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Vertical specialization
in Chinese trade



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Judith Dean*, K.C. Fung** and Zhi Wang***

Vertical specialization in Chinese trade

Abstract

In this decade, China's foreign trade has increased rapidly and the share of high-technology goods in China's exports has become outstanding. These developments are partly related to processing trade that reflects the global production fragmentation. This paper discusses the role of processing trade in China by using a concept of vertical specialization (VS). The paper explains approaches to estimate vertical specialization and evaluates the findings of recent research in this field. It seems evident that processing trade has played a major role behind the fast growth of Chinese exports and the increase of high-tech goods in its exports. Moreover, recent research seems to imply that China's and much of Asia's exports are still heavily dependent on American and European consumers and, consequently, exports are not de-coupled from the final demands in the United States or Europe.

Key words: China, vertical specialization, foreign trade, processing imports

*US International Trade Commission, ** UC Santa Cruz and US International Trade Commission,
** US International Trade Commission

Introduction

In recent years, China's trade has grown exponentially, raising many interesting questions. Two particular questions are: what has caused this rapid trade growth and why have China's exports become dominated by what appears to be high-technology goods? The answers to these questions may relate to the growing phenomenon of global production fragmentation. The fragmentation literature suggests that parts and components cross borders many more times than in ordinary trade. Within a product, a country will likely specialize in fragments that correspond to its comparative advantage.

Measuring vertical specialization

In our studies (Dean, Fung and Wang 2007, 2008), we focus on the important case of China. The Chinese trade data show that processing trade has accounted for a large part of trade growth and furthermore much of this processing trade has been carried out by foreign-invested firms. That implies that there is a significant amount of foreign inputs contained in Chinese exports, which are often conducted by non-Chinese firms. To more formally capture the idea of foreign content, we utilize the measure of vertical specialization (VS) as highlighted by Hummels, Ishii and Yi (HIY 2001). The HIY VS share can be conceptually explained by three elements: first, the extent of imported inputs by sectors; second, how much these imported inputs are further used and reused in the domestic economy in ultimately generating the country's exports; and lastly the pattern of the country's exports by sectors.

