Figuring out the Chinese high-tech export dynamics: What is the impact on the global trade frame?[ɷ]

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Abstract

This paper examines the evolution of Chinese trade patterns over the period 1991-2010; the focus is on the shift of Chinese specialization towards more technology-intensive products and its impact on the global economy. We consider a pool of eight countries, two emerging (Brazil and India) and six industrialized economies (France, Germany, Italy, Japan, United Kingdom, USA), to have a direct assessment of the structural change induced by Chinese export mix on countries with different specializations and comparative advantages. We start looking at the specialization pattern of China making use of the Lafay index, particularly suitable for this kind of analysis since it controls for intra-industry trade. The Lafay index is also computed net of processing and assembling trade for which we make use of Chinese revenues and customs data in combination with the UN Comtrade database. The analysis also measures to what extent China has been increasing exports in sectors considered more dynamic in terms of technological content and world demand. We then compare the degree of similarity between Chinese specialization structure and those of the eight countries above by making use of the Finger-Kreinin index in order to have a better idea of what countries might have been more exposed to Chinese competition. Finally, we directly quantify the gains/losses of sector market shares realized by China with respect to the countries considered. Our results confirm that China is shifting towards more technology-intensive productions while still increasing market shares in more traditional labour-intensive sectors. Furthermore, our results go in favour of the hypothesis that the shift of Chinese export towards more technology-intensive productions is not just depending on a measurement bias due to processing and assembling goods. Overall this brings a situation in which China is experiencing remarkable gains with respect to more industrialized countries (especially Italy, UK and Japan) while still competing with emerging economies (e.g. Brazil).

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1. INTRODUCTION

If 1978 is the year signing the start of the gradual reform path undertaken by China, 2001 represents the year since when reforms have started producing surprising results with unexpectedly rapid change for China and the world economy. The share of Chinese export on world export started from a level just below 2% in 1978, gradually moved towards 4% in 2000, and jumped to around 10% in 2010. This big-bang irruption of China in the global arena, even though attained through gradual reforms, is affecting heterogeneously countries worldwide. The analysis of China's export mix and its evolution over time towards more sophisticated and technology-intensive productions is crucial to understand what sectors and countries have been and will be most affected.

There is a wide debate on whether China's success is the result of strong specialization in labour-intensive productions with low technological content. Aggregate data seems to state clearly the opposite with Chinese share in world high-tech export passing from about 3% in 1999 and going above the 18% in 2007 (Source: World Bank data); when looking into more disaggregated data though, the picture becomes much more blurred due to high-tech products that in China are just assembled but whose components are made abroad in countries with more capital-intensive specialization structures. For instance, Amiti and Freund (2010) conclude that, once accounting for "processing trade", there is hardly any shift in skill intensity of Chinese export with production in unskilled labour-intensive sectors driving growth of Chinese exports. Wang and Wei (2010) instead reject the view that China's increasingly sophisticated export structure is just the result of processing trade or foreign- invested firms. Meanwhile, these findings confirm the importance of human capital and government- sponsored high- tech zones in increasing the sophistication of China's export structure.

This paper starts analysing the specialization pattern of China in the last twenty years through the use of the Lafay index (Lafay 1992). The index is constructed in a way to account also for intra-industry trade and, hence, introduce a first control on processing trade. To make results even more robust the analysis continues explicitly

considering trade of assembled and processed goods (for which we make use of data from the Global Trade Atlas produced by the Global Trade Information Services, GTI). Results seems to go in favour of Rodrik's (2006) hypothesis that China's has not just acquired market shares through competitive advantage in more labour intensive goods' categories, but that it has also increased the degree of sophistication of its export – the mix of exports traded by China is very similar to that of countries with income per-capita three times higher than China's itself.

The fact that Chinese export has now shifted towards more technology-intensive products and not as an illusion driven by processing trade is also confirmed by Cui and Syed (2007). Their analysis is prompted by the presence of a gap between growth rates of export and import, with the former having grown at higher pace. This gradual "delink" of exports from imports is taken as proof of the lower degree of dependence of Chinese export from processing trade. They estimate that the slowdown in import has mainly been driven by parts, components and semi-finished goods accounting for almost a half of the slowdown between 2003 and 2006.

The upcoming of China as an exporter of an increased variety of goods has impacted in different ways other countries. Harrigan and Deng (2010), for example, point out that China's export share has increased more rapidly in markets where China had already initially a relatively higher export weight and therefore countries operating in those markets have been suffering more Chinese competition. Furthermore, China has constantly shifted from just assembling sophisticated goods to actually produce them with production steadily integrating backwards and the supply chain shifting towards those phases characterized by higher productivity. Schott (2008) compares the sector composition of China's export with the US' one making use of Finger-Kreinin's Index (Finger and Kreinin 1979) and shows that the two export structures resemble more and more to each others, even though prices of Chinese goods remain markedly lower. This clearly states that China nowadays exerts a strong competition not only on other emerging economies but also with respect to more industrialized countries.

Part of the current study focuses on assessing what countries have been affected most by Chinese burgeoning weight in the world scene. The analysis proposes a

comparison between the Chinese pattern of specialization and the specialization patterns occurred in two of the fastest growing emerging economies, India and Brazil, and in some OECD countries such as France, Germany, Italy, Japan, United Kingdom and the United States. In addition to the use of the Finger-Kreinin index as a measure of export mix similarity the paper encompass a constant market share analysis in the fashion proposed by Batista 2008, allowing a direct measure (both monetary and expressed in share) of the gross gains and losses of China with respect to the countries listed above. The methodology adopted allows also to disentangle between two effects: the gains/losses which derive from competition with other countries and the changes in market shares depending on the goodness of export mix with respect to world demand. The analysis covers two decades since 1991 till 2010 and shows how industrialized countries have suffered more the pressure of Chinese competition.

The structure of the paper is as follows. Section 2 briefly describes the process of policy reforms implemented by China in the last decades and introduces the main features of the Chinese trade composition in manufacturing. Section 3 examines the pattern of trade specialization of China by using the Lafay index (Lafay 1992) with particular attention to the technological content and to the world demand of the products. We then investigate the role of the processing trade in influencing the comparative advantages by comparing the Lafay index with the Lafay index net of processing trade. Section 4 analyzes the China's market share evolution and the Finger-Kreinin index by comparing China with the eight economies and by exploring the effects of Chinese competition on them. Finally, we summarize the main conclusions in Section 5.

2. FOREIGN TRADE IN CHINA

The process of trade liberalization in China started with the election of Deng Xiaoping in 1978, after three decades in which Chinese leaders adopted a Soviet-style heavy-oriented development strategy (Lin, Cai and Li, 1996 and Alessandrini and Buccellato 2008). The basic state policy, labelled as "reforming the system" (Naughton, 1995), has focused on creating a price system, decreasing state's role in resource allocation and opening to the outside world. Since the Deng Xiaoping's government foreign trade has been regarded as an important source of modern technology and skills transfer. As a result restrictions on commercial flows were relaxed, tariff levels were reduced, quotas and licenses were removed and foreign investment was legalized, especially in the form of joint ventures with foreign firms to ensure knowledge spillovers between domestic and foreign firms (see Lardy 2002 and Branstetter and Lardy 2006).

In promoting foreign trade, particular attention deserves the strategy of the Chinese government to support the local productive system in attracting and acquiring advanced foreign technology. First of all, the creation of Special Economic Zones (SEZs) - special areas with more free-market orientated and flexible legal framework - stimulated productive exchanges between foreign firms with advanced technology and major Chinese economic networks (Lai, 2006). Since 1980, the government established SEZs in Shenzhen, Zhuai and Shanou in Guangdong province, in Xiamen in Fujan province and in the entire province of Hainan. In 1984 further 14 coastal cities were opened to overseas investment and over time a multilevel diversified pattern of opening and integrating coastal areas with river, border, and inland areas was developed. The SEZs acted as foreign and export oriented areas which integrated science and industry with trade and served as national models for the country in establishing new systems, upgrading industries and opening wider the economy to international competition.

Second, the role of the processing trade as a means to attract FDI has considerably expanded over time. The Chinese government has been actively promoting export processing since the end of the 1970s by extending special privileges to firms

involved in export processing in 1979. Initially, this legal framework provided various incentives for the processing of raw materials for export and the assembly of imported goods to produce finished goods for export. In 1987, the government expanded these incentives to provide for duty-free import of all raw materials, parts, and components used in the production of goods for export. Also joint ventures and wholly foreign-owned companies have generally been allowed to import capital goods duty-free throughout the reform period. Actually, export processing in China is subject to very different policy treatment compared to non-processing trade (Dai, Maitra and Yu 2011). First, processing activities enjoy favourable taxation. The amount of imported inputs actually used in the making of the finished products for export is exempt from tariffs and import-related taxes. All processed finished products for export are also exempt from export tariffs and value-added tax. Second, the finished products using the tax-exempted materials have to be re-exported, and enterprises are not allowed to sell the tax-exempted materials and parts or finished products in China. Moreover, China's processing trade policy has played an important role in attracting FDI towards China and expanding its exports. In order to transform its traditional industries through advanced and applicable technology, China has applied specific FDI policies to encourage technology into the economy, to establish R&D centres and to foster links between foreign-invested enterprises to collaborate with domestic enterprises and scientific research institutions to develop new technology (see Long 2005).

Third, the government heavily financed large-scale science and development plans and projects since early 1990s. Most of the China's large state-owned enterprises (SOEs) had established technical development centers, funded for the purpose of improving production efficiency as well as increased product quality and marketability. China's policies for industrial and commercial reforms continue to emphasize the need for cooperation among China's industrial, commercial, and research enterprises in an effort to bolster the revenues of China's state-owned enterprises and to modernize China's economy as a whole. Moreover, in order to spur domestic technological innovation and to diffuse applied technologies across government, industry, scientific, and academic communities, China has established

numerous National Engineering Research Centers (NERCs) across the country. These centers play a key role in China's strategy to reform its science and technology research system and are likely to become more prominent over time. The highly regarded Chinese Academy of Sciences (CAS) has also established over 500 commercial enterprises in the high-tech sector as part of a government program to develop "technological enterprises" as subsidiaries of existing research institutes. Together with the abundance of well-trained scientists, engineers, mathematicians, or other technical experts educated abroad, the China's incentives to acquiring foreign technology as well as encouraging companies' foreign investment to upgrade technology of domestic industries, have had a positive impact on domestic technology development, knowledge spillovers and productivity growth of domestic firms (Hale and Long 2006).

