favored assembly and

processing operations, through tariff exemption. This selective trade policy has accelerated China's international processing activities with China's high export growth on existing products. China's trade growth with developing countries has taken the lead as the country gains in intensive margins goods trade. The increased supply of existing varieties China's exports in the recent years is the engine for its trade with emerging and developing countries.

Conclusions

Although much has been written about China benefiting from embracing globalization, a better understanding requires a comprehensive profile of China's trade growth using bilateral time-series data. Our method allows us to perform such analysis indicating that China's rapid export growth is largely driven by expanding trade in existing goods, or so-called intensive margin. We find that other developing countries not only are playing a complementary role in China's trade growth their trade with China has intensified at a faster pace. We categorize for the end use of traded goods ranging from primary, intermediate, and finished goods because China's policies impact all segments of China's trade flows. China's trade growth patterns with major high income countries clearly indicate that the adjacency-neighborhood partners alone is unlikely to explain its unprecedented growth in exports and imports.

China's outstanding performance in trade growth can be traced back to the late 1970s with changes in its policies and increased involvement in the international segmentation of production processes through FIEs and ETDZs. China's strong specialization in the

downstream segments of production or processing can be associated with a selective trade policy that granted preferential tariff treatment to assembling and processing activities as well as FDI in those activities. The technological content of intermediate goods has been a major channel for China's import growth of high technology goods which enabled China to compete as a formidable supplier in global manufacturing. While in the late 1970s and 1980s China's export and import growth in all goods with major high income industrialized countries is outstanding, in most recent years China's trade growth rates are moderate. But, China still maintains a competitive edge compared with other *middle income developing* countries, like India and South America.

China's great flexibility via foreign direct investment and "joint ventures" spurred by accumulated assets has provided the foundation for China's to redeploy its capabilities from sector to sector and consequently the expansion of the existing varieties (the intensive margin). We find that the structure of China's economy changed dramatically, with export shares in manufacturing and service increasing and a decline in agriculture. Export growth is accompanied by increasing specialization and is mainly accounted for by high export growth of existing products (the intensive margin) rather than in new varieties (the extensive margin).

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Table 1--China's estimate annual growth* for total merchandise trade by trading partner**

Item	1980s	1990s	2000s
Total imports	17.36	13.39	22.08
Total exports	16.67	16.75	19.84
Imports from Developed countries*	14.57	13.56	17.19
Exports to Developed countries	14.30	19.73	21.55
Imports from Developing countries	20.27	13.31	25.58
Exports to Developing countries	18.05	15.03	18.50
Imports from India	11.34	33.61	37.79
Exports to India	47.23	23.88	36.10
Imports from South America	7.86	13.44	32.91
Exports to South America	7.87	28.16	28.90
Asia			
Imports from South and Southeast	5.76	24.42	28.64
Exports to South and Southeast Asia	14.31	18.94	22.66
Imports from Africa	3.03	25.67	37.15
Exports to Africa	0.94	20.07	25.95
Imports from Transitional Economies	43.32	1.51	22.17
Exports to Transitional Economies	34.70	6.28	42.35

*Note: Growth rates estimated using TCD method annualized by time period (Somwaru et al., 2008).

*High Income Industrialized countries are: the U.S, EU, Japan, and High Income South East Asian countries including Australia and New Zealand while the remaining countries are labeled as "Rest of the World" for simplicity reasons.

Table 2—Variety growth in China’s exports, 1976-2005

	Type of merchandise	Partner	Intensive	Extensive	Net variety growth (Feenstra index)	Total export growth %
1978-1989	All	World	32.14*	67.86*	17.18*	231.86
1990-1999	All	World	76.33*	23.67*	13.07*	318.81
2000-2005	All	World	88.98*	11.02*	25.84*	335.38
1978-2005	All	World	82.57*	17.43*	21.42*	5951.11