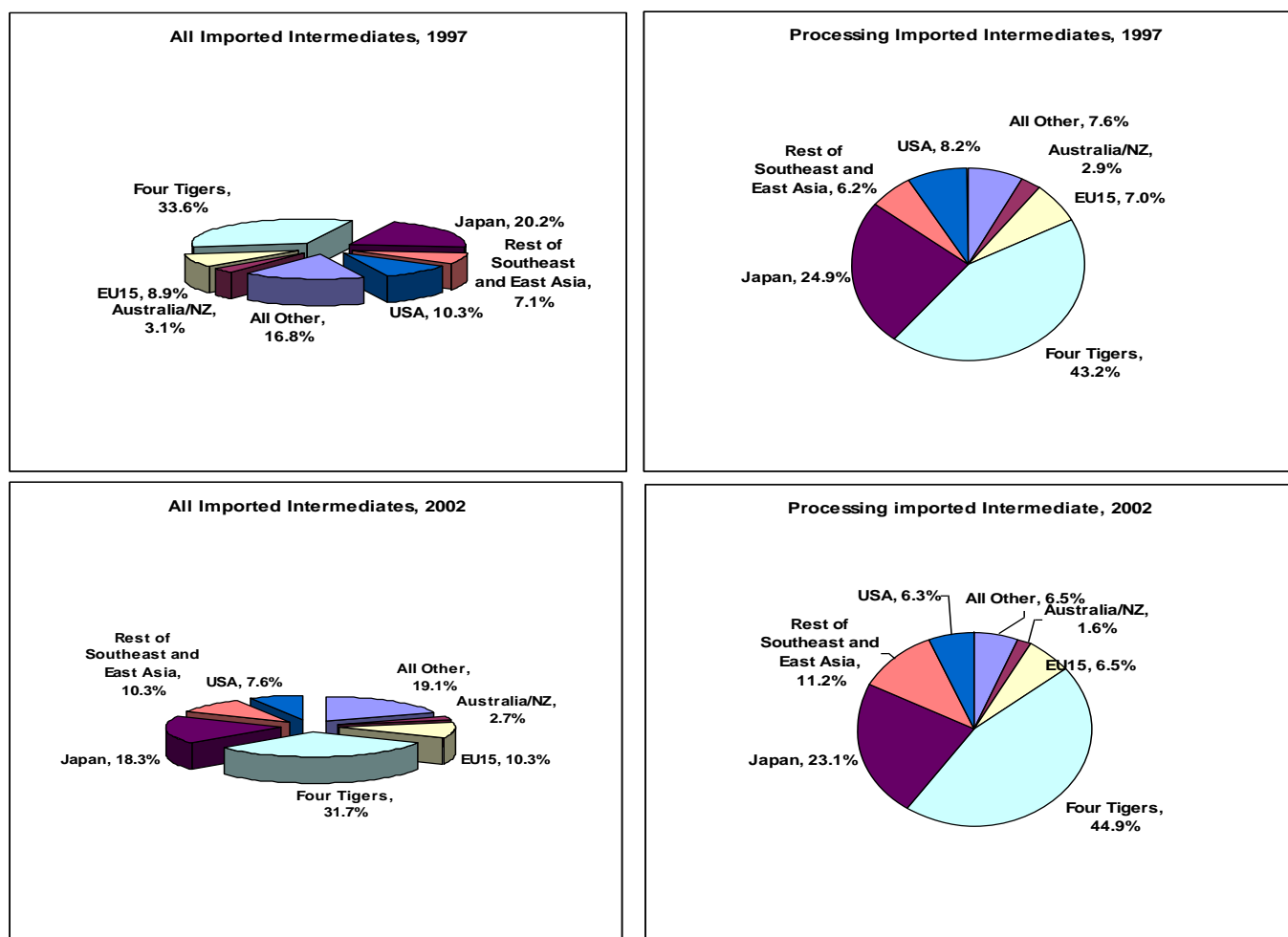
Applying the HIY VS measure to China presents two challenges. First we need to identify imported inputs from other types of imports. For the Chinese case, this depends on the customs regime. Processing imports are by definition imported intermediates, whereas normal imports may or may not be imported inputs. Second, the allocation of imported inputs across sectors also depends on the customs regime. Processing imports are used only in processing exports, and processing exports are concentrated primarily in a few sectors. These challenges apply mainly to the first element discussed above. For the second element, the iteration of use in the domestic economy can be captured by the total input requirement coefficients which are elements in the Leontief inverse matrix. Finally we can use the detailed Chinese trade data to map into the pattern of exports to provide a detailed picture of China's exports, which is the third element.

The objective of our studies is to measure the vertical specialization of China's trade, addressing these various challenges. We will first develop a new method (the Dean-Fung-Wang or DFW method) to identify imported intermediates. We then combine these with the unified input-output table to calculate the HIY VS share. We call this approach the "non-split method". In addition to this, we also use the Koopman, Wang and Wei (2008) technique to split the official input-output table to allow different imported input intensities for processing exports and then calculate the VS share for processing and non-processing exports separately. We call this second approach the "split method".

Asian countries play a dominant role in China's vertical specialization

According to the new DFW method, processing imports are considered 100% intermediates. To find the share of non-processing imports that are intermediates, we map the United Nations Broad Economic Categories (UNBEC) into the trade data. For the data, we use the 1997 and 2002 Chinese official benchmark input-output tables with the detailed trade data from the Chinese Customs. We find strong evidence of an Asian network of intermediate suppliers to China (see Figure 1). In 2002, out of all imported intermediates, the four tigers (Taiwan, South Korea, Singapore and Hong Kong), accounted for 31.7%, Japan accounted for 18.3% while the rest of Southeast and East Asia accounted for 10.3%. It is also somewhat surprising that the U.S. and the EU accounted for 7.6% and 10.3% respectively of all imported intermediates, given their distances from China. If we confine ourselves to just processing imported intermediates, the role of the Asian network is even more pronounced. The four tigers accounted for 23.1% of all imported intermediates.