The trade liberalization process was accompanied and further sustained in the 1990s by a substantial privatization process, which favoured entrepreneurial initiatives, increased productivity and sustained investments. From 1994, the reform policy, "replacing the system", had been guided with better defined targets and, although state ownership was still regarded as a "principal component of the economy", private ownership was considered for the first time a "supplementary component of the economy". Thereafter the Fifteenth Party Congress held in September 1997 made a major breakthrough on ownership issues by elevating private ownership to an "important component of the economy" (Qian, 2003*a* and *b*). Privatization of State Owned Enterprises (SOEs) and layoffs of state workers began to emerge on a large scale in 1995 (Cao, Qian, and Weingast, 1999), started initially by local governments as experiments in a few provinces, such as Guangdong (already a SEZ), Shandong, and Sichuan and increased during the following decade. By the first years of the new millennium, more than two third of China's GDP was in the private sector. Furthermore, the restructuring of ownership was accompanied by the abolition of the dual-track approach, reforms of fiscal, financial and banking system, and downsizing of the government bureaucracy (see, for example, Qian and Roland 1998 and Dong 1999).

The main effect of the two decades of reforms is represented by the increase of the

weight of Chinese trade on the world scale since the early 1990s. As illustrated by Figure 1 the share of Chinese exports on world total, steadily around 2% in the 1980s, has constantly increased in the 1990s and the 2000s with a more pronounced path between 2002 and 2007. In 2009, the share of Chinese exports worldwide reached the percentage of 9.9%. With the exception of India, the growth of the Chinese export has coincided with an overall decrease in the export share of the selected economies in the sample, in particular United States which fell from 14.3% to less than 12%; the sum of the export share of the four European countries has declined from 23% at the end of the 1990s to 17.8% in 2009. Moreover, as shown in Table 1, the pattern of Chinese trade has been accompanied by the constant growth of 'Manufactured goods' (sectors 5, 6, 7 and 8), which jumped from 81.4% to 93.2% of total exports, and by a stable expansion of resource-based imports such as 'Fuels' (3) and 'Ores and metals' (27, 28 and 68). Among manufactured goods exports, sub-category 'Machinery and transport equipment' (7) has displayed an impressive path jumping from 17.8% at the beginning of the 1990s to nearly 50% at the end of the period. The rapid expansion of category (7) merits particular attention. This sector, in fact, chiefly contains the most dynamic products in term of technology content and world demand, such as ICT-related products and equipment. The extraordinary performance of China in producing and trading this type of products has permitted the economy to become the world leader in high-technology exports in less than ten years, with 18% of worldwide high-tech exports in 2007 from 3% in 1999 (Figure 2). Japan and United States, which had nearly 30% of high-tech world exports in 1999, represented together the same share of Chinese high-tech exports in 2007.

The rapid expansion of China's high-tech exports remains a subject of debate in the recent economic literature. Most of the research agrees that China is far from being a real high-tech exporter (Yuqing 2011 and Lawrence and Edwards 2011) and that Chinese firms producing high-tech exports are mainly located at the lowest value added segment of the production chains, such as processing and assembling. The drastic expansion of high-tech exports is mainly due to FDI as a major driving force and to the proliferation of production fragmentation and outsourcing activities of multinational enterprises, which relocate standardized production process into

China by taking advantage of the relative low labour costs.

However, it is also evident that the efforts of the Chinese government in encouraging direct foreign investments and requiring partnerships with domestic firms has provided not only financing, but also the business and technology skills of global corporations and raised the overall level of innovation of its economy and exports. It is not surprising, in fact, that China, in the past 15 years, has moved from 14th place to second behind the U.S. in the world in published research articles and that China's patent fillings are outpacing those in Japan and the U.S (Baily 2011 and Ensinger 2011). China is rapidly becoming the world's leader in innovation and, thanks to its strategy of technology and skills transfer, is now able to upgrade its plants with domestic technology and, in the very new technological sectors such as clean energy production, to anticipate foreign competition: China is already the world's leading producer – and consumer - of wind and solar power – half of the world's demand for equipment used in building solar panels and wind turbines comes from China – and the largest investor in producing energy technology designed to lower carbon dioxide emission (WWEA 2011 and REN21 2011).

The debate on the nature of the Chinese trade specialization model is therefore still open. In the next sections we will try to analyze and explain whether the Chinese specialization has moved towards more technology-intensive products, with particular attention to the role of the processing trade and the impact of Chinese trade rise on the global economy.

3. TRADE SPECILIZATION IN CHINA

The literature suggests a large number of indicators to measure the comparative advantage of different countries. A widely used indicator is the Revealed Comparative Advantage (*RCA*) index proposed by Balassa in 1965, which compares the national export structure with that of the world and thus focuses only on export data. However, in the current context of increasing intra-industry trade, any indicator that just focuses on exports is likely to throw out valuable information especially if the analysis is carried out at a high level of disaggregation. Thus, instead of relying on *RCA*, we base our analysis on the Lafay's revealed comparative

advantage index (LFI henceforth), which, rather than just looking at exports, also includes imports and thus is able to capture intra-industry trade flows (Lafay 1992)[1]. An additional advantage of the LFI is that it is able to control for distortions due to the business cycle. Positive values of the *LFI* imply specialization, while negative values imply reliance on imports; higher degree of specialization (de-specialization) is therefore associated with higher (lower) value of the index. One possible shortcoming of the index is that it may take a value close to zero for a sector in which China is both an importer and an exporter of equivalent amounts of commodities, in different sub-segments of the sector. However, this issue is likely to be less crucial if the analysis is carried out at a sufficiently detailed level of disaggregation. For the purpose of this paper, the source of the data is the UN-Comtrade Database over the period 1991-2010 for 260 items at 3-digit SITC-Rev.3 classification (see Appendix for details). In order to reduce the impact of outliers and the impact of wide variation in exchange rates or prices we use the 5-year average.

Tables 2a-2b report the top 20 and the bottom 20 product categories of China according to their LFI computed at 5-year average for four selected sub-periods. The Table also reports an indicator of the technological content of the sectors (see Appendix), computed according to OECD (2001, Annex A) and Khondaker (2005, Appendix A). The Table suggests some interesting insights in terms of the sectors that are represented in the top and bottom ranks. First of all, the top Table confirms the strength of China in the production and trade on Manufactured goods (categories from 6 to 8), which cover most of the positions among the 20 top sectors. Second, the top Table reveals that China shifted its specialization pattern from low-tech groups in the 1990s (category 8 which mostly includes wear products) to higher tech groups in the 2000s (category 7 which includes telecommunication

[1] The LFI is expressed by the following formula:

$$LFI_j = 100\left(\frac{x_j - m_j}{x_j + m_j} - \frac{\sum_{j=1}^{N}(x_j - m_j)}{\sum_{j=1}^{N}(x_j + m_j)}\right)\frac{x_j + m_j}{\sum_{j=1}^{N}(x_j + m_j)}$$

where x and m represent imports and exports of product j and N is the number of traded goods. The above formula indicates that the comparative advantage for China in product j is the deviation of the product normalized trade balance from the overall normalized trade balance. Thus, the sum of LFI across j for any year must by construction be equal to zero.

and computer products). In fact, while at the beginning of the period only one high-tech product (sector 762 'Radio broadcast receiver') was included in the rank, the number of high-tech items increased over time to six high-tech products out of 20 in the last period. In 2005-10 the two top positions were stably represented by 'Computer equipment' (762) and 'Telecommunication equipment' (764) respectively. In the case of 'Telecommunication equipment' it is worth to underline that this sector was among the bottom 20 positions till the end of the 1990s. Third, despite the improvement occurred in the top rank, Chinese economy is still import-dependent on high-tech categories, in particular on products such as 'Valves/Transistors' (776) and 'Electric circuit equipment' (772) and industrial machinery such as 'Textile/leather machinery' (724), 'Special industrial machinery' (728) and 'Measure/control apparatus' (874). Moreover, the increasing need of resources of the growing Chinese economy is evident from the steadily decrease in the LFI of petrol products (333 and 334). It is worth to underline that despite the improvement of the Chinese specialization towards the most dynamic sectors, the economy has still a strong comparative advantage in the lowest tech content products, such as wears and clothing sectors. In the last period in fact, ten out of the twenty top categories are represented by items, which display low or medium-low tech content. This however suggests the wide differentiation of products in which China has been able to specialize.

The overall shift of the Chinese specialization towards products characterized by higher tech content could be summarized by Table 3, which collects the average LFI by product categories and by Figure 3 which displays the pattern of trade specialization by tech group. The lowest tech content group has declined from 0.21 in 1991-95 to 0.11 in 2006-10, while the medium-low tech content category has slowly increased being positive at the end of the period. The N/A category, which mostly includes natural resource products such as petroleum products (see also Table 1), has constantly fallen over time due to the increasing need of resources related to the fast rate of growth of the Chinese economy. The most notable and interesting dynamics can be observed in the remaining two categories. The medium-high group increased from -0.2 to -0.02, while the high-tech category became

positive in 2006-10 (0.002) from the negative value of -0.9 recorded in 1991-95.

By comparing the evolution over time of the LFI against world demand for the product items is possible to investigate whether the changes in the Chinese manufacturing trade specialization have been towards the most dynamic products. In terms of efficiency, a specialization model can be labelled as 'efficient' when the country gains comparative specialization in product groups for which global demand has grown the fastest (Zaghini, 2005 and Alessandrini, Fattouh and Scaramozzino, 2007). On the other hand, a specialization model is labelled 'inefficient' when the country gains specialization advantage in products groups in which global demand growth has been in decline. A way to check for the efficiency of the specialization model is to examine the cumulative distribution of the LFI ranked according to the share of world imports over total world trade both at the beginning and the end of the time period. Figure 4 displays the result for China by comparing the evolution of the cumulative distribution of the LFI with respect to world demand in 2010 against 1994 (dotted line). The graph starts with the LFI of the item corresponding with lowest share in world trade and must end at zero by construction for the item with the highest share. The beginning of the distribution would show positive values for a specialization in products which showed low share in world trade, while a highly dependence on high share products on a world scale is displayed by negative values initially.

