The "China effect" on EU Exports to OECD markets – A focus on Italy

Giorgia Giovannetti[a,b], Marco Sanfilippo[b] and Margherita Velucchi[a]
[a]University of Firenze; [b]European University Institute

Abstract

This paper analyzes the indirect impact of China on the export performance of major European countries (Italy, France, Germany and Spain) in their main destination markets (OECD countries). Given a strong specialization in manufacturing sector, these EU countries are likely to be at risk from China's competition, especially in consumer goods. The heterogeneity in the production (and export) structures of EU countries makes Italy, whose productive structure is based on so-called "traditional" sectors, most vulnerable to China's competitive pressure. Using data for the period 1995-2009, this paper estimates the possible displacement effect at sector level. Results show that there is a considerable variation in different EU countries' exposure to China's competition and that, in some sectors the Chinese exports effect is, indeed, strong. This is particularly true for the more recent period, after China has entered WTO and for Italy, both in traditional and more capital intensive sectors.

Acknowledgements

We wish to thank for their comments participants to the workshop "The Chinese Economy", organized by the Bank of Italy in Venezia, November 2010; to a seminar at the Vienna Institute for International Economic Studies (Wiiw), June 2011, to the annual conference of the Chinese Economic Association in Dublin, July 2011 and to the European Economic Association Meeting in Oslo, August 2011 as well as an anonymous referee. Giorgia Giovannetti thanks FIRB 2007 for financial support.

1. Introduction

The rapid growth and international integration of China in the last thirty years has had a very strong impact on the world economy. Having gone through a rapid process of structural transformation as well as international integration, while increasing its exports, China has also been upgrading its production quality. Its export market share has increased dramatically from a mere 1% in the early 1980s to over 10% in 2009, when China overtook Germany to become the first world manufacturing exporter. There is a wide and increasing literature on whether these developments are likely to result in a change in Chinese comparative advantage towards more sophisticated productions and, therefore, on whether sectors more subject to the Chinese competition are changing with potentially disruptive consequences on a number of countries.

Against this background, this paper analyzes the impact of China on Italian exports to its main destination markets, comparing it with the impact on the export performance of other three main manufacturing exporters in EU (France, Germany and Spain). Among developed countries, and these four countries in particular, Italy is likely to be one most at risk from China's competition, given its specialization in low technology manufacturing products. This paper aims at measuring the existence of a displacement effect at sector level, exploiting the potentials of a highly disaggregated dataset.
The paper proceeds as follows. Section 2 briefly reviews the literature on the upgrading of Chinese exports. Section 3 provides the analytical framework referring to the literature on the impact of China on developed countries through the trade channel. Section 4 specifies the econometric model, describes data, methodology and results. Section 5 concludes, summarizing the main findings.

2. The upgrading of Chinese exports: a sketch of the main issues

2.1 The structural composition of Chinese exports

Since its opening to international markets in 1978, China has been characterized by its capacity to supply large quantities of low cost manufactures. Over time, China has widely increased the range of products that it exports. Analyses based on the most disaggregated statistics on trade (at the 6-digit of the Harmonized System), show that in the mid 2000s China was exporting as many products as Germany, which is the country exporting the greatest number of products worldwide (Schott, 2004).

China started with a cautious approach to foreign trade, marked by tight controls on foreign-trade regime, import substitution and an overvalued exchange rate. In the pre-reform era, characterized by a small share on world trade, capital intensive goods represented the bulk of Chinese exports. According to Branstetter and Lardy (2006), in 1985, the largest component of Chinese export was petroleum (20% of total). Following an intense liberalization process started in 1984[1], exports have grown rapidly and their structure shifted to labor intensive commodities, especially textiles, garments and miscellaneous manufactures (Naughton, 2007). After the slowdown due to the 1997/98 Asian financial crisis, a new wave of liberalizations occurred during the process of the definitive admission of China to WTO of December 2001. The trade surge that followed WTO-accession has been characterized by a further change in the export structure across the manufacturing sector. As it had already happened to other developing countries, especially East Asian countries,

[1] According to Naughton (2007), the main political measures to promote exports have consisted in a de-monopolization of foreign trade regime, with more trading companies allowed to trade; the establishment of the export-processing trade regime granting special status to foreign invested enterprises (FIEs); a real devaluation of renmibi of 60% to the dollar (that has been kept substantially up to 2005, with an exceptional overvaluation in correspondence of the Asian financial crisis of 1997).

there is evidence of a reallocation of traditional Chinese exports (namely footwear, textiles, toys) in the manufacturing sector. Over the last decade, the composition of the manufacturing sector has moved towards more sophisticated categories of products, with a growing relevance of machinery and transport equipment[2] compared to lower value added categories[3]. Looking at 2-digit data from the SITC classification, it is possible to note a sharp decline in the contribution of the low technology manufacturing, including textiles, to total exports. This fall in traditional exports has corresponded to a sharp increase of higher technology sectors weight. This evidence triggered a lively debate, shortly refereed to below, on how much of this structural change can be attributed to an upgrading of export capabilities of Chinese firms.

2.2 The debate on China's exports sophistication

The changes occurring in China's export structure have been the focus of a recent stream of research, aiming at understanding whether this structural change can be considered exceptional for a country still at an early stage of economic development and which factors have mostly contributed to it. This research question triggers different considerations. A first issue is whether not only developing but also developed countries and not only labour intensive but also capital intensive goods are affected by the competitive threat from China. At the theoretical level, the debate on the increase of export sophistication of developing countries may help to shed light on both the 'old' and the 'new' theories of trade. It focuses on the aspects related to narrow the concept of specialization to different stages of value-added within the product space and on the effects of the specialization/diversification of their export structures on international

[2] The SITC-7 group.
[3] Namely SITC-8 miscellaneous manufactures and SITC 6 manufactured materials

prices. Also, this research highlights the nexus between structural transformation of developing countries and their economic growth.[4]

The pioneering study of Lall and Albaladejo (2004) has shown that, starting in the nineties, Chinese exports have slowly moved from traditional low- technology specialization to medium and high-technology productions, drawing particularly on the technology transfer from foreign multinational enterprises (MNEs) and the high spending in research and development (R&D). According to this literature, over time, this may induce a shift in the competitive pressure from developing Asian countries to more developed ones.
Rodrik (2006) is the first to show how Chinese exports have become relatively more sophisticated since 1992 and that, in 2003, the export structure of the country was more similar to that of a country with an income per capita three times higher than the Chinese one.[5] The so-called "China is special" argument (Xu, 2007) proposed by Rodrik has been confirmed in two recent studies by Schott (2008) and Fontagné et al. (2008). Both studies measure export sophistication by means of unit values. Schott (2008), with an analysis up to ten-digit disaggregated data on US and using an export similarity index, shows that Chinese exports are becoming increasingly similar to those of OECD countries. Nonetheless, on the basis of unit values, he also shows that Chinese products are still lagging behind OECD countries in terms of quality, especially in the machinery sector and in manufacturing materials (group SITC-6). A similar conclusion is reached by Fontagné et al. (2008). Using data on the unit value of exports, Fontagné et al. (2008) find that, the similarity between the north (EU) and the south (China) decreases when the analysis is carried out with more disaggregated data and market shares at the prod-