Figure 1. Intermediate suppliers to China in 1997 and 2002



Using the above “non-split” method, we found that the 2002 aggregate VS share of merchandise exports was 25%, and growing over time. (See table 1.) Across sectors, the maximum VS share was 58%, with five sectors’ VS shares exceeding 40%. Some of the sectors with the highest VS shares in 2002 included cultural and office equipment, electronic computer, other computer peripheral equipment, radio, television and communication equipment as well as other electronic

and communication equipment (Figure 2). In terms of destinations, Singapore, Hong Kong, United States, Mexico and the EU15 had the top VS shares (Figure 3). We can also see that the VS shares vary by destinations with the range being 18% to 29%. Figure 3 also suggests that VS share decreases with the GDP per capita of the trading partner.

Table 1. Aggregate VS Share Estimates for China's Exports to the World

Method	Exports	Imported Input Identification	VS Share		
				1997	2002
Non-Split	All	DFW	Direct	9.0	15.0
	All	DFW	Total	17.9	25.4
Split	All	DFW	Direct	46.1	42.4
	All	DFW	Total	47.7	46.1
	Processing	DFW	Direct	81.7	72.5
	Processing	DFW	Total	81.9	74.3
	Ordinary	DFW	Direct	1.9	4.5
	Ordinary	DFW	Total	5.3	10.8
Ping (2005)	All	IO	Direct		
	All	IO	Total	15.2	21.0
Chen et al. (2006) (implicit)	All	IO	Direct		
	All	IO	Total		54.4

The above approach is limited in that it only addresses the challenge of correctly identifying imported intermediates. It implicitly assumes that imported input intensity does not vary across processing exports versus normal exports or domestic sales. As a result, the non-split method can only yield an average VS share across all types of Chinese production. In order to address this allocation problem, we require separate input-output tables that will allow for the concentration of processing exports in certain sectors and allow for higher imported input intensity used in processing.

Using the split method, we find the 2002 aggregate weighted average VS share of merchandise exports was 46% and declining over time (Table 1). For processing exports, the share was 74% while for normal exports, the share was 11%. Looking at the estimates by sectors, the maximum was 95%, with five sectors having VS shares above 70%. The differences in magnitudes between the split and non-split estimates are highly correlated with the share of processing trade across sectors. Both methods yield a similar set of sectors with the highest VS shares (Figure 4). Regarding destinations, 2002 VS shares were 18% to 60%. Again, both methods show a similar set of trading partners with the highest VS shares (Figure 5).

There are also some limitations of the split approach. For example, it is assumed that the sectors use imported intermediates in the same proportion for goods destined for normal exports or for domestic sales. If normal exports use relatively more imported inputs, the VS share may be underestimated.

Figure 2. Vertical Specialization of Chinese Merchandise Exports by Sector, 1997 and 2002: Non-Split Method