The graph yields some very interesting results. The pattern of specialization of Chinese manufacturing has improved over the period towards sectors characterized by medium-high and high share over world trade. Moreover, if compared with the other countries of the sample (Table 4), China is the only economy that has experienced a remarkable increase in the average LFI both in the medium-high and high share groups (see also the cumulated LFIs for the other eight countries as illustrated in Figure 5). In the case of the highest category, the jump is evident when petrol products (categories 333 and 334) are excluded from the sample, due to the increasing import-dependence of China on these two sectors (which appear amongst the top positions in terms of world share). The increasing specialization of China towards products characterized by high world demand can be explained by the

comparative advantage reached by China in high-tech content and high-demanded products such as 'computer equipment' (752) and 'telecommunication equipment' (764). Hence, overall, it appears that China is improving its pattern of specialization in the sectors which are characterized by the highest shares in terms of world demand. In conclusion, China, differently from the other economies in the sample, tends to present a pattern of specialization that is consistent with the dynamics of world demand and, to some extent, could have exerted a direct influence on it, stimulating consumption of products through an effect of lowering world prices.

The final analysis concerns the role of the processing trade in the comparative advantages achieved by China. The use of the LFI in this study has been a first way to include and consider the weight of imported items in the analysis of the Chinese comparative advantages since the index, by considering both exports and imports, is able to control for intra-industry trade. By using the GTI dataset (see Appendix for details) available for years from 2003 to 2010, we re-calculate the LFI by considering the weight of the processing trade, that is by subtracting the share of intermediate inputs imported from abroad, which are otherwise included as part of final goods exported. This enables us to compare the original LFI with the LFI net of processing trade for the last 5-year period (LFI NET) and to test whether the weight of the processing trade reduces the comparative advantages of China and modifies the top-bottom rank with particular attention for high-tech exports. As shown in Table 5, the top-bottom rank is not influenced by processing trade and all the products in the twenty top and twenty bottom positions maintain the original location in the rank. The small discrepancies in the value of the two LFIs is due to the reduction in the total value of exports after subtracting the processing exports which mainly affect, by construction, the products in the top position. In addition, the average LFI NET by tech content (Table 6), if compared with the LFI, does not reveal any evident change in terms of the average comparative advantage by group. A more accurate look at the whole rank, however, seems to bring to the conclusion that there is a relation between the weight of the processing trade and the decline in the comparative advantage. Table 7 displays the first 20 sectors ranked according to their share of processing trade over total exports. The last column shows the difference between

the LFI and the LFI NET. The three sectors with a share greater than 10% shows a slight reduction in the LFI (-0.1 on average), that declines to only -0.02 for products with a share between 2.5% and 5% and falls practically to 0 for products with a share less than 2.5%. This is however not sufficient to conclude that there is a stable and clear relation between the processing trade and the loss in high-tech comparative advantages. Anyway, as described in the previous section, the Chinese government support in the last three decades to processing trade by providing opportunities for multinational enterprises to integrate China into their production networks and utilize China as a low cost assembling base, has undoubtedly exposed local firms engaging in processing activities to production of know-how and product designs of foreign companies. Processing trade has therefore also functioned as an effective channel for knowledge spillovers by contributing substantially to the productivity growth of domestic firms and becoming a significant channel for technology spillovers to local Chinese companies (Yu 2010). The current economic growth and exports expansion of China is still driven by the advantage of an abundant and low paid labour force, but probably in the next few decades China will be able to keep the entire production chain in the most advanced and dynamic products.

In conclusion, the main question is now to inquire into how and to what extent the ability of China to differentiate its trade specialization model and to compete in different market niches from clothing and ITC-related manufacturing items, affects the specialization patterns in other economies of the world. Next last section investigates this aspect by analyzing the China's market shares evolution by using our sample of eight countries.

4. Main "losers" of China's market share evolution

A first simple measure to compare the trade specialization structures between two different periods or countries is the Finger-Kreinin export similarity index (F&K) (see, as examples of applications, Pomfret 1981, Kreinin and Plummer, 2004, Belke and Heine 2006, Schott 2008 and Alessandrini and Enowbi Batuo, 2010)[2]. The indicator

[2] One issue of the F&K is that it is sensitive to the number of the years used as well as the aggregation level chosen.

developed by Finger and Kreinin in 1979 is defined as the sum of smaller values of the two countries' shares of all products in their total exports to the world; it lies between 0 (maximum dissimilarity) and 1 (maximum similarity). The F&K index therefore measures the similarity of export structure of two countries and does not reflect their degree of competition for exports; the focus is placed on export structure rather than the absolute volume exports. We calculate the F&K index for testing the evolution of the export structure of China with respect to the eight countries selected and to compare the degree of similarity between Chinese export structure with the export structure of our selected economies[3].

Table 8 shows the F&K index by comparing the export structure of the economies at the beginning and at the end of the time sample and in the two sub-periods 1994-2002 and in 2002-2010. The Table suggests that China, Brazil and India display a lower degree of similarity in the sample, with respect to the OECD economies; in the case of China, an F&K of 0.54 implies that nearly half of export composition has changed between 1994 and 2010.

Thereafter we measure the similarity between China export structure and the comparing sample in selected years (Table 9), in order to assess the tendency of the specialization models getting closer in terms of similarity. According to the index, the Chinese manufacturing export structure has constantly become more similar to the export structure of Germany, the USA, Japan and, in a stronger way, Italy, while the similarity with Brazil and India has practically remained unchanged. The growing similarity with Italy, the highest recorded in all the years of the analysis, is mainly due to the Chinese competition in clothing-related products since the mid-1990s such as 'Footwear', 'Articles of apparel' and 'Women clothing' where Italy displays a

[3] The F&K index in formula:

$$F\,\&\,K_{x;z} = \sum_{j=1}^{N} \min(s_{j,x}, s_{j,z})$$

In the above equation sj is the share of export of product j over total exports; x and z can be two countries or two different years (x = t; z = t-1). The F&K index adds up the minimum value of sj between two countries or two years across products and hence allows us to compare export structure of the manufacturing sector of two different economies in the same year or, alternatively, to compare export structure of the manufacturing sector of a country in terms of similarity in two different periods.

positive and relatively high LFI[4]. The growing similarity with the other OECD countries instead, can find a possible explanation in the role of the processing trade since the USA, Japan and Germany together with Korea are the first four destinations of China's processing trade (Xing 2011). The USA and Japan in particular have faced the growing Chinese competition in high-tech sectors like 'Computer equipment' and 'Telecommunications products'. In this last sector, for example, both countries displayed a positive and high LFI in the 1990s with the sector among the first top positions which then turned to be negative in 2010. Foreign direct investment, production fragmentation, and production networks have jointly reversed the trade pattern predicted by conventional trade theories and both countries now import from China some of the high-tech goods that they invented (Xing and Detert 2011). Part of the imports from China is then re-exported to the rest of the world, but the remaining is to satisfy the inner demand. This explain why the F&K is growing between China and economies such as Japan and the USA, while the LFI, which considers also imports, is falling in these product categories in the two OECD economies.

To complete the analysis of Chinese competition effects we make use of the constant market share analysis à la Batista 2008. The analysis starts measuring the change in export market shares for all the countries selected, hence providing a clear idea of what countries have been gaining/loosing market shares and how much. The relative change of each country market shares is then broken down into two effects– the competitiveness effect (CE) and the product composition effect (PCE). The CE captures the part of the change in the market share of a given country and a given sector that is due to gain or losses attributable to other countries, whereas the PCE measures to what extent the change in the market share of a given country is due variations in the demand of the sector mix of the exporter country[5]. In other words if

[4] We calculated the top-bottom tables according to the LFI for the 8 economies of the sample. The 16 Tables are not reported in the paper but are available on request.

[5] Following the notation proposed by Batista (2008), the decomposition of the change in market shares can be expressed as follows:

$$\Delta k_H \equiv k_H^{t+1} - k_H^t \equiv \underbrace{(k_{Hi}^{t+1} - k_{Hi}^t)m_{Ki}^{t+1}}_{\substack{Competitiveness \\ effect}} + \underbrace{k_{Hi}^t(m_{Hi}^{t+1} - m_{Hi}^t)}_{\substack{Product \\ composition \\ effect}}$$

a country has been increasing (reducing) its market share this must have happened either because another country has been reducing (increasing) it (CE), or because the world demand of products it exports has increased (reduced) (PCE). The CE can be further broken down by products and by countries.

Table 10 displays the share in world export in the first and second five-year-periods of the 2000s for all the nine countries considered in the analysis and decomposes the difference in the shares into the two effects - PCE and CE. It is quite clear that the accession of China to the World Trade Organization has rescaled substantially the weight of more developed countries: China has passed from a share of around 2.4% of world export to a share over the 9.5% with a jump of around 7.2 percentage points; more interesting is that the big increase in trade export has been constituted entirely by a competitiveness effect, with the PCE that has actually had a slightly negative trend which has been more than offset by the CE. Brazil has increased its share only slightly in the order of 0.2% whereas India has doubled it passing from 0.64% to 1.27%.

Next step is to allocate the Chinese gross gains across the countries of interest to assess at the expense of what markets China has been realizing the most of its share gains (Table 11). Our analysis goes back also to the 1990s to have a broader perspective. China has been constantly eroding shares to all the countries selected along the whole time horizon, with a partial slowdown in the quinquennium 1996-2000. To make data comparable across countries, the last column of the table shows the share of the loss on each country total export and the country that seems to have suffered the most China competition is Italy, especially in the first decade (see Giovannetti, Sanfilippo and Velucchi 2011 for a more precise assessment of the "China effect" on Italian trade patterns). More recently also Japan and UK have been suffering increasingly Chinese competition.

Where $k_H^t \equiv X_H^t/M_K^t$ represents the share of country H export in market K imports both at time t; The index i denotes a given sector of the of the goods exchanged in the market; $m_{Ki}^t \equiv (M_{K1}^t/M_K^t, \dots, M_{Kz}^t/M_K^t)$ represents the shares in market k of good i at time t.

Finally, we look at the sector dynamics to assess in what sector China has become more competitive and has gained more weight in international markets (Table 12). At the beginning of the time horizon China was more competitive in sectors with relatively low technological intensity – mainly clothing and textile covering together more than the 30% of Chinese export. The composition of Chinese sector changes quite rapidly with office machines, telecommunication equipments and electric machinery starting to occupy an increasingly important share of Chinese export, overall abundantly above 50%, and a considerable share of world export (13.1% for electric machinery, 12.8% for office machines and 10.3% for telecommunication and sound equipment).