* Paired t-test, statistically significant at 1 percent

Fig.1 China's Sectoral Value Added Shares in GDP, 1978-2005

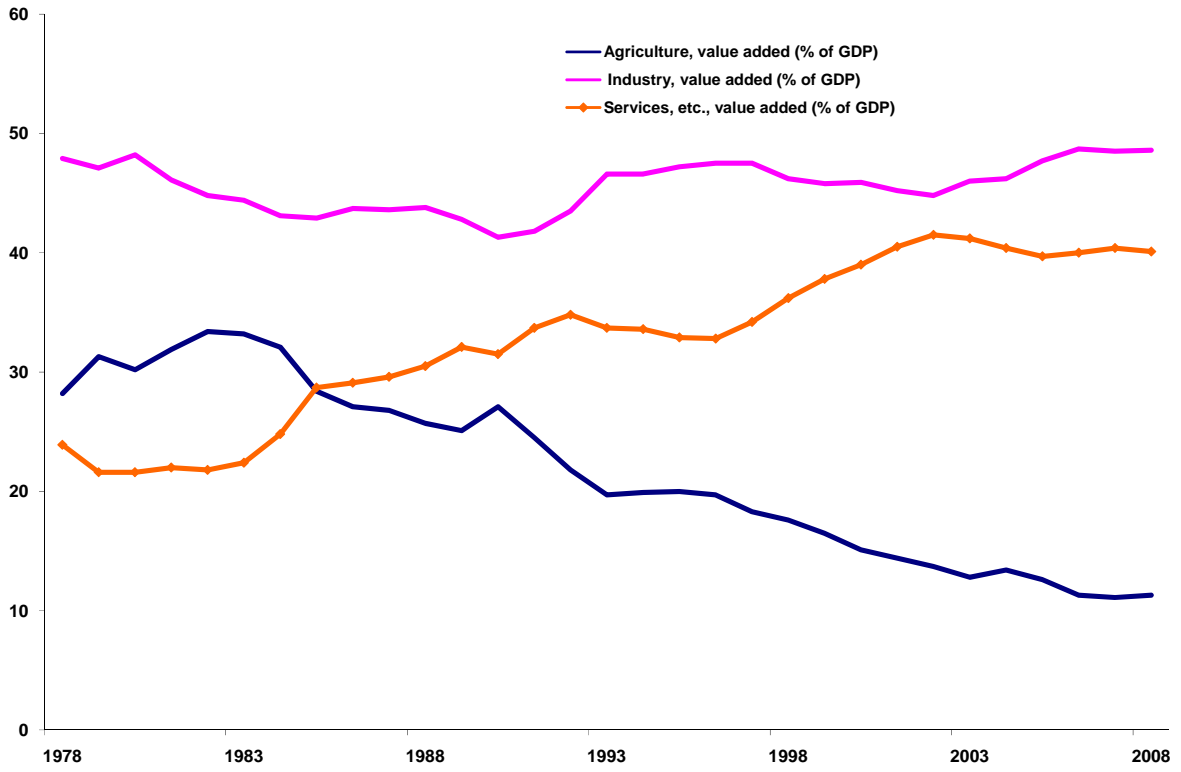


Fig. 2 China's sectoral employment shares, 1987-2002

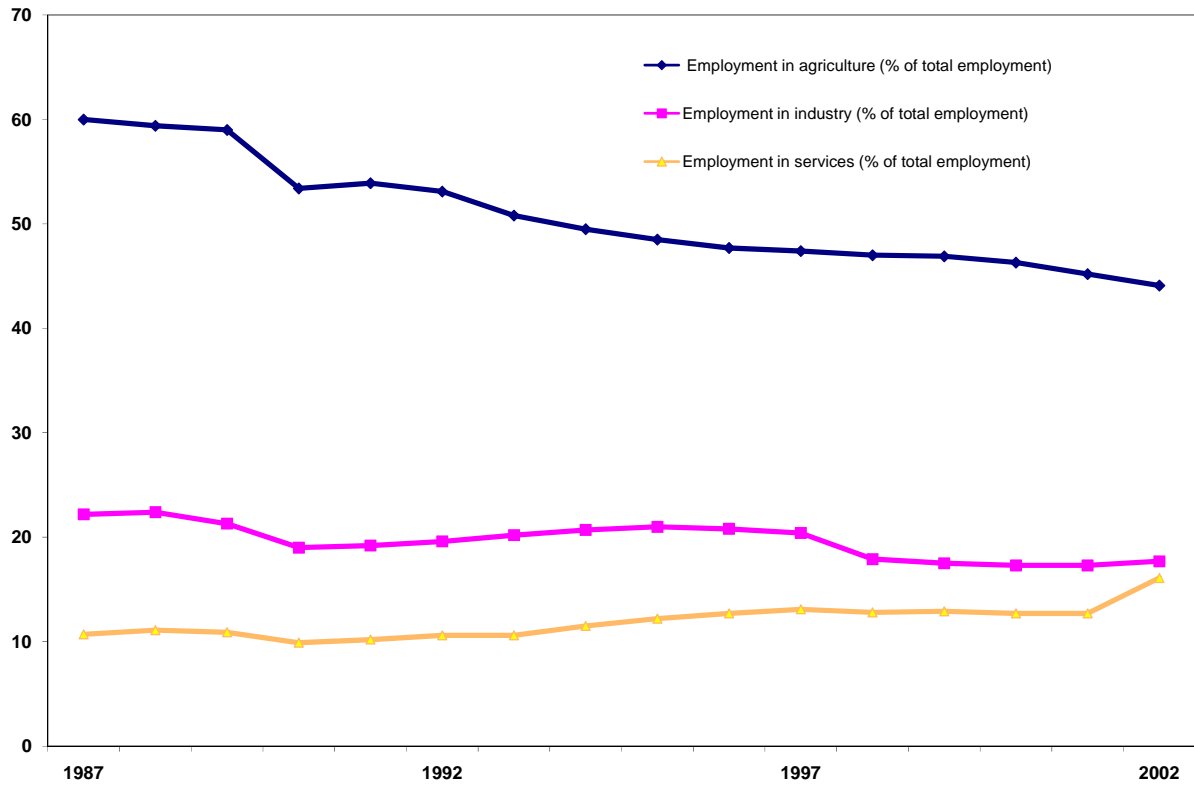


Fig. 3 China's shares of sectoral exports in total merchandise exports, 1985-2007