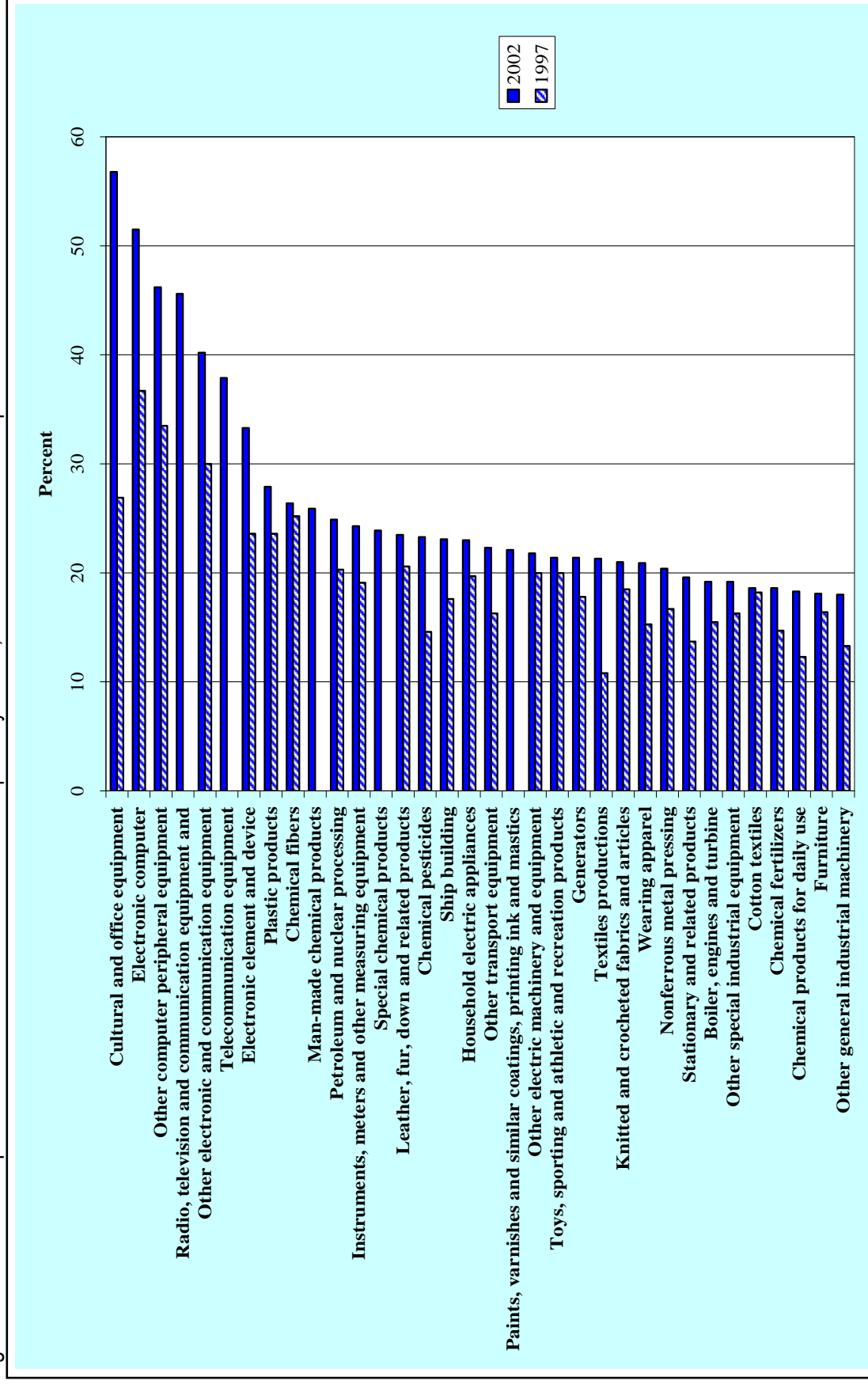


Figure 3. Vertical Specialization of Chinese Merchandise Exports by Destination, 1997 and 2002: Non-Split Method