5. Conclusions

In the last three decades China has experienced an important process of trade reforms, which has mainly encouraged favourable FDI policies, promoted processing activities and favoured the technological advancement of the firms through technology spillovers effects generated by foreign investments. This has allowed China to differentiate its specialization pattern and to become one of the stronger exporter of technological manufacturing products in the world. China is currently able to compete in different product niches, from low-tech categories such as clothing to high-tech categories such as ITC-related items.

The main result of the analysis conducted in this paper is that the shift of Chinese export towards more sophisticated and technology-intensive goods is just a matter of facts. Chinese pattern of specialization resembles more and more the one of industrialized countries and seems to have adapted better than others to sectoral world demand changes. As illustrated by the use of the LFI, the specialization in the most advanced products in terms of the technological content and world demand has increased substantially and not just as a result of the processing trade. Remarkable is that China has been increasing its share in productions typical of industrialized countries while competing also with other emerging economies in more labour intensive productions. As a result China has been eroding market shares to both industrialized and emerging economies.

APPENDIX

The Lafay index

In this study, the Lafay index (LFI) is computed based on annual merchandise trade flow data from the United Nations COMTRADE database, covering 1990–2010. Data are disaggregated to the third digit of the Standard International Trade Classification Revision 3 (SITC-3) and encompass up to 260 product categories. To compute the LFI, missing trade flows were set to zero if either one of export and import flows are not zero and both the total export and import values are not zero. Moreover, to reduce the impact of outliers and year-to-year variations in exchange rates and prices, the index with trade flows taken at the 5-year average is computed.

Index of technological content

The taxonomy of technological content for sectors follows the OECD classification in 'OECD Science, Technology and Industry Scoreboard 2001—Towards a Knowledge-based Economy, Annex A. Classification of Manufacturing Industries Based on Technology'. The methodology uses two indicators of technology intensity: (i) R&D expenditures divided by production, and (ii) R&D expenditures divided by value added. The classification of the sectors is based on the analysis of R&D expenditure and output in 12 OECD countries11 for the period 1991–9. Manufacturing industries are classified as low-technology, medium-low-technology, medium-high-technology, and high-technology groups. Sectors included in higher categories have a higher intensity for both indicators than sectors included in lower categories. Some sectors belonging to mining or agricultural industries present no expenditure in R&D and are classified as N/A.

Global Trade Information Services (GTI) dataset for processing trade

The data on processing trade are collected by the General Customs Administration of the People's Republic Of China and then ordered and rendered available through the GTIS. Processing trade is characterized by specific customs procedures, under which goods can be brought into China Customs territory for manufacturing or processing and then re-exported abroad. Processing trade includes two sub-categories: (i) the

imported inputs that remain property of the foreign supplier; (ii) the ownership of imported inputs are transferred to Chinese producers. For the purpose of our analysis we use GTI data only to compute the share of processing trade for at three digit SITC-Rev3 level and then apportion the UN-Comtrade data. In this way we avoid possible issues of comparability due to different methodologies in data collection.

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Table 1. Structure of Chinese exports and imports, average (percentage)

EXPORT	**1991-95**	**1996-00**	**2001-05**	**2006-10**
Agricultural raw materials (2 excl. 22, 27, 28)	2,10	1,34	0,69	0,47
All food items (0, 1, 22, 4)	10,13	6,69	4,29	2,77
Fuels (3)	4,24	3,22	2,61	1,83
Manufactured goods	81,38	86,69	90,48	93,16
5-Chemicals products and related products	5,35	5,45	4,67	5,16
6-Manufactured goods (excl. 68)	0,42	0,38	0,34	0,36
7-Machinery and transport equipment	17,84	27,59	41,79	48,05
8-Miscellaneous manufactured articles	39,82	37,08	28,88	24,22
Ores and metals (27, 28, 68)	1,82	1,93	1,72	1,62
IMPORT	**1991-95**	**1996-00**	**2001-05**	**2006-10**
Agricultural raw materials (2 excl. 22, 27, 28)	4,41	4,71	3,92	3,40
All food items (0, 1, 22, 4)	4,80	4,76	3,57	3,89
Fuels (3)	4,35	6,31	7,80	12,61
Manufactured goods	81,63	78,44	77,77	68,01
5-Chemicals products and related products	11,68	13,78	12,34	10,92
6-Manufactured goods (excl. 68)	0,51	0,43	0,28	0,16
7-Machinery and transport equipment	41,39	39,96	45,23	41,45
8-Miscellaneous manufactured articles	6,21	5,91	7,81	8,66
Ores and metals (27, 28, 68)	4,13	5,11	6,52	11,59

Note: sectors are classified according to UNCTAD (2011)

Table 2a. Top 20 product groups based on LFI, China

Sector		Tech Content	LFI 1991-95	Sector		Tech Content	LFI 1996-00
841	Mens/boys wear, woven	*	2,74	851	Footwear	*	2,15
842	Women/girl clothing wven	*	2,69	845	Articles of apparel nes	*	2,10
851	Footwear	*	2,43	894	Baby carr/toy/game/sport	*	2,02
845	Articles of apparel nes	*	2,23	841	Mens/boys wear, woven	*	1,85
894	Baby carr/toy/game/sport	*	1,95	842	Women/girl clothing wven	*	1,71
848	Headgear/non-text clothg	*	0,95	752	Computer equipment	****	0,92
658	Made-up textile articles	*	0,93	831	Trunks and cases	*	0,89
831	Trunks and cases	*	0,90	848	Headgear/non-text clothg	*	0,82
762	Radio broadcast receiver	****	0,86	658	Made-up textile articles	*	0,76
899	Misc manuf articles nes	*	0,80	762	Radio broadcast receiver	****	0,72
652	Cotton fabrics, woven	*	0,62	844	Women/girl wear knit/cro	*	0,72
44	Maize except sweet corn.	na	0,57	899	Misc manuf articles nes	*	0,72
54	Vegetables,frsh/chld/frz	*	0,53	821	Furniture/stuff furnishg	*	0,67
821	Furniture/stuff furnishg	*	0,52	893	Articles nes of plastics	**	0,67
844	Women/girl wear knit/cro	*	0,47	775	Domestic equipment	***	0,50
893	Articles nes of plastics	**	0,46	786	Trailers/caravans/etc	***	0,39
36	Crustaceans molluscs etc	*	0,40	897	Jewellery	na	0,39
897	Jewellery	na	0,39	843	Men/boy wear knit/croch	*	0,38
56	Veg root/tuber prep/pres	*	0,36	671	Pig iron etc ferro alloy	**	0,37
321	Coal non-agglomerated	na	0,36	666	Pottery	**	0,35
Sector		Tech Content	LFI 2001-05	Sector		Tech Content	LFI 2006-10
752	Computer equipment	****	2,33	752	Computer equipment	****	3,49
845	Articles of apparel nes	*	1,82	764	Telecomms equipment nes	****	2,55
894	Baby carr/toy/game/sport	*	1,72	845	Articles of apparel nes	*	1,43
851	Footwear	*	1,61	894	Baby carr/toy/game/sport	*	1,14
842	Women/girl clothing wven	*	1,29	821	Furniture/stuff furnishg	*	1,08
841	Mens/boys wear, woven	*	1,15	851	Footwear	*	1,07
821	Furniture/stuff furnishg	*	0,94	842	Women/girl clothing wven	*	0,84
763	Sound/tv recorders etc	****	0,92	775	Domestic equipment	***	0,78
775	Domestic equipment	***	0,80	763	Sound/tv recorders etc	****	0,78
848	Headgear/non-text clothg	*	0,71	793	Ships/boats/etc	**	0,66
893	Articles nes of plastics	**	0,68	761	Television receivers	****	0,64
658	Made-up textile articles	*	0,67	841	Mens/boys wear, woven	*	0,63
764	Telecomms equipment nes	****	0,65	658	Made-up textile articles	*	0,61
831	Trunks and cases	*	0,65	844	Women/girl wear knit/cro	*	0,56
844	Women/girl wear knit/cro	*	0,55	831	Trunks and cases	*	0,47
899	Misc manuf articles nes	*	0,50	893	Articles nes of plastics	**	0,46
786	Trailers/caravans/etc	***	0,48	759	Office equip parts/accs.	****	0,44
785	Motorcycles/cycles/etc	***	0,43	751	Office machines	****	0,42
762	Radio broadcast receiver	****	0,43	699	Base metal manufac nes	**	0,41
813	Lighting fixtures etc	**	0,40	899	Misc manuf articles nes	*	0,36