[4] The chapter by Marvasi in this book looks specifically at China's structural transformation and provides a more detailed review on some of these issues.
[5] The work of Rodrik is based on the export sophistication indicator EXPY that had been previously developed by the same author together with Hausman and Hwang (Hausman et al., 2007).

uct level. This suggests that “northern” countries still maintain a higher specialization across varieties within the same products, a view recently challenged by Pula and Santàbarbara (2011), who criticize the use of unit values as a proxy of quality in the case of China. Pula and Santàbarbara (2011) claim, first, that unit values do not take into account tariffs, taxes and distribution mark-ups, all having an impact in the final price of the product but not on its quality. Indeed, in case taxes are higher, Chinese companies have to sell their products at lower values to be competitive. Secondly, production costs and exchange rates have an impact on final prices, widening the gap with the product quality. They estimate the quality of Chinese exports to Europe by adding information on market shares and find that, despite the lower unit values, the quality of Chinese exports is higher compared to other developing countries.

Objecting to the hypothesis of export sophistication, a different strand of literature emphasizes external factors (including processing trade, inward FDI and foreign invested enterprises), or identifies internal conditions (domestic policies and regional disparities) as contributing to the recent upgrade in Chinese exports. Xu and Lu (2008), Amiti and Freund (2008) and Mayneris and Poncet (2010) for instance emphasize the importance of processing trade (noting that analyses focusing on China's export upgrading along the lines of Schott (2008) tend to neglect the role of imports and especially imported inputs. Data on aggregate trade flows might suffer some limitations, the main being what is called a “statistical illusion”, i.e. the specialization of a country in the lowest value-added activities into the more advanced sectors (Lall, 2000). This occurs in those sectors (like the SITC 7, and especially in machinery and transport equipment) largely characterized by trade in parts and components (Jongwanich, 2007). For long time, processing trade has represented an important characteristics of Chinese exports, which have been historically linked to inward FDI (Liu et al., 2002), given that the great-

est share of export from China still comes from foreign invested enterprises. The most recent data show the relevance of processing trade on total Chinese exports (ranging from 53% of China custom statistics data to 68% of international organization data). Nonetheless, some other works, that focus on the growing trade surpluses of China over the recent years, have shown that the structural change of Chinese export might have contributed to a progressive de-linkage between imports and exports. These studies claim that China is starting moving up the value chain (Humprey and Schmitz, 2007), thanks to a more prominent role played by domestic production (spurred by growing investment) and a declining relevance of imports of processing goods (Cui and Syed, 2007; Yusuf, 2008; Winters and Yusuf, 2007).

Foreign invested enterprises (FIEs) also affect significantly the structure of Chinese exports, accounting for about 30 to 50% of Chinese exports, especially in technologically advanced sectors (Dean et al., 2007). Koopman et al. (2008), using input/output tables, find that the domestic value added is lower than 50% in more sophisticated sectors that accounted for 44% of total exports in 2002; 50-65% in 15 sectors (especially labor intensive such as toys, arts&craft manufacturing) that account for 22% of total exports and prevalent in the remaining 33 sectors that account for one third of total exports (especially the apparel). Pula and Santabàrbara (2011) get to similar conclusions showing that, during the last decade, quality of Chinese exports has risen substantially in sectors such as office machines, where the presence of foreign firms is prevalent: in 2007 China became the second highest quality exporter to Europe. However, the opposite occurs in sectors like wearing and apparel industry, where the domestic content of production is high; these sectors do not show a significant quality upgrade.

A different line of research highlights the role of internal factors such as domestic policies and the existing disparities in the distribu-

tion of wealth among the Chinese territories. According to Rodrik (2006), Chinese policies to attract foreign investors, stimulating technology transfer and promoting the development of selected sector have been of vital importance in enhancing the structural change. In line with it, Vaidya et al. (2007) illustrate how the emergence of some domestic firms in high tech sectors (such as the telecommunications) has been promoted by government policies both in terms of the provision of a favorable policy regime and through opportunity of leveraging capabilities from foreign firms[6]. In addition, Koopman et al. (2008) considered the government's efforts in promoting special economic zones (e.g. EPZs and high-tech zones) and investing in human capital as having a strong positive impact on the sophistication of export structure.

2.3 The evolving nature of China comparative advantage

The arguments presented above may cast some doubts on the fact that China's export structure has really undergone an upgrading process. However, many indicators point to the evidence of a structural transformation of Chinese exports. The rest of this paragraph investigates the likely consequences of the structural transformation on the pattern of comparative advantage of China.

Vaidya et al. (2007) find evidence of rising comparative advantages for high-tech products, adopting the OECD technological taxonomy to classify Chinese exports by sectors and using the Balassa index[7]. This rise in revealed comparative advantages is consistent with two additional facts: the growing share of these sectors in international

[6] As a matter of fact, the recent rise of Chinese FDI abroad is a consequence of this. Many Chinese MNEs are currently involved in international ventures, often pushed by domestic policies, often with the aim of enhancing their competitive advantages in many advanced countries, including Italy (cf. Pietrobelli et al., 2010).

[7] High tech products as a group, moved from 0.7 in 1987 to 2.16 in 2006 driven by automatic data processing equipment; telecommunication equipment and optical instruments

markets and the positive trade balance of China in the same sectors. On the whole, according to the authors, this pattern of specialization sees China keeping its competitive advantage in low-tech productions and gaining an advantage in end-of-the-spectrum productions in high-tech sectors. This last point is confirmed by a detailed study on the electronics sector (Van Assche and Ganges, 2008) which shows that Chinese exports have a comparative advantage consistent with the country's level of development (measured by the GDP per capita), since it lies in the lowest value added products.
Other analyses showed that, rather than a real shift in the nature of comparative advantage, China is currently experiencing an increase in the number of sectors where it enjoys a comparative advantage (Qureshi and Wan, 2008). In summary, several authors seem to reject the assumption of an absolute upgrade in the structure of comparative advantages of China (Branstetter and Lardy, 2006; Naughton, 2007).