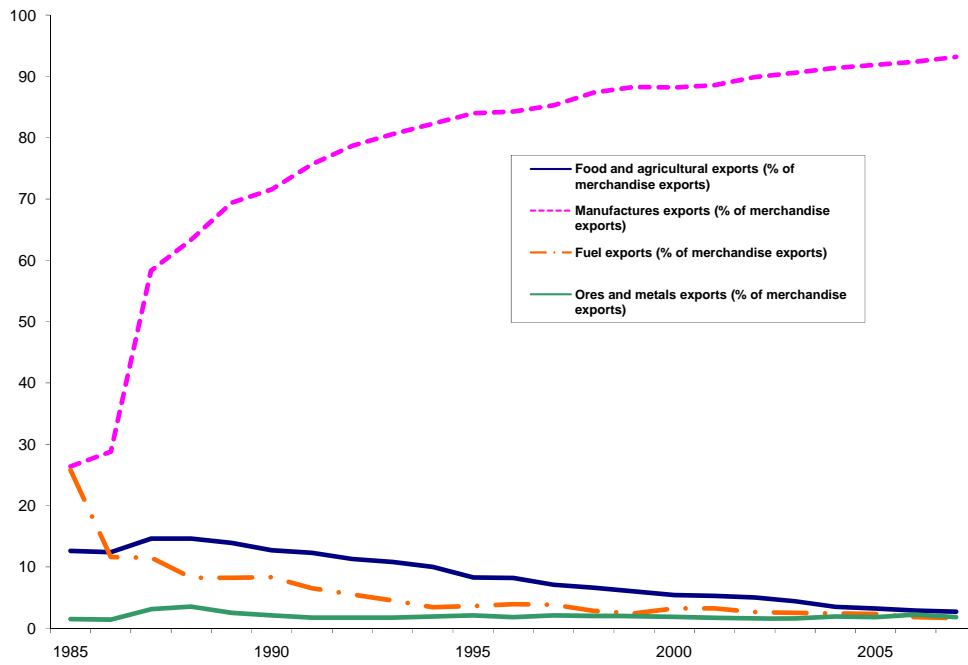


Fig. 4 China's shares of sectoral imports in total merchandise imports, 1985-2007

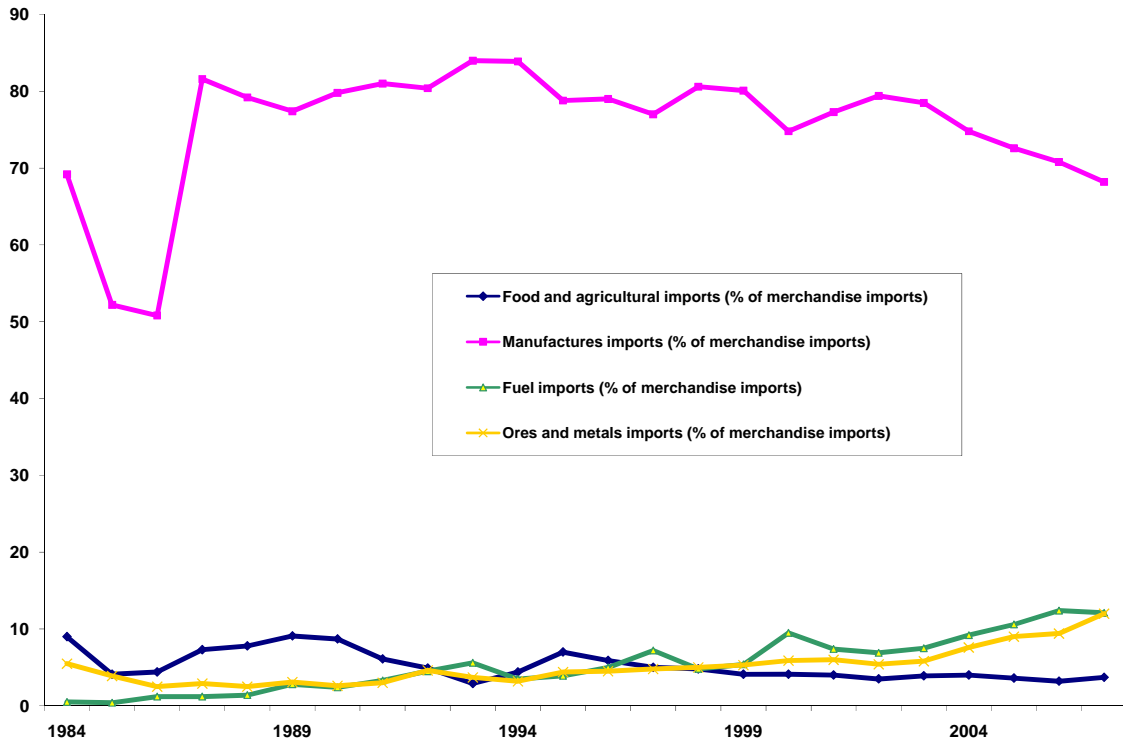


Fig. 5-- China's export shares of selected merchandise, 1978-2005