Table 2b. Bottom 20 product groups based on LFI, China

Sector		Tech Content	LFI 1991-95	Sector		Tech Content	LFI 1996-00
571	Primary ethylene polymer	**	-0,50	266	Synthetic spinning fibre	***	-0,40
682	Copper	**	-0,50	741	Indust heat/cool equipmt	***	-0,41
874	Measure/control app nes	****	-0,52	682	Copper	**	-0,48
782	Goods/service vehicles	***	-0,53	281	Iron ore/concentrates	na	-0,49
653	Man-made woven fabrics	*	-0,57	874	Measure/control app nes	****	-0,51
41	Wheat/meslin	na	-0,58	575	Plastic nes-primary form	**	-0,52
741	Indust heat/cool equipmt	***	-0,60	653	Man-made woven fabrics	*	-0,59
641	Paper/paperboard	*	-0,60	611	Leather	*	-0,59
572	Styrene primary polymers	**	-0,61	673	Flat rolled iron/st prod	**	-0,60
611	Leather	*	-0,63	571	Primary ethylene polymer	**	-0,61
334	Heavy petrol/bitum oils	**	-0,68	334	Heavy petrol/bitum oils	**	-0,64
781	Passenger cars etc	***	-0,84	724	Textile/leather machinry	***	-0,70
776	Valves/transistors/etc	****	-0,91	333	Petrol./bitum. oil,crude	na	-0,71
562	Manufactured fertilizers	***	-1,11	572	Styrene primary polymers	**	-0,75
673	Flat rolled iron/st prod	**	-1,11	764	Telecomms equipment nes	****	-0,76
792	Aircraft/spacecraft/etc	****	-1,14	792	Aircraft/spacecraft/etc	****	-0,84
676	Iron/steel bars/rods/etc	**	-1,22	641	Paper/paperboard	*	-0,84
764	Telecomms equipment nes	****	-1,28	562	Manufactured fertilizers	***	-1,00
724	Textile/leather machinry	***	-1,73	776	Valves/transistors/etc	****	-1,84
728	Special indust machn nes	***	-2,50	728	Special indust machn nes	***	-1,98
Sector		Tech Content	LFI 2001-05	Sector		Tech Content	LFI 2006-10
511	Hydrocarbons/derivatives	***	-0,41	287	Base metal ore/conc nes	na	-0,34
513	Carboxylic acid compound	****	-0,42	571	Primary ethylene polymer	**	-0,39
724	Textile/leather machinry	***	-0,43	512	Alcohols/phenols/derivs	***	-0,41
641	Paper/paperboard	*	-0,45	283	Copper ores/concentrates	na	-0,42
571	Primary ethylene polymer	**	-0,49	288	Nf base metal waste nes	**	-0,43
575	Plastic nes-primary form	**	-0,49	874	Measure/control app nes	****	-0,47
572	Styrene primary polymers	**	-0,50	792	Aircraft/spacecraft/etc	****	-0,47
251	Pulp and waste paper	*	-0,52	575	Plastic nes-primary form	**	-0,48
222	Oil seeds etc - soft oil	na	-0,55	511	Hydrocarbons/derivatives	***	-0,48
792	Aircraft/spacecraft/etc	****	-0,55	334	Heavy petrol/bitum oils	**	-0,48
675	Flat rolled alloy steel	**	-0,55	251	Pulp and waste paper	*	-0,49
874	Measure/control app nes	****	-0,57	781	Passenger cars etc	***	-0,53
673	Flat rolled iron/st prod	**	-0,60	772	Electric circuit equipmt	****	-0,56
682	Copper	**	-0,60	728	Special indust machn nes	***	-0,67
281	Iron ore/concentrates	na	-0,62	222	Oil seeds etc - soft oil	na	-0,75
772	Electric circuit equipmt	****	-0,63	682	Copper	**	-0,76
871	Optical instruments nes	****	-0,69	871	Optical instruments nes	****	-1,32
728	Special indust machn nes	***	-1,20	281	Iron ore/concentrates	na	-2,07
333	Petrol./bitum. oil,crude	na	-2,41	333	Petrol./bitum. oil,crude	na	-4,34
776	Valves/transistors/etc	****	-4,56	776	Valves/transistors/etc	****	-5,42

Table 3. Average LFI by technological content

TECH CONTENT GROUP	1991-95	1996-00	2001-05	2006-10
*	0,210	0,152	0,139	0,112
**	-0,086	-0,042	-0,034	0,009
***	-0,200	-0,130	-0,071	-0,022
****	-0,088	-0,065	-0,075	0,002
na	0,032	-0,038	-0,116	-0,275

Table 4. Average LFI by world demand

1995	CHINA	BRAZIL	FRANCE	GERMANY	INDIA	ITALY	JAPAN	USA	UK
+	0,012	-0,001	0,004	-0,004	-0,035	-0,035	-0,019	0,010	-0,001
++	0,004	0,011	0,011	-0,002	0,041	0,029	-0,064	0,028	0,001
+++	0,000	0,088	0,019	0,029	0,064	-0,017	-0,008	0,025	0,003
++++	-0,016 (-0,011)	-0,099 (0,022)	-0,034 (0,008)	-0,023 (0,015)	-0,070 (0,106)	0,023 (0,057)	0,092 (0,006)	-0,063 (0,002)	-0,003 (-0,022)
2010	**CHINA**	**BRAZIL**	**FRANCE**	**GERMANY**	**INDIA**	**ITALY**	**JAPAN**	**USA**	**UK**
+	0,002	-0,006	0,002	0,003	0,002	0,008	-0,002	0,005	0,001
++	0,021	0,023	0,008	0,013	0,056	0,034	-0,013	0,016	-0,012
+++	0,006	0,082	-0,003	0,008	0,022	-0,015	-0,052	0,026	-0,013
++++	-0,029 (0,001)	-0,099 (-0,072)	-0,007 (-0,001)	-0,024 (0,014)	-0,080 (-0,072)	-0,027 (-0,014)	0,068 (0,211)	-0,047 (-0,061)	0,025 (-0,009)

Note: mean share of the groups in 1994: low share (+), 0.04%; medium-low share (++), 0.13%; medium-high share (+++), 0.27%; high share (++++), 1.1%. Mean share of the groups in 2010: low share (+), 0.04%; medium-low share (++), 0.16%; medium-high share (+++), 0.31%; high share (++++), 1.01%. In brackets average LFI in the high share (++++) group excluding sectors 334 and 333.

Table 5. LFI vs LFI net of processing 2006-2010

TOP			
SECTOR	TECH CONTENT	LFI	LFI NET
Computer equipment	****	3,49	4,05
Telecomms equipment nes	****	2,55	3,12
Articles of apparel nes	*	1,43	1,45
Furniture/stuff furnishg	*	1,08	1,14
Footwear	*	1,07	1,00
Sound/tv recorders etc	****	0,78	0,90
Domestic equipment	***	0,78	0,85
Women/girl clothing wven	*	0,84	0,81
Baby carr/toy/game/sport	*	1,14	0,75
Television receivers	****	0,64	0,73
Made-up textile articles	*	0,61	0,69
Office equip parts/accs.	****	0,44	0,60
Women/girl wear knit/cro	*	0,56	0,57
Ships/boats/etc	**	0,66	0,57
Mens/boys wear, woven	*	0,63	0,49
Base metal manufac nes	**	0,41	0,44
Office machines	****	0,42	0,41
Articles nes of plastics	**	0,46	0,40
Motorcycles/cycles/etc	***	0,35	0,40
Trunks and cases	*	0,47	0,39
BOTTOM			
SECTOR	TECH CONTENT	LFI	LFI NET
Base metal ore/conc nes	na	-0,34	-0,34
Primary ethylene polymer	**	-0,39	-0,39
Alcohols/phenols/derivs	***	-0,41	-0,41
Copper ores/concentrates	na	-0,42	-0,42
Heavy petrol/bitum oils	**	-0,48	-0,43
Nf base metal waste nes	**	-0,43	-0,44
Hydrocarbons/derivatives	***	-0,48	-0,48
Plastic nes-primary form	**	-0,48	-0,48
Electric circuit equipmt	****	-0,56	-0,48
Aircraft/spacecraft/etc	****	-0,47	-0,49
Pulp and waste paper	*	-0,49	-0,50
Passenger cars etc	***	-0,53	-0,52
Measure/control app nes	****	-0,47	-0,59
Special indust machn nes	***	-0,67	-0,65
Oil seeds etc - soft oil	na	-0,75	-0,75
Copper	**	-0,76	-0,78
Optical instruments nes	****	-1,32	-1,66
Iron ore/concentrates	na	-2,07	-2,08
Petrol./bitum. oil,crude	na	-4,34	-4,36
Valves/transistors/etc	****	-5,42	-5,41

Table 6. Average LFI vs LFI net by technological content, 2006-2010

TECH CONTENT GROUP	LFI	LFI NET
*	0,112	0,107
**	0,009	0,008
***	-0,021	-0,019
****	0,002	0,024
na	-0,273	-0,279

Table 7. Share of the processing trade by product and difference between LFI and LFI NET, top 20 products

Sector	Share of processing trade over total processing exports	Difference between LFI NET and LFI
Electrical equipment nes	15,10	-0,36
Clothing accessories	10,94	-0,02
Non-elec parts/acc machn	10,02	-0,01
Base metal manufac nes	5,83	0,00
Prefabricated buildings	4,64	0,00
Trailers/caravans/etc	3,40	0,03
Misc manuf articles nes	3,34	-0,06
Other organic compounds	3,20	0,01
Iron/steel wire	2,82	0,01
Footwear	2,75	-0,05
Measure/control app nes	2,59	-0,09
Articles nes of plastics	2,11	-0,01
Baby carr/toy/game/sport	1,76	-0,32
Mineral manufactures nes	1,72	0,01
Man-made woven fabrics	1,64	0,04
Worn clothing etc	1,61	0,00
Electric current	1,59	0,00
Special transactions and commodities nc	1,16	0,00
Other inorganic chemical	1,10	0,00
Cotton fabrics, woven	1,07	0,04

Table 8. The F&K index over time

	2010 vs 1994	2010 vs 2002	2002 vs 1994
CHINA	0,54	0,77	0,72
BRAZIL	0,59	0,73	0,73
FRANCE	0,80	0,85	0,86
GERMANY	0,85	0,87	0,88
INDIA	0,48	0,64	0,74
ITALY	0,79	0,86	0,89
JAPAN	0,78	0,84	0,87
UK	0,74	0,82	0,82
USA	0,76	0,78	0,89

Table 9. The F&K index between China and selected countries.

	1995	2000	2005	2010
BRAZIL	0,27	0,26	0,29	0,24
FRANCE	0,41	0,45	0,43	0,44
GERMANY	0,38	0,41	0,44	0,46
INDIA	0,41	0,37	0,39	0,40
ITALY	0,48	0,49	0,50	0,52
JAPAN	0,31	0,40	0,42	0,45
UK	0,41	0,46	0,44	0,40
USA	0,37	0,45	0,45	0,46

Table 10. Decomposition of the market shares into the product composition (PCE) and the competitiveness effect (CE).