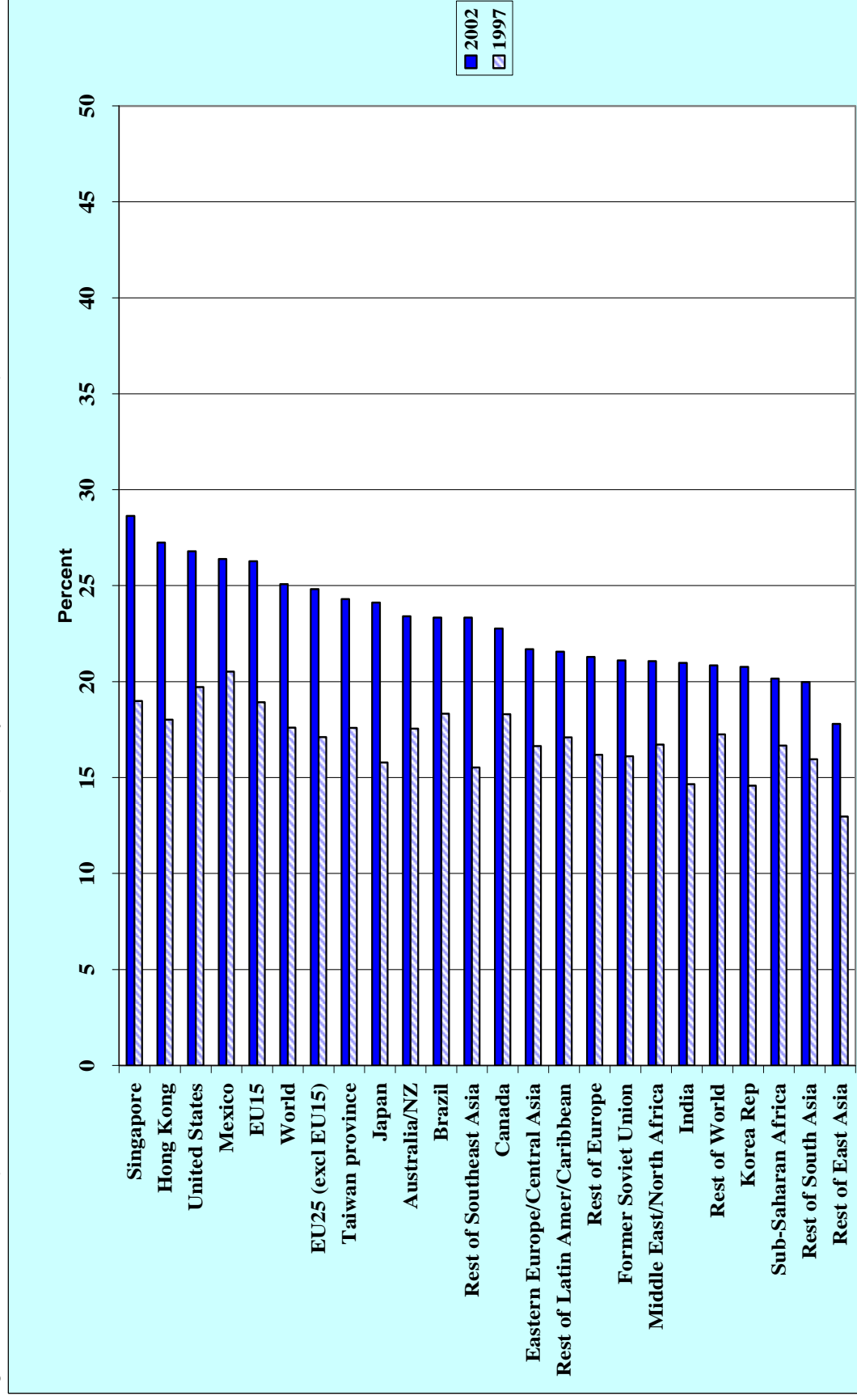


Figure 4 Vertical Specialization of Chinese Merchandise Exports by Sector, 2002: Non-Split and Split Methods