One of the main findings of unit-value based analysis is that most of the high tech products (e.g. consumer electronics) exported by China have in general declining prices and are exported in large quantities. This is considered by some authors as an index of low production quality (Van Assche and Ganges, 2008; Amiti and Freund, 2008).
Amiti and Freund (2008) adopt a Gini index to measure whether the Chinese export structure has shown a pattern of diversification or specialization during two different years (1992 and 2005), finding strong evidence in favour of specialization. Moreover, they maintain that – at least in the case of exports to US – the shift in the export structure has not been accompanied by an increase in the varieties exported (the *extensive margin*), but rather it has consisted of an increase in the quantity of existing varieties (the *intensive margin*). This has significant implications for the theoretical debate. On the one hand, consistently with 'old' trade theories, the Chinese economic growth has been accompanied by a specialization in its ex-

ports. On the other, the increase in specialization and the corresponding rise in the *intensive margin* of trade have had a strong influence on international terms of trade, making prices of manufacturing goods more competitive worldwide. Indeed, Kaplinsky and Santos-Paulino (2005) use EU imports (at the 8-digit HS from Eurostat) to test for recent trends in unit values in the manufacturing sector. They show that export prices are most likely to fall in low income exporters, especially in those sectors in which China is an important exporter.

3. The impact of Chinese exports on EU exports

China's sustained pattern of economic growth over the last three decades has influenced other economies in the world through a number of different channels, with trade being the most significant one (Arora and Vamvakidis, 2010). Following China's entry into the WTO in 2001, a stream of the literature (Shafaeddin, 2002; Yang, 2006) has investigated the possible impact on trade performance of different groups of countries mainly focusing on East Asia, given the crucial role of China in the re-organization of global production networks in its home region . Indeed, China is now specializing on assembling intermediate products from the neighbor countries (Gaulier et al., 2006). There is evidence that changes in Chinese trade specialization threatened both the "mature tigers" and the "new tigers" in more advanced segments of production (Lall and Albaladejo, 2004; Eichengreen et al., 2004; Greenaway et al., 2006; Yusuf, 2008). Only recently, some contributions analyzed the impact of China on other developing countries in Latin America (Jenkins et al., 2008) and Africa (Giovannetti and Sanfilippo, 2009).
Little attention has been given so far to the possible impact of Chinese export on developed countries, whose productive structures have been considered to be less at risk, due to their relatively more sophisticated production. However, some developed countries spe-

cialized in the manufacturing sector might be "at risk". A detailed analysis by Cheptea et al (2010) points to the heterogeneity of developments within developed countries (EU, US and Japan) and among sectors against the rise of Chinese market shares. They show that, on average, EU countries have performed better than US and Japan[8]. Italy is an interesting case because its productive structure is based on so-called "traditional" sectors, i.e. those less intensive in technology and skilled labor. The overlap between Chinese and Italian trade specializations, furthermore, has been growing considerably over the period 1991-2001, especially in low skilled but also in some skill intensive sectors (Amighini and Chiarlone, 2005). A more recent analysis, also based on export similarity indexes, shows how, outside the Asian region, Italy is the country with the most similar export structure to China, followed by Germany (ICE-Prometeia, 2011). The same study shows that, in the case of Germany, an interesting and somewhat unexpected issue is that its similarity with China increased quite fast over the last decade.

Italy's specialization in low skilled production, whose world demand has been growing less that the world average in the last decade, has been often used to explain the country's loss of world's market shares over the last twenty years (Barba Navaretti et al, 2007; De Arcangelis et al, 2002, Lanza and Quintieri, 2008). Furthermore, several authors have shown that Italian comparative advantages have remained fairly stable over time (this being true also for EU27, cf. Di Mauro et al, 2010). The shift in Italian specialization has been more "within sectors" than "between sectors" (Giovannetti and Quintieri, 2008). At the same time, as noted in paragraph 2.3, China has increased the number of sectors where it enjoys a comparative advantage, achieving a considerable gain also in sectors, such as

[8] Chinese gains are higher in middle and bottom segments of the market, often excluding Germany from tougher competition even though China has achieved an important diversification of its exports and is now shipping almost as many products as Germany to the US.

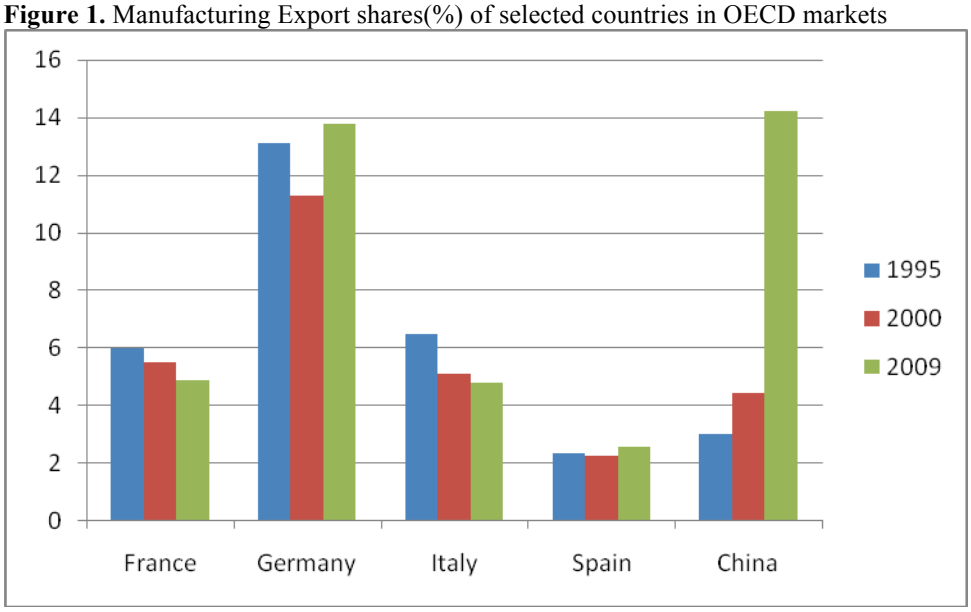
more advanced intermediate goods (74-77 of the SITC rev. 3), which were previously dominated by well established manufacturing exporters from developed countries including Italy and Germany (see Table 1).

INSERT HERE

Table 1. Balassa index of Revealed Comparative Advantages at the 2 digit SITC rev. 3 for selected sectors

This has favoured a rapid increase of Chinese shares on global markets, and a catching-up on developed countries. This trend is even stronger considering the manufacturing sector only (ICE, 2010). Figure 1 shows the remarkable increase of Chinese export shares in OECD markets. Germany has kept fairly stable market shares over time, with a slight increase over the last decade despite the rapid growth of China, while France shares have been decreasing.