	{a}	{b}	{c}	{d}	{b-a} or {c+d}
	Quinquennium 2001-2005	Quinquennium 2006-2010	Part of the difference due to PCE (%)	Part of the difference due to CE (%)	Difference in the share of the two quinquennia (%)
Brazil	1.06%	1.27%	-0.05%	0.26%	0.22%
China	2.41%	9.63%	-0.73%	7.95%	7.22%
France	6.30%	3.90%	-0.40%	-2.00%	-2.40%
Germany	11.56%	9.51%	-0.53%	-1.52%	-2.05%
Italy	5.05%	3.48%	-0.45%	-1.12%	-1.57%
Japan	10.00%	5.26%	-0.30%	-4.44%	-4.74%
India	0.64%	1.27%	-0.07%	0.70%	0.63%
UK	5.18%	3.16%	0.10%	-2.12%	-2.02%
USA	13.10%	8.78%	-0.65%	-3.67%	-4.32%

Table 11. Attribution of gains deriving from the competitiveness effect across competitors

1991-1995				1996-2000			
Country	Gross Gain ($BN)	Share on total CE gains	Share on total country export	Country	Gross Gain ($BN)	Share on total CE gains	Share on total country export
India	1.4	1.2%	1.2%	Italy	5.7	7.8%	0.5%
Italy	10.1	8.5%	1.1%	Japan	7.3	9.9%	0.3%
Brazil	1.4	1.2%	0.7%	UK	4.5	6.2%	0.3%
France	8.0	6.8%	0.7%	France	4.9	6.7%	0.3%
Germany	14.1	11.9%	0.7%	Germany	8.4	11.5%	0.3%
UK	6.2	5.2%	0.6%	USA	6.9	9.4%	0.2%
Japan	10.4	8.8%	0.6%	Brazil	0.1	0.2%	0.1%
USA	13.2	11.1%	0.5%	India	0.0	0.1%	0.0%
2001-2005				**2006-2010**			
Country	Gross Gain ($BN)	Share on total CE gains	Share on total country export	Country	Gross Gain ($BN)	Share on total CE gains	Share on total country export
Japan	30.4	9.8%	1.2%	UK	33.7	6.2%	1.6%
USA	45.8	14.8%	1.2%	Italy	31.3	5.7%	1.4%
Italy	15.1	4.9%	1.0%	France	30.2	5.5%	1.2%
UK	15.5	5.0%	1.0%	Japan	38.9	7.1%	1.1%
France	14.7	4.8%	0.8%	Germany	64.5	11.8%	1.0%
Germany	23.6	7.7%	0.6%	USA	59.2	10.8%	1.0%
India	1.3	0.4%	0.4%	Brazil	5.1	0.9%	0.6%
Brazil	1.2	0.4%	0.3%	India	1.6	0.3%	0.2%

Table 12. Allocation of Chinese gross gains across sectors

1991-1995			1996-2000		
Share of World Export in the sector	**Share of Chinese Export**	**Product**	**Share of World Export in the sector**	**Share of Chinese Export**	**Product**
17.1%	20.9%	Articles of apparel and clothing accessories	21.7%	34.4%	Office machines and adp machines
9.8%	11.9%	Miscellaneous manufactured articles,n.e.s.	15.0%	23.7%	Telecommunications and sound recording equipm
9.5%	11.6%	Textile yarn,fabrics,made up articles,etc.	11.6%	18.3%	Electric machinery,n.e.s.and parts
5.1%	6.2%	Telecommunications and sound recording equipm	5.9%	9.3%	Articles of apparel and clothing accessories
4.9%	6.0%	Electric machinery,n.e.s.and parts	5.7%	9.0%	Textile yarn,fabrics,made up articles,etc.
4.4%	5.4%	Footwear	4.1%	6.5%	General industrial machinery n.e.s.
3.9%	4.8%	Iron and steel	3.6%	5.6%	Miscellaneous manufactured articles,n.e.s.
3.2%	3.9%	Office machines and adp machines	3.4%	5.3%	Instruments and apparates n.e.s.
3.2%	3.9%	Manufactures of metals,n.e.s.	3.3%	5.2%	Manufactures of metals,n.e.s.
2.6%	3.1%	Petroleum and products	3.2%	5.0%	Road vehicles
2001-2005			**2006-2010**		
Share of World Export in the sector	**Share of Chinese Export**	**Product**	**Share of World Export in the sector**	**Share of Chinese Export**	**Product**
21.7%	34.4%	Office machines and adp machines	13.1%	21.2%	Electric machinery,n.e.s.and parts
15.0%	23.7%	Telecommunications and sound recording equipm	12.8%	20.8%	Office machines and adp machines
11.6%	18.3%	Electric machinery,n.e.s.and parts	10.3%	16.8%	Telecommunications and sound recording equipm
5.9%	9.3%	Articles of apparel and clothing accessories	7.2%	11.8%	Articles of apparel and clothing accessories
5.7%	9.0%	Textile yarn,fabrics,made up articles,etc.	5.8%	9.4%	Other transport equipment
4.1%	6.5%	General industrial machinery n.e.s.	5.0%	8.2%	General industrial machinery n.e.s.
3.6%	5.6%	Miscellaneous manufactured articles,n.e.s.	4.7%	7.7%	Textile yarn,fabrics,made up articles,etc.
3.4%	5.3%	Instruments and apparates n.e.s.	3.8%	6.1%	Miscellaneous manufactured articles,n.e.s.
3.3%	5.2%	Manufactures of metals,n.e.s.	3.7%	6.1%	Road vehicles
3.2%	5.0%	Road vehicles	3.7%	6.1%	Iron and steel

Figure 1. Share of Exports of goods and services on world total (%)

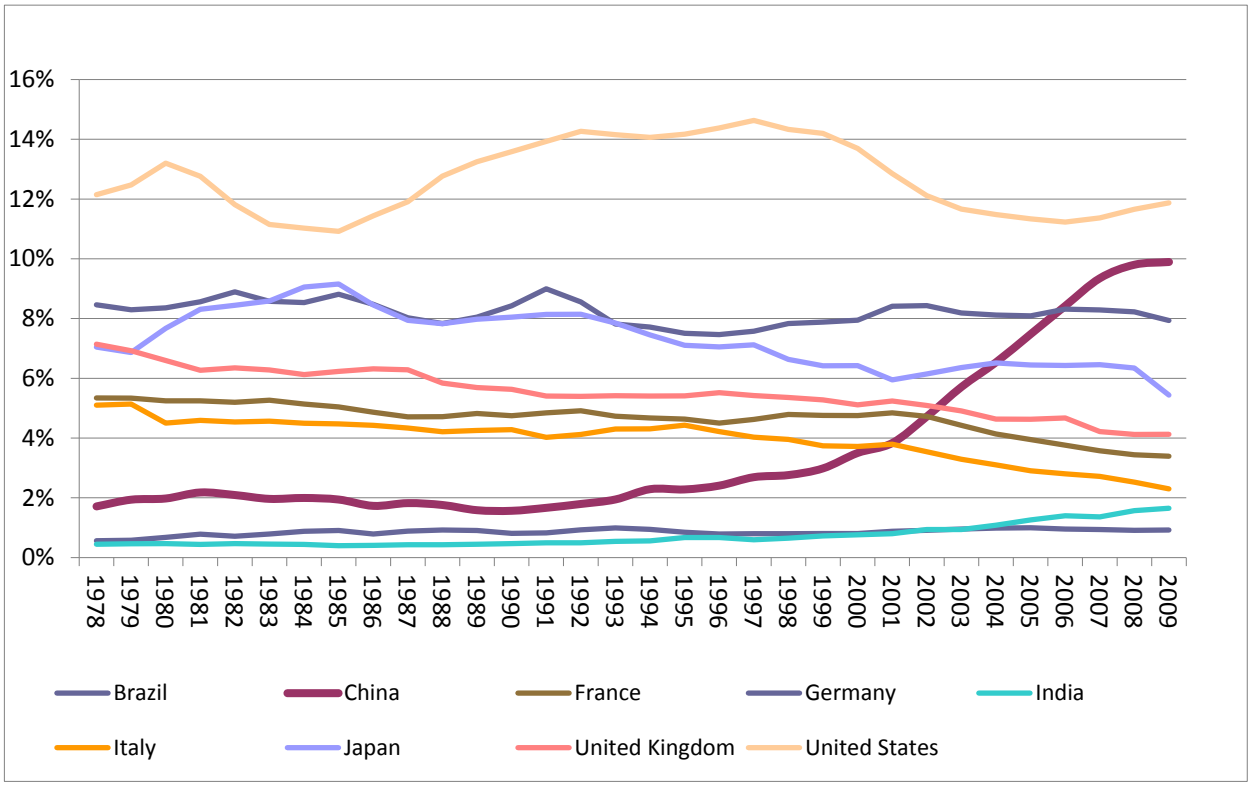


Figure 2. High-technology exports share on world total (%)