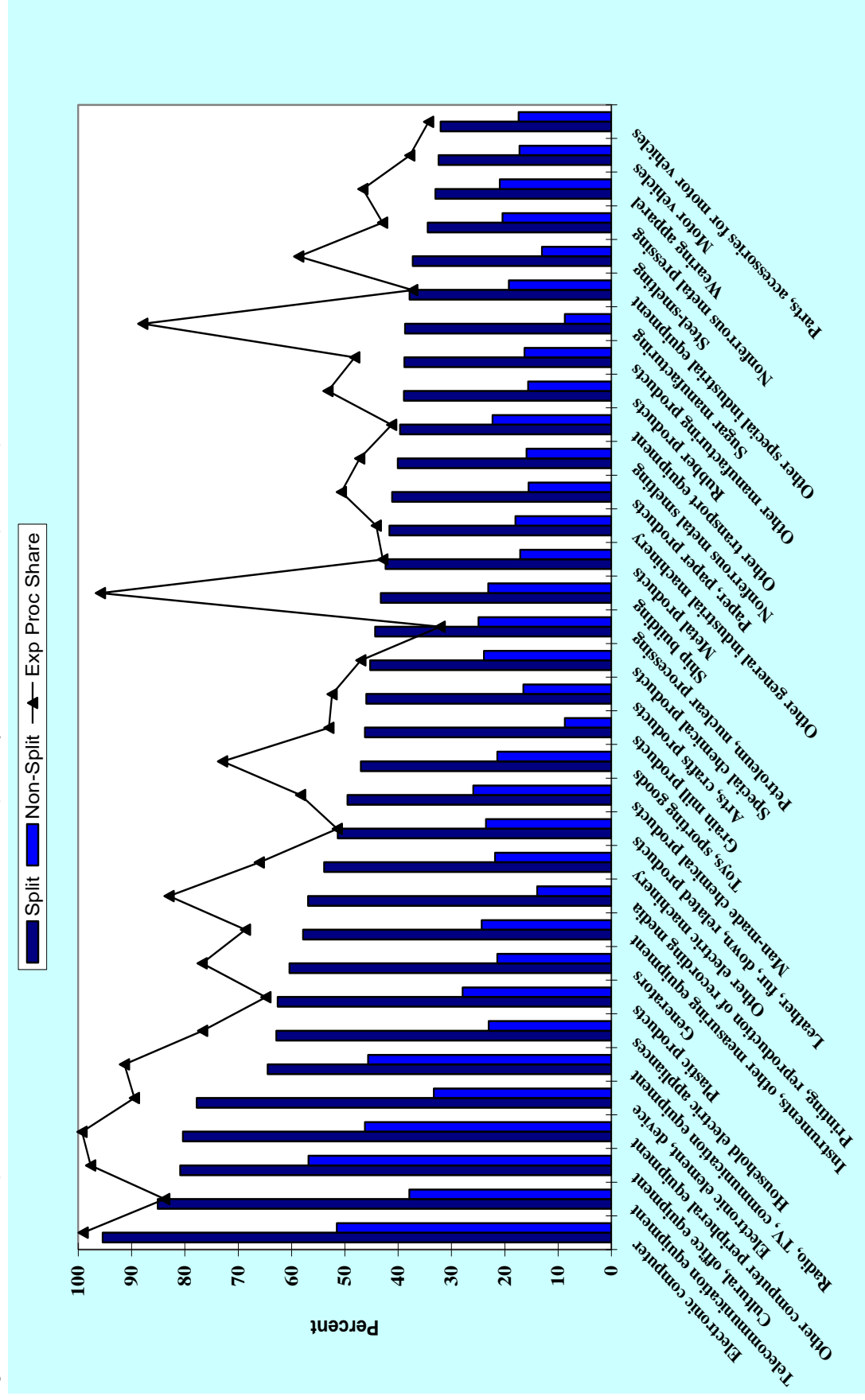
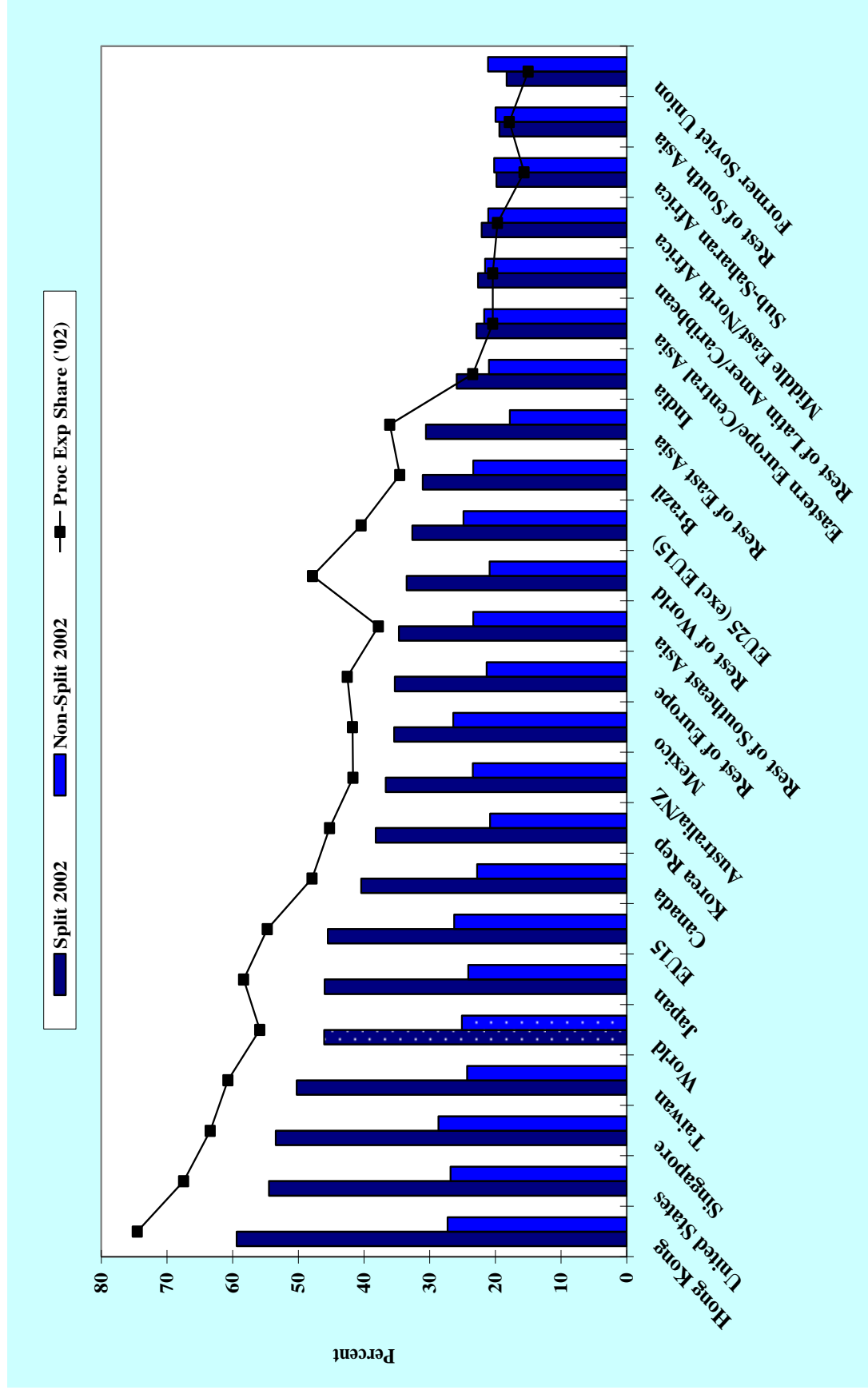