Figure 1. Manufacturing Export shares(%) of selected countries in OECD markets



Source: Authors' elaboration on UN Comtrade data accessed via WITS

Historically, China's main source of competitive advantage has been related to low cost of factors (Shafaeddin, 2002). Hence, Chinese

competitive advantage has resulted in a strong downward pressure on export prices in the manufacturing sector. Fu et al. (2010) in a recent work show that, over the last twenty years, Chinese export competitiveness has influenced the export prices of almost all country groups, including high income countries in low technology product markets. Focusing on Italy, Bugamelli et al. (2010) show that the competitive pressure by Chinese exports has contributed to a decrease in output prices of domestic firms, especially the smaller and those specialized in traditional sectors. Fontagné et al. (2008) adopt the unit value ratio of exports at 6-digit of the harmonized system for all the country pairs to show that the relative prices of Chinese exports in 2004 were substantially lower than those of developed countries (around 30% of EU25, US and Japan's prices), while Pula and Santabàrbara (2011) show that the gap in unit values of exports between China and the EU-15 was more or less constant (at about 30%) over the period 1995-2007.

4. The Model

4.1 The empirical analysis

In this paper, we estimate a gravity model on bilateral trade to analyse the dynamics of competition between exports of China and those of selected EU countries.

Gravity models, used to describe how two forces are attracted to each other in physics, perform particularly well in applied analyses. They have been firstly introduced in economics by Tinbergen (1962) to analyze bilateral trade between two countries, and, since then, have been widely used to explain international trade dynamics.[9]

[9] For instance, with the help of gravity models, the impact of trade-related policies such as the effects of participation to free trade agreements (Rose, 2003; Fontagnè and Zignago, 2007) or to monetary unions (Serlenga and Shin, 2004) can be confidently assessed.

An extended version of gravity models, first proposed by Eichengreen et al. (2004), has been recently used to measure the effect of Chinese export on other Asian countries' exports (Eichengreen et al., 2004; Eichengreen et al., 2006; Greenaway et al., 2006) and on Sub Saharan African countries exports (Giovannetti and Sanfilippo, 2009). ISAE (2005) has adopted a similar model to assess the effect of competition of Chinese exports on three EU countries (Italy, France e Germany) for the period 1993-2003. This augmented version includes Chinese exports to the same markets among the independent variables, thus controlling for possible competitive effects. Due to possible endogeneity a two stage least square (2SLS) estimator based on the instrumental variables (IV) method is usually adopted. According to Eichengreen et al (2004), endogeneity is due to the fact that any unobservable factor that affects a country imports from the exporter may also have an impact on the imports from China.

In this paper, we aim at identifying the impact of China's exports on four major EU manufacturing exporters: France, Germany, Italy and Spain. More precisely, we check whether and how EU exporters are displaced on OECD destination markets by Chinese exports. We also investigate whether Italy is more affected than its EU competitors, given its structural characteristics and its exports composition. Finally, we study whether, and to what extent, it is true that Germany, with a relatively more advanced productive structure, is less exposed to the same risk[10].

We estimate the following model in a panel context:

[10] Indeed, while analyzing four EU countries, in what follows we mainly present and comment results on Italy and Germany because their different structural characteristics make them the most interesting cases to look at.

$$X_{i,j,z,t} = C + \beta_1 CH\_EXP_{j,z,t} + \beta_2 GDP_{i,t} + \beta_3 GDP_{j,t} + \beta_4 T_j + e_{i,j,z,t} \quad (1)$$

Where $X_{i,j,z,t}$ represents the value of exports of country *i* (France, Germany, Italy and Spain) to country *j* in sector *z* in year *t*. $GDP_{i,t}$ and $GDP_{j,t}$ represent the GDP levels of the exporter and the importer at time *t,* respectively, T_j is a country and time invariant set of variables including factors that may favour or limit trade flows at time *t*: bilateral distance between the exporter and the importers, lack of access to sea, common boundaries and common language between the exporter and the importer. Finally, $CH\_EXP_{j,z,t}$ represents the value of Chinese exports to country *j* in sector *z* in year *t.* A negative sign of the coefficient of this variable (and its statistical significance) indicates an inverse relationship between Chinese and the exporter, suggesting a substitution effect (everything else being equal). The error component $e_{i,j,z,t}$ is i.i.d. and normally distributed.

As in Eichengreen et al. (2004), in this paper we use a two stage least square method with instrumental variables to address the issue of endogeneity. In line with existing literature, we find that Chinese exports are endogenous and that distance from China of importing country j and Chinese GDP are good instruments to eliminate the endogeneity introduced by the Chinese exports regressor.[11]

4.2 Results – full sample.

The dataset covers the period 1995-2009 and includes the group of OECD importers. Data on bilateral trade flows, originally classified according to the harmonized system (1992) at 6-digit level, come

[11] In particular, the Wu-Hausman test of endogeneity for the variable lch_v_export rejects the null Hp of endogeneity (p-value=0.0000). The Kleibergen-Paap rk statistics perform a LM test, testing the rank of matrix, and reject the null of underidentification while the Wald F version of Kleibergen-Paap rk statistics similarly refuse the null of weak identification

from the BACI dataset published by CEPII (cf. Gaulier and Zignano, 2008). Data have been re-aggregated according to the Standard International Trade Classification (SITC) revision 3 at the two digit level.

Bilateral distances, measured as simple distance (in Km) between the two most populated cities, comes from the CEPII, as well as the dummies indicating the lack of access to the sea and the territorial contiguity between the exporter and the importer. Data on GDPs of the exporter and the importers are from the World Bank World Development Indicators.

Except for the two dummies, all variables have been transformed in natural logarithms. Descriptive statistics of the (time variant) variables are reported in Table 2.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lv_export	32700	10.728	2.265	-0.480	17.050
lgdp	32700	26.817	1.500	22.672	30.296
Lex_gdp	32700	28.064	0.484	27.074	28.922
ldist	32700	7.701	1.116	5.156	9.883
Lch_v_export	32700	10.834	2.507	-0.736	17.652

Table 3 reports the results for model (1) taking into account a sample including the OECD countries as destination market and all sectors within the manufacturing at the same time for the four exporters object of the analysis. In order to take into account possible sources of heterogeneity arising from country- and sector- specific factors, we have introduced country fixed effects in the regression and clustered standard errors by sectors.