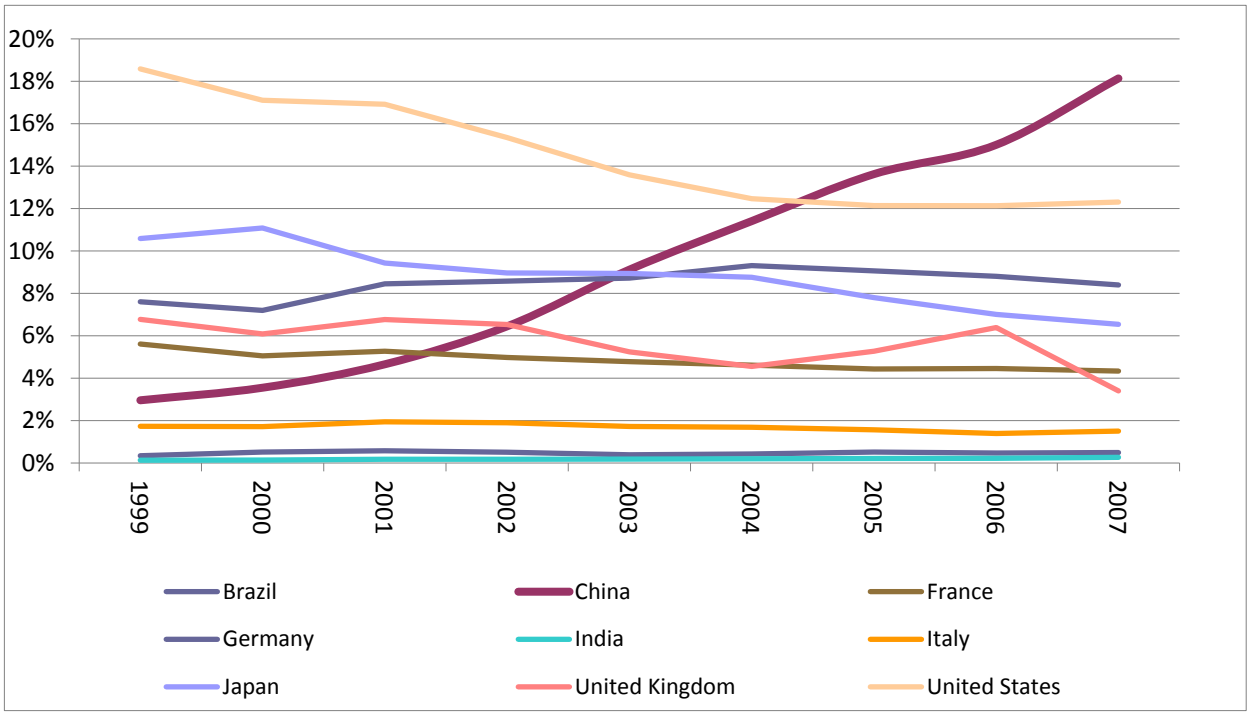


Figure 3. Average LFI by tech content, 1994-2010

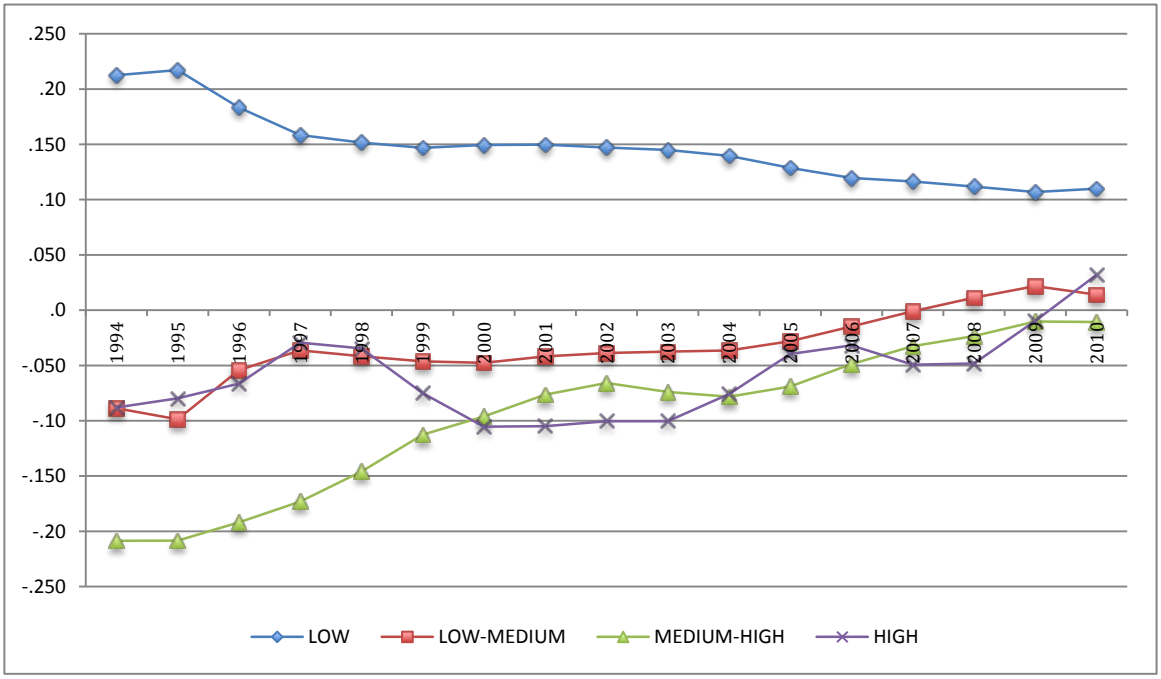
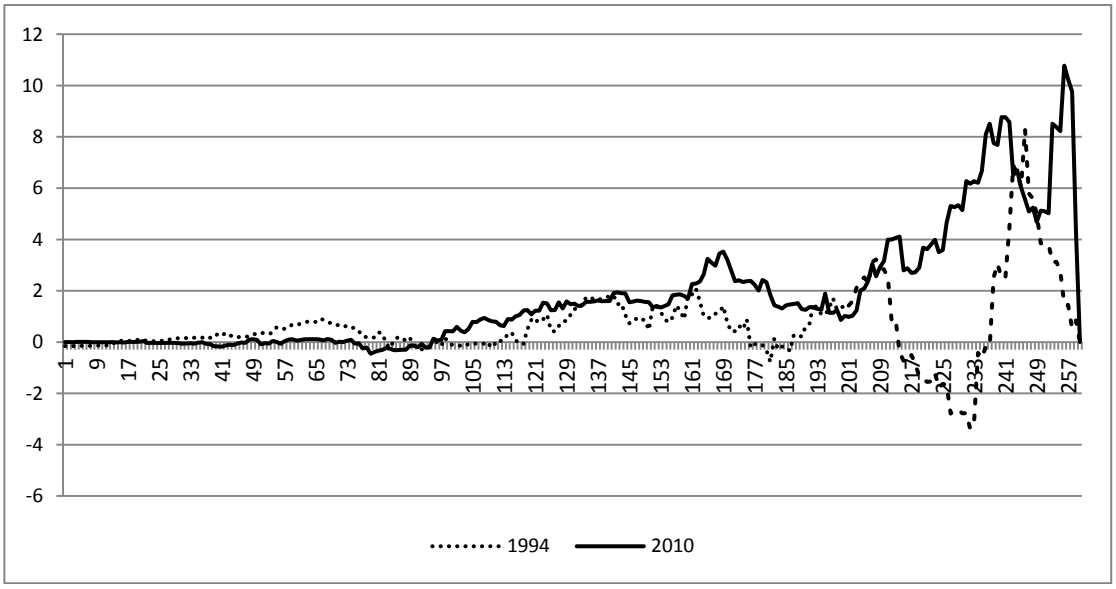
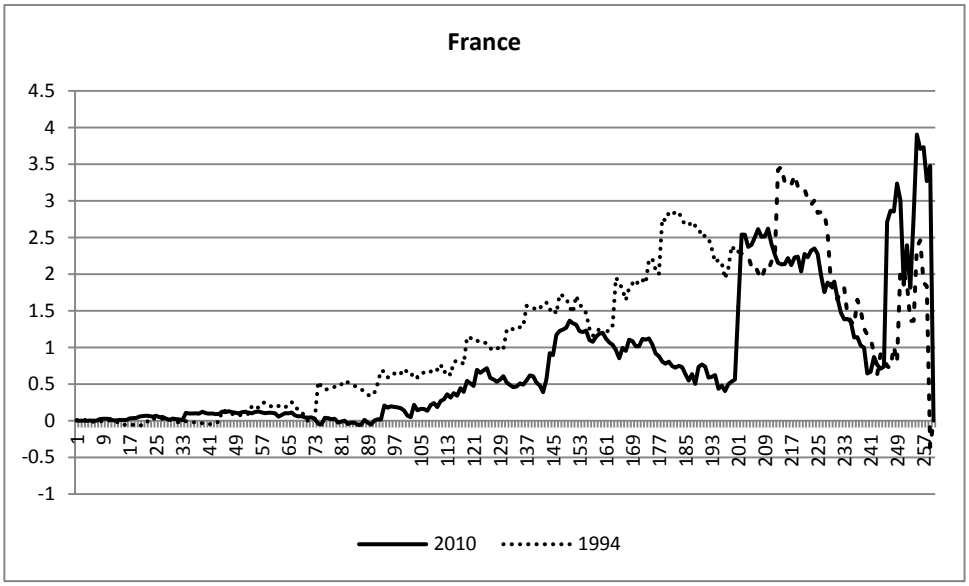


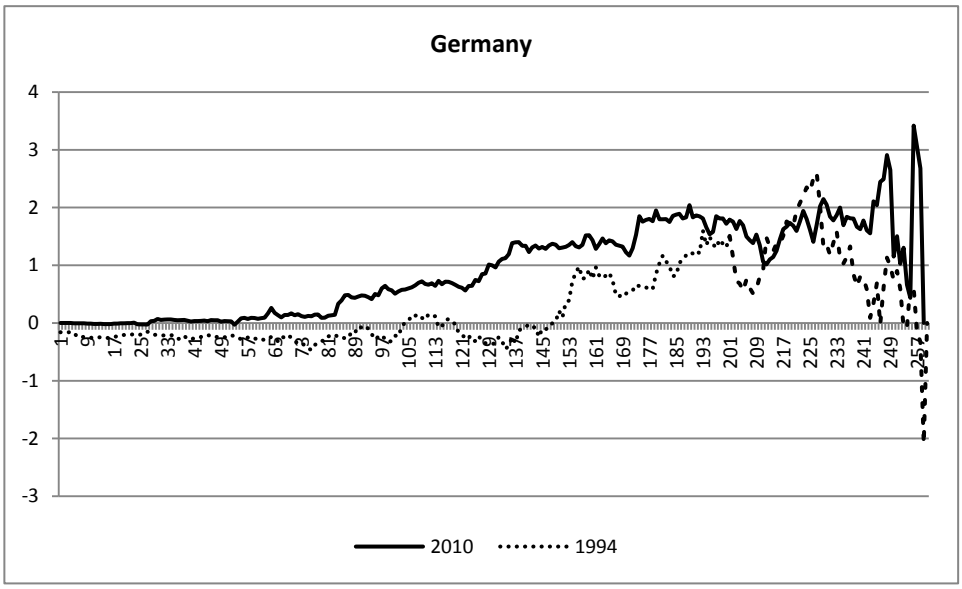
Figure 4. Specialization and world demand: the cumulated LFI for China

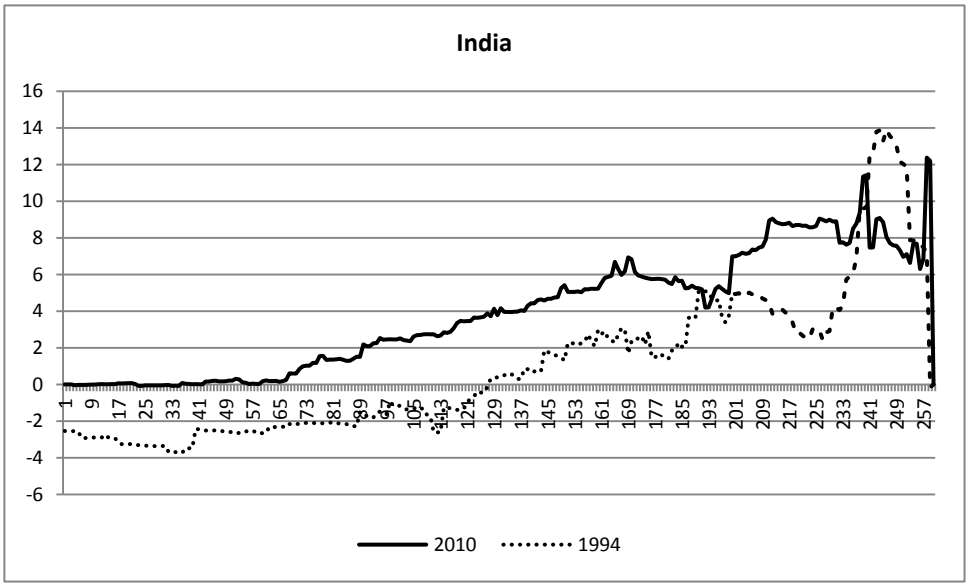


Note: items ordered by share on world import from the lowest to the highest

Figure 5. Specialization and world demand: the cumulated LFI for France, Germany, India, Brazil, Italy, Japan, USA and UK