Figure 5. Vertical Specialization of Chinese Merchandise Exports by Destination, 2002: Non-Split and Split Methods



Conclusions

Our studies have at least three implications concerning Chinese trade. First, there is no doubt that China's exports have experienced explosive growths in recent years. However, a significant part of such growths comes in the form of vertical specialization, where parts and components cross borders several times before the final goods are exported. This also explains the sharp drop of Chinese exports in recent months as global demands for final products decline. The *quantitative* growth of Chinese exports is thus in some sense artificially magnified. Second, China is also perceived to be moving rapidly into exporting high technology products and China's profile of exports look like the exporting profiles of much richer countries. Our studies indicate that the perceived high *quality* of Chinese exports is at least partly due to China's involvement in vertical specialization. The fact that China is exporting computers does not necessarily mean that China's exports are highly sophisticated. China imports much of the sophisticated computer parts as well as machinery from Japan, the Asian NIEs, the United States and the EU, uses these inputs and assembles them into laptop and desktop computers and then exports them to the rich countries. The skill and technology content contributed by factories located in China is likely to be small compared to the skill and technology content contained in the imported parts and components. Lastly, our discussions also imply that much of China's and indeed much of Asia's exports are still heavily dependent on external demands, particularly demands for final consumer goods by American and European consumers. Chinese and Asian exports are *not de-coupled* from the final demands in the United States and in Europe.

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