Table 3. Estimation results of the general model - Manufacturing sector[12]
1995-2009

	(I)
lv_export	IV 2SLS
Lgdp	0.591***
	(0.121)
lex_gdp	1.389***
	(0.133)
Ldist	-0.414***
	(0.0709)
landlocked	-0.860***
	(0.291)
Contig	0.629***
	(0.0653)
comlang_off	0.608***
	(0.0705)
lch_v_export	-0.111
	(0.0732)
Constant	-39.53***
	(3.318)
Observations	32,700
R-squared	0.584
Country effects	Yes
Wu-Hausman	341.57 (0.000)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Gravity type control variables have in general the expected sign and are highly significant. Exports grow with an increase in supply and demand factors (represented by a positive sign of the exporter and importer GDPs) and are mainly directed to those countries with whom the exporters share a border or with those where a common

[12] Manufacturing sector is defined as the one including the SITC codes from 61 to 89.

language is spoken. On the other hand, exports decrease with the distance and tend to further decrease in countries that lack an access to the sea, the latter being a strongest barrier to trade compared to the former.

The Chinese exports' coefficient presents a non significant sign, indicating that, at such an aggregate level of analysis, counterbalancing forces are set in motion and there is no competitive effect. However, the large confidence interval suggests a high variability of the China effect among the different exporters and sectors. Hence, in the next paragraphs we estimate model (1) for each country and by disaggregating the manufacturing sector according to its main divisions.

4.3 Results by sector and by exporter

We exploit the multi-country and multi-sectoral dimension of our dataset by providing results for sub-sectors within the manufacturing and especially by running model (1) disaggregated by exporter. Table 4 summarizes the most relevant results, showing for each EU country only the sign and the level of significance of the coefficient of Chinese exports to OECD markets[13].

[13] The complete set of results, available on request, is not reported for reasons of space.

Table 4. Estimation of the coefficient Ch_export for sectors in the manufacturing (1995-2009)

SITC	Description	Italy	Germany	France	Spain
61	Leather manuf.	x	x	1.32***	x
62	Rubber man.	-0.046	x	0.095*	x
63	Cork and wood manuf.	x	x	0.76***	x
64	Paper, and articles of paper	x	x	0.43***	x
65	Textile yarn, fabrics	-0.35**	-0.047	-0.12	-012
66	Non-metallic mineral manuf.	-0.073	x	x	x
67	Iron and steel	x	0.92***	xx	-0.18
68	Non-ferrous metals	x	xx	x	x
69	Manuf. of metals, n.e.s.	-0.14**	0.11**	0.11**	x
71	Power generating mach & equip.	0.42***	0.31***	x	x
72	Machinery for specialized industries	-0.014	0.12***	0.21***	x
73	Metalworking machineries	x	0.17***	0.74***	x
74	General industrial machinery&equipment	0.113**	x	0.25***	0.18*
75	Office machines	-0.92***	-0.018	-0.12**	x
76	Telecommunications mach	x	x	0.43***	x
77	Electrical mach	0.11**	0.18***	0.07	x
78	Road vehicles	x	x	x	x
79	Other transport equipment	x	0.86	0.96***	x
81	Prefabricated buildings, sanitary, heating etc..	-0.069	x	x	-0.07
82	Furniture	-0.074	x	x	x
83	Travel goods	x	x	0.82***	x
84	Articles of apparel and clothing accessories	-0.37***	-0.049	0.097	x
85	Footwear	-0.55***	x	-0.28*	x
87	Professional, scientific apparatus	x	0.24**	0.18*	-0.02
88	Photographic apparatus	-0.22	-0.027	x	x
89	Miscellaneous manufacturing	-0.23***	x	x	x

*** p<0.01, ** p<0.05, * p<0.1

Number of observations: 315

Note: x and xx denote respectively the cases in which the Wu-Hausman test does not report the endogeneity of the variable ch_export making the adoption of an instrumental variable approach not efficient and the few cases where the model was not running.

Results in Table 4 suggest that the effect of Chinese competition varies substantially among sectors and countries. It is straightforward to notice the different extent to which different countries have absorbed the huge growth of Chinese exports to the OECD markets. At one extreme there is Germany, which has not been significantly affected by Chinese competition in any of the sectors considered. This probably represents a signal of the country's specific capacity to change its sectors of specialization as well as to position itself at a more sophisticated level of production. At the other extreme there is Italy, whose exports fell in five sectors in correspondence to Chinese exports' growth[14]. With this respect, it can be noticed how traditional sectors such as the clothing, apparel and footwear (SITC 84, 85, and textiles yarn, SITC 65), have been subject to a large impact from China, possibly given to their low technological content in a context of competition largely based on costs of factors. Different considerations may concern the competitive impact estimated in sector SITC 75 (office machines), that include the production of more complex goods. In this sector, also France has been outnumbered by the large increase of Chinese exports. In the case of Spain, the fitting of the model is limited to few sectors, so that it is difficult to get to more general considerations.

The counterintuitive presence in some sectors of a positive and significant coefficient could be due to a strong increase in the demand or to high levels of processing trade leading to a simultaneous increase in intermediate goods (most likely to be exported by China) and final goods (from EU exporters). The high level of aggregation of the data, which limits information on the quality of individual products, or the lack of information on the concentration of exporting firms within sectors can be other possible explanations.

[14] Indeed, also in other six sectors the coefficient is negative, though not significant (i.e. 11 out of 26 considered).

4.3.1 Is there a WTO effect?

Table 4 suggests that the China effect has hit the four European countries in a very heterogeneous way; also the competitive pressure from China has been spread heterogeneously across sectors within the four countries under analysis. These sources of heterogeneity may be due to the relatively long time span of our sample . During this period China has strongly liberalized its external sector and has undergone severe reforms to be admitted to the WTO. We maintain that, though some form of competitive pressure – especially in low tech sectors – certainly existed already during the 1990s, the competitiveness of China has increased and with it the possible impact on other countries' export performance as a consequence of the country's accession to WTO. From an econometric point of view, the structural stability of the parameters of interest may be undermined by the existence of a structural break in the series, assuming that both the intercept and/or the slopes of the parameters may change over different periods. When – as in this case – the point of structural break is known a priori (i.e. 2001) a modified Sargan-Bhargava (MSB) test proposed by Bai and Carrion (2009) can be used[15]. The test statistics computed on the variable Ch_exports is highly significant ($p<0.001$) suggesting that the effect of the coefficient is statistically different across the two periods. Hence, we run model (1) confining the attention to the period post- WTO accession of China. Table 5 below reports the results for the period 2001 -

[15] Bai and Carrion analyze the presence of multiple structural breaks when testing for the unit root hypothesis in a panel data framework. They compute the MSB test as a weighted sum of partial sum processes so to get rid of the break fraction parameters in the limit distributions. It's a five steps procedure: 1) difference the data and estimate the number and locations of structural breaks for each series, 2) given the locations of structural changes, estimate the common factors, factor loadings, and the magnitudes of changes via an iterative procedure, 3)compute the residuals for each series based on the estimated quantities in step 2 and obtain the cumulative sum of residuals, 4) compute the univariate MSB test for each residual series 5) construct the panel MSB test by pooling the individuals series.