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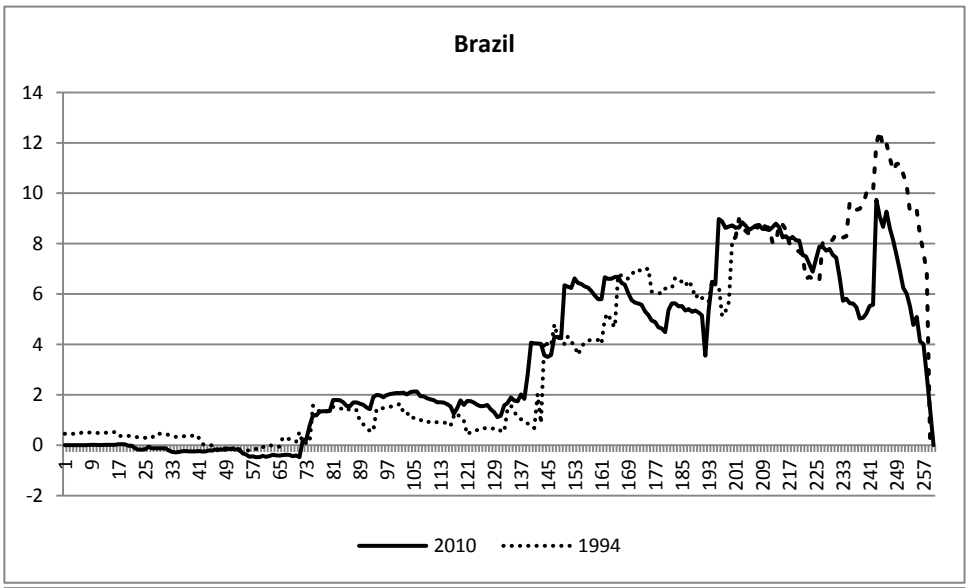
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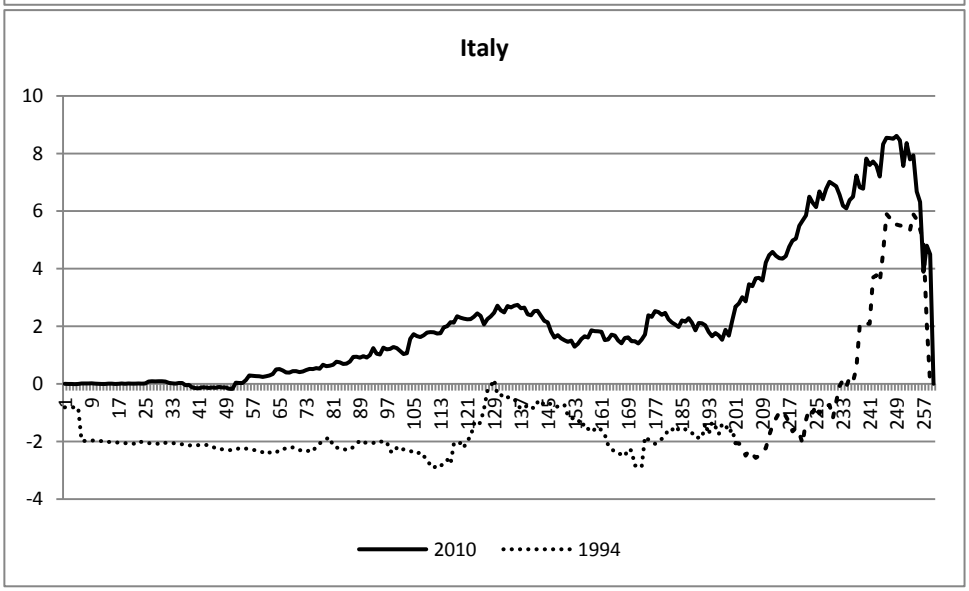
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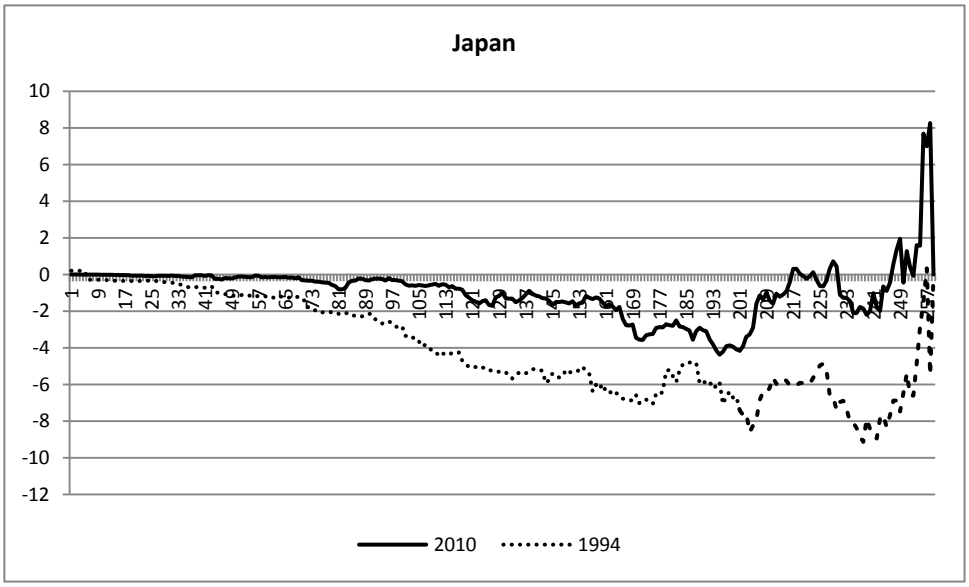
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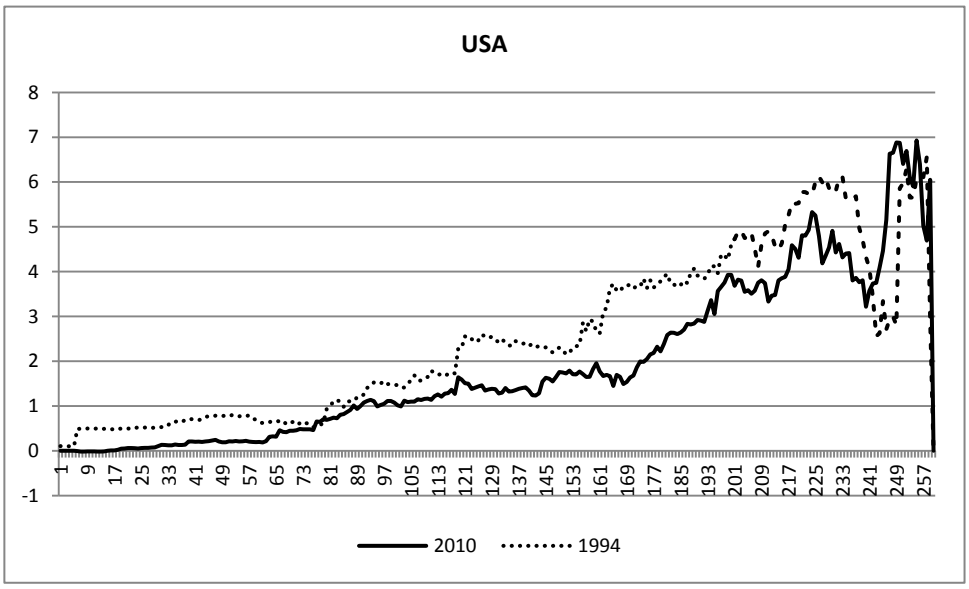
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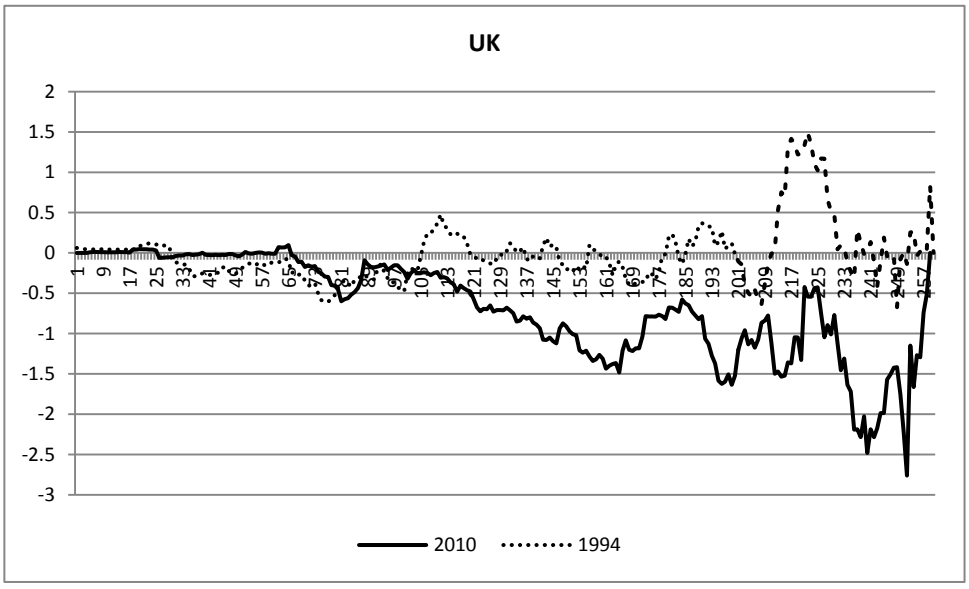
1994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