2009. To better isolate economies that are most exposed to China's manufacturing exports, we select the two EU countries which share with China a similar productive structure, though at different qualitative levels: Italy and Germany.[16]

[16] On the other hand, not significant results can be drawn for the other two countries, France and Spain, whose role as exporters in the manufacturing are lower compared to Germany and Italy and whose sectors of specialization are less overlapping with that of China.

Table 5. Estimation of the coefficient Ch_export for sectors in the manufacturing (2001-2009)

SITC	Description	Italy	Germany
61	Leather manuf.	x	x
62	Rubber man.	-0.47***	-0.15*
63	Cork and wood manuf.	xx	xx
64	Paper, and articles of paper	-0.26**	-0.48***
65	Textile yarn, fabrics	-2.73	xx
66	Non-metallic mineral manuf.	-1.15***	-0.13
67	Iron and steel	x	1.08***
68	Non-ferrous metals	x	xx
69	Manuf. Of metals, n.e.s.	x	x
71	Power generating mach & equip.	-0.37	x
72	Machinery for specialized industries	-0.31***	-0.15*
73	Metalworking machineries	x	-0.036
74	General industrial machinery&equipment	-1.36**	-0.61
75	Office machines	1.42***	2.03***
76	Telecommunications mach	x	xx
77	Electrical mach	-1.51**	-0.67
78	Road vehicles	-1.25**	-1.37**
79	Other transport equipment	x	0.82
81	Prefabricated buildings, sanitary, heating etc..	1.91***	1.34***
82	Furniture	0.81***	0.74***
83	Travel goods	x	x
84	Articles of apparel and clothing accessories	-0.62***	x
85	Footwear	-0.37***	x
87	Professional, scientific apparatus	-0.36***	-0.28*
88	Photographic apparatus	xx	x
89	Miscellaneous manufacturing	-1.77***	-0.46**

*** p<0.01, ** p<0.05, * p<0.1

Number of observations: 126

Note: x and xx denote respectively the cases in which the Wu-Hausman test does not report the endogeneity of the variable ch_export making the adoption of an instrumental variable approach not efficient and the few cases where the model was not running.

Table 5 shows that, during the post-WTO accession the competitive threat by China has been widespread across sectors for both EU countries. It is worth noting how Germany, which over the whole period was less affected by China's competition, after 2001 shows a displacement in its exports to OECD markets in a number of significant sectors. Among them, behind the resource-based manufacturing divisions included in the group SITC-6, the most significant ones are certainly those in the group SITC-7, including the medium technology[17] sector of machineries for specialized industries machineries and equipment and road vehicles. Among the high-technology sectors, only exports in the group 87, including professional and scientific apparatus, have significantly reduced in correspondence of a rise of Chinese exports to OECD markets, since as expected, the technology embodied in these sectors seems to better shelter them from price competition.

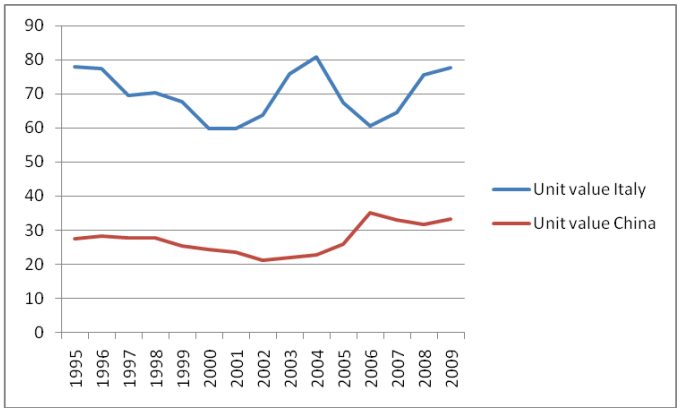
Also in post WTO accession period, however Italy has been most severely affected by Chinese competition. The number of sectors where Italian exports have fallen in correspondence to an increase of Chinese ones is substantially larger compared to Germany. Table 5 shows that all the sectors of the so-called "made in Italy" suffered the pressure of Chinese exports and their exports have been displaced in OECD markets. For such traditional sectors, it is worth emphasizing how the "China effect" seems to be structural, given that they enter the regression with a negative and significant sign also for the sub-period 1995-2000. During the most recent period, however, also more advanced sectors like medium technology intermediate goods in the SITC-7 group (machineries for specialized industries or road vehicles) and high-technology goods (electrical machineries or professional, scientific and photographic apparatus), have been displaced.

---

[17] The distinction between resource-based, low-, medium- and high-technology sectors is based on Lall's classification (Lall, 2000).

Recent trends in Italy's specialization can help to understand these results. As for the Chinese competitive impact on traditional products, and consumer goods more in general, it might help to highlight intra-sectoral dynamics. In Italy, a number of products in traditional sectors have recently undergone a quality upgrading (Marvasi, 2010; Lanza and Quintieri, 2008). Chinese products are likely to have occupied the lower end of the markets with a possible segmentation of demand in destination markets. Indeed, data on the unit value of exports, also available in BACI dataset[18], suggest that some of the sectors were Chinese competition is higher are characterized by large gaps in the average unit values of exports, possibly signaling quality differential. As it is possible to see from figures 2 and 3, this is the case both for a traditional sector like "clothing-apparels" and for a more sophisticated one such as "professional products".

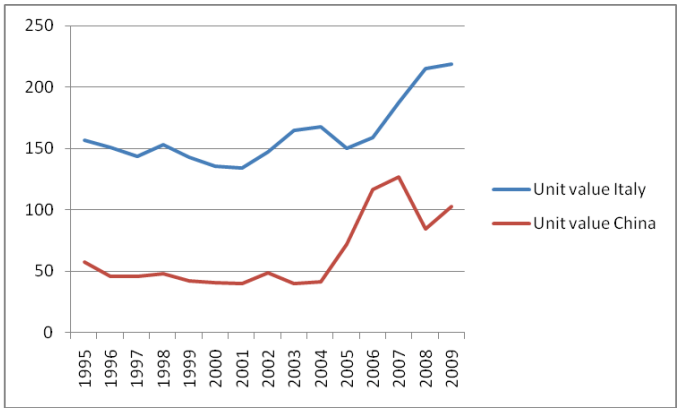
Figure 2. Average unit value of exports by Italy and China to OECD markets in sector SITC-84



Source: Authors' elaboration on BACI

[18] The value reported in figures 2 and 3 has been computed using data at the 6 digit level of HS-1992 classification. It is the average of the median values of Italy's and China's unit values of exports for each product at the 6-digit level to the whole group of OECD markets in a given year.

Figure 3. Average unit value of exports by Italy and China to OECD markets in sector SITC-87



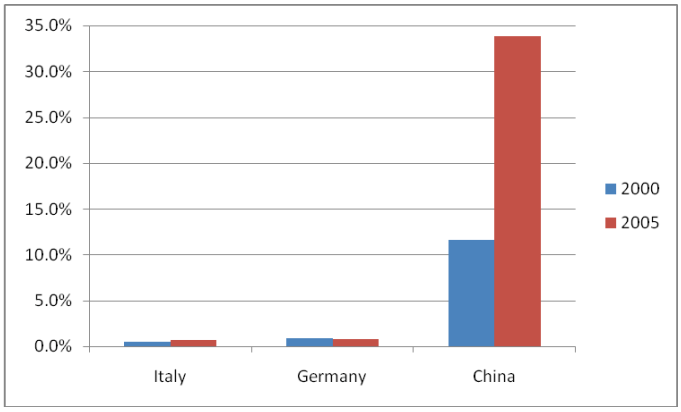
Source: Authors' elaboration on BACI

On the contrary, the increasing competition on mid- and high-technology sectors could be due to Italy's scarce capacity of changing its specialization model, moving to more advanced sectors, against the highly dynamic performance of China . This however, should not be overemphasized. Results might depend also on the role played by trade in parts and components. Chinese exports to OECD markets in such sectors is often characterized by high shares of trade in parts and components, while Italian (or German) exports are mostly in the form of ordinary exports.

An example using data from input-output tables made available by OECD can help in exemplifying this feature. Figure 4 below reports the shares of China, Germany and Italy on US' total imports of intermediate goods, taking into account intra-sectoral trade in the office machines division (SITC-75). Data show that in this sector the role of intermediate inputs from China is overwhelming and that over time it has been growing fast. Conversely, for western exporters the role of intermediate inputs is marginal, accounting for less than 1% of total imports, suggesting thus that their exports in the sector are mainly of final goods. These differences could justify the positive sign of the coefficient on Chinese exports in table 5 and

could indicate that China and Italy (and Germany) export flows in sector SITC-75 to the US are likely to be complementary rather than competitive.

Figure 4. US' imports of intermediate goods in sector SITC-75 (% of World's total)



Source: Authors' elaboration on OECD STAN

5. Conclusions

Over the last decades, China's massive entry in international markets has been successful and this has come at the expense of a large number of countries. Recent research has emphasized the adverse impact of Chinese manufacturing exports on many developing and emerging countries. European countries were considered sheltered because of their different specialization in high tech and high quality sectors. However, the rapidly changing international environment, the increasing fragmentation of production, and related importance of global value chains, the possibility of trading tasks and offshoring have changed the picture.

This paper contributes to the literature in two directions. On the one hand, by providing evidence of rising competition towards more advanced exporters in medium and high-technology intensive sectors,

where the hypotheses of rising export similarity and of China's export sophistication are somehow supported. On the other, the paper enriches the literature on the effect of China's role in the world market, showing that also developed countries are now suffering for the increase in Chinese penetration in different sectors and that China's competition has become more evident after the country's entry in the WTO. Although EU countries, especially Germany, have had good export performance in recent years, displacement effects are feared and felt. More specifically, the paper shows that China has become a challenging competitor for EU countries even in their prime market of destination, OECD countries. Italy – specialized in low tech, "traditional" goods, fairly similar to Chinese ones and with a "static" specialization model– seems to be most at risk. Moreover, given that patterns of national export specialization tend to change slowly over time, Italy's and Europe's vulnerability to China appears unlikely to diminish in the near future.

It is important to note that our approach allows us only to give a sense of the extent to which China is in competition with other large exporters for market share but it does not account for other relevant conditions related to the role of consumers' preferences, quality upgrading or prices. Further research is needed to assess more in details these additional issues.

References

Amighini A., Chiarlone,S. (2005) Rischi dell'integrazione commerciale cinese per il modello di specializzazione internazionale dell'Italia. Rivista di Politica Economica, 95, 7-8: 63-86.

Amiti M., Freund C. (2008) An Anatomy of China's Export Growth. Paper prepared for the NBER project on the Evolving Role of China in the World Trade

Arora V., Vamvakidis A. (2010) China's Economic Growth: International Spillovers. IMF Working Paper 10/165

Bai J., Carrion-I-Silvestre J.L., (2009), Structural Changes, Common Stochastic Trends, and Unit Roots in Panel Data, Review of Economic Studies, 76(2): 471-501.

Barba Navaretti G., Bugamelli M., Faini R., Schivardi F., Tucci A. (2008) Le imprese e la specializzazione produttiva dell'Italia: dal macrodeclino alla microcrescita? Fondazione R. De Benedetti, Torino

Branstetter L., Lardy N. (2006) China's Embrace of Globalization. NBER Working Paper 12373, Cambridge.

Bugamelli M., Fabiani S., Sette, E. (2010) The Pro-Competitive Effect of Imports from China: an Analysis of Firm-Level Price Data. Bank of Italy Working Paper Series N. 737, January 2010.

Candelon, B. and Lutkepohl, H. (2001) On the reliability of Chow-type tests for parameter constancy in multivariate dynamic models. Economics Letters 73: 155 –160

Cheptea A, Fontagé L., Zignago, S. (2010). EU export performance. CEPII document de travail, 2010-12, Paris.

Cui L., Syed M. (2007) The Shifting Structure of China's Trade. IMF Working Paper 07/214

Dean J.M., Fung K.C., Wang Z. (2007) Measuring the Vertical Specialization in Chinese Trade. U.S. International Trade Commission – Office of Economics Working Paper January 2007

De Arcangelis G., Ferri G., Galeotti M., Giovannetti G (2002) Quote di mercato e competitività delle imprese italiane nel bacino del Mediterraneo e dei Balcani, in G. Galli e Paganetto L. Rapporto sulla Competitività dell'Italia: le imprese. Il Sole 24 ore, Milano.

Di Mauro F., Ottaviano GM., Taglioni D. (2009) The euro and the competitiveness of European firms. Economic Policy, 24: 5-53

Eichengreen B., Yeongseop R., Tong H. (2004) The Impact of China on the Exports of other Asian Countries. NBER Working Paper Series N. 10768

Eichengreen B., Tong H. (2006) How China is Reorganizing the World Economy. Asian Economic Policy Review, 1: 73-97

Fontagné L., Zignano, S. (2007) A Re-Evaluation of the Impact of Regional Agreements on Trade Pattern. *Integration and Trade*, 26

Fontagné L., Gaulier G., Zignago S. (2008) North-South Competition in Quality. Economic Policy, January 2008: 51-91

Fu X., Kaplinsky R., Zhang, J. (2010) The Impact of China's Exports on Global Manufactures Prices. SLPTMD Working Paper Series N. 032, University of Oxford.

Gaulier G., Lemoine F., Unal-Kesenci, D. (2006) China's Emergence and the Reorganization of Trade Flows in Asia. CEPII Working Paper N. 2006-05

Gaulier G., Zignano, S. (2008) BACI: A World Database of International Trade at the Product-level – the 1995-2004 Version. CEPII Working Papers, draft version July 2008

Giovannetti G., Quintieri B. (2008) Commercio, Outsourcing e gli effetti sul mercato del lavoro, in Dell'Aringa, C., Giovannetti, G., Padoan, P., Quintieri, B. and Sestisto, P. (Eds.) Globalizzazione, Specializzazione Produttiva e Mercato del Lavoro, Rubbettino editore, Roma

Giovannetti G., Sanfilippo M. (2009) Do Chinese exports crowd-out African goods? An Econometric Analysis by Country and Sector. European Journal of Development Research, 21, 4: 506-530.

Greenaway D., Mahabir A., Milner C. (2006), Has China Displaced Other Asian Countries Exports? University of Nottingham Research Paper Series- China and the World Economy, N. 2006/21

Hausmann R., Hwang J., Rodrik D. (2007) What you Export Matters. Journal of Economic Growth, 12, 1: 1-25

ISAE (2005) Le previsioni per l'economia italiana – crescita e struttura produttiva, Rapporto ISAE, February 2005.

ICE (2010) Rapporto sul Commercio Estero, Istituto per il Commercio Estero, Rome

Jenkins R., Petres E.D., Moreira M.M. (2008) The Impact of China on Latin America and the Caribbean. *World Development*, 36, 2: 235-253

Kaplinsky R., Santos-Paulino A. (2006) A disaggregated analysis of EU imports: the implications for the study of patterns of trade and technology. Cambridge Journal of Economics, 30: 587–611

Koopman R., Wang Z., Wei S.J. (2008) How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added when Processing Trade is Pervasive. NBER Working Paper 14109

Jongwanich J. (2007) Determinants of Export Performance in East and Southeast Asia. ERD Working Paper N. 106, Asian Development Bank

Lall S. (2000) The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-1998. QEH Working Paper Series N. 44

Lall S., Albaladejo M. (2004) China's Competitive Performance: A Threat to East Asian Manufactured Exports? World Development, 32, 9: 1441-1466

Lanza A., Quintieri B (Eds.) (2008) Eppur si Muove. Come cambia l'export italiano, Rubbettino, Rome

Liu X., Burridge P., Sinclair P.J. (2002) Relationships between Economic Growth, Foreign Direct Investment and Trade: Evidence from China. Applied Economics, 34: 1433-1440

Mayneris F, Poncet S. (2010) The Performance of China's domestic firms: the role of foreign export spillovers. CEPII document de Travail, 2010-32, Paris.

Marvasi E. (2010) Prezzi e Qualità: in che direzione si muove l'export italiano? In ICE (2010) L'Italia nell'Economia Internazionae – Rapporto ICE 2009-2010, Istituto Nazionale per il Commercio Estero, Rome

Naughton B. (2007) The Chinese Economy: Transition and Growth. the MIT Press, Cambridge (US)

Pietrobelli C., Rabellotti R., Sanfilippo M. (2010) The Marco Polo effect: Chinese FDI in Italy. Chatman House International Economics Programme Paper 2010/04, London.

Pula G., Santabàrbara D. (2011) Is China Climbing up the Quality Ladder? Estimating cross country differences in product quality using Eurostat's Comext trade database. European Central Bank Working Paper N. 1310/ March 2011

Qureshi M.S., Wan G. (2008) Trade Expansion of China and India- Threat or Opportunity. UNU-Wider Research Paper N. 2008/08

Rodrik D. (2006) What is so Special About China's Exports? Center for Economic Policy Research Discussion Paper N. 5484

Rose A.K. (2003) Which International Institutions Promote International Trade? CEPR Discussion Paper 3764

Schott P.K. (2004) Across-Product versus Within-Product Specialization in International Trade. The Quarterly Journal of Economics, May

Schott P.K. (2008) Chinese Exports. Economic Policy, January 2008: 5-49

Serlenga L., Shin, Y. (2004) Gravity models of this intra-EU trade application of the Haushan-Taylor estimation in heterogenous panels with common time-specific factors. Edinburgh School of Economics. Discussion Paper No. 88/2004.

Shafaeddin S.M. (2002) The Impact of China's Accession to WTO on the Exports of Developing Countries. UNCTAD Discussion paper N. 160/2002

Tinbergen J. (1962) Shaping the World Economy; Suggestions for an International Economic Policy, (Appendix VI), The Twentieth Century Fund, New York.

Vaidya K., Bennett D., Liu, X. (2007) Is China's Manufacturing Sector Becoming more High-Tech? Evidence on shifts in comparative advantage, 1987-2005. Journal of Manufacturing Technology Management, 18, 8: 1000-1021

Van Assche A., Gangnes B. (2007) Electronics Production Upgrading: Is China Exceptional? CIRANO Scientific Series 2007s-16

Winters L.A. and Yusuf, S. (2007) *Dancing with the Giants- China, India, and the Global Economy*. The International Bank for Reconstruction and Development / The World Bank and The Institute of Policy Studies: Washington and Singapore

Wooldridge J.M. (2002) Econometric Analysis of Cross Section and Panel Data. MIT Press, Cambridge (US)

Xu B. (2007) Measuring China's Export Sophistication, mimeo China Europe International Business School, October 2007

Xu B. and Lu J. (2008) Foreign Direct Investment, Processing Trade and China's Export Sophistication, mimeo, June 2008

Yang Y. (2006) China's Integration in the World Economy: implications for developing countries Asian Pacific Economic Literature, 20, 1: 40-56

Yusuf, S. (2008) How China is reshaping the Industrial Geography of South-East Asia. Presented at the Conference "The Rise of China", McCulloch Center of Global Initiatives at Mount Holyoke College