China's competition and the export price strategies of developed countries

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Abstract

This paper analyzes the effects of the impact of Chinese competition on Italian export prices. We estimate separately the pricing behavior of two major sub sectors of manufacturing, consumer goods and machinery, analyzing both the price and market competition of Italy's main competitors (China and other OECD countries) in different destination markets. Results show that both channels affected Italian price strategies over the period 2000-2008, in an idiosyncratic way according to the income level of importers, sector and technology level of products exported. We find that for low technology and labor intensive products within the consumer goods the influence of China on Italy's export prices is marginal and it often triggers an upgrading of exports, especially when destination markets are high-income. Conversely, in more technology intensive goods included in the machinery and transport equipment sector China's competition has pushed Italian firms to reduce their margins, especially for products characterized by a lower specialization level.

Keywords: China, price competition, Italy **JEL classification:** F-10; F-14

1. Introduction

The international literature has devoted a great deal of attention to the exceptional economic growth experienced by China over the last three decades and its effects on other countries.

China's catching up through sustained economic growth over the past thirty years and its specialization in low tech manufacturing goods resulted in a substantial increase in competition for a large number of countries and, more generally, in a structural change in global terms of trade. Overall, the magnitude of the China impact via the trade channel is highly correlated to other countries' factor endowments and specialization and is expected to keep changing over time to the extent that the productive structure of China moves towards more sophisticated goods. This has raised questions on whether the quality of Chinese exports has recently changed, and the possible consequences of these changes on other countries. While some authors have stressed a recent relative upgrading of Chinese exports, therefore suggesting that even more advanced countries might increasingly be under the threat of Chinese competition (Rodrik, 2006; Schott, 2008), others have argued that China's specialization in labour intensive activities remains prevalent (Xu, 2007; Amiti and Freund, 2010).

Following WTO's accession in 2001, China's shares in the world's manufacturing sector have risen considerably, including in more advanced markets. How the main competitors have reacted to this threat is still a partially unexplored issue in the literature. While an established strand of the literature, based on the so-called "fallacy of composition" hypothesis, shows that prices of manufacturing goods from developing countries fell due to China's entry in the world markets, little is known on the competitive strategies of advanced competitors. Theoretically, as lower income countries specialize in low-technology sectors, developed countries react by upgrading the quality of their exports, slowly abandoning less sophisticated ones, in favour or more advanced products (Schott, 2008). Indeed, the existing evidence, mostly at the firm level, shows that China's competition has pushed producers in developed countries to reduce their margins in low-technology products, lowering their prices, while increasing the quality through vertical differentiation (Abraham and Van Hove, 2010; Bloom et al., 2011, Martin and Méjean, 2011).

The main objective of the paper is to help understanding whether in sectors with the highest competitive pressure from China, developed countries (Italy, in particular) have undertaken a competition based on prices and reduced markups or if they have upgraded the quality content of their export for any given couple of markets (including low- middle- and high-income ones) and sectors. On the one hand, our findings can complement, adopting a macro framework and considering foreign rather than domestic prices, those by Bugamelli et al. (2010), who show that the competitive pressure by Chinese exports in the domestic market has contributed to a decrease in output prices of Italian firms. On the other hand, the paper can also support the view that Italy has upgraded its exports, especially in traditional sectors, to protect its market shares from international competition (Lanza and Quintieri, 2007). To our knowledge, so far, there is no direct evidence that this has occurred as a consequence of increasing competition from lower income countries. While our study focuses on Italy, the reasoning can be extended to other manufacturing producers from developed countries.

The paper is structured as follows: section 2 reviews the literature on China's competition and on developed countries' strategies to confront it. Section 3 introduces the theoretical model and the

empirical strategy. Section 4 reports the results by main sectors and by destination markets. Section 5 concludes.

2. Literature review

The entry of China in the world market triggered a large literature on its likely effects. After the WTO accession in 2001, many studies focused on the possible consequences of the opening up of China in the international markets, for developing countries, particularly from Asia (Lall and Albadelejo, 2004; Feensta and Wei, 2010). More recent analyses, stimulated by the growing literature on China's export sophistication (Rodrick, 2006), have started to look at the competitive effect of China on developed countries as well, either by measuring the extent to which export similarity represents a threat to existing export structures (Schott, 2008; Fontagné et al., 2008) or which countries have reduced their market shares as a consequence of China's growth (Cheptea et al., 2010; Husted and Nishioka, 2010). Most of these studies argue that, despite an ongoing process of export upgrading, Chinese competition is still mainly due to cheaper cost of factors and relatively low quality of production, reflected in lower prices of exported products.

A paper by Fontagné et al. (2008) adopts data on the unit values from the BACI dataset to measure the relative price of exports at the 6-digit HS, finding that the relative prices of Chinese exports in 2004 were substantially lower compared to developed countries (around 30% of EU25, US and Japan's prices) and more competitive than those of other emerging economies (around 80% of Brazilian, Russian and India's prices). One of the main findings of unit-value based analysis is that most high tech products (e.g. consumer electronics) exported by China have, in general, declining prices and are exported in huge quantities (van Assche and Ganges, 2008). In line with these findings, Amiti and Freund (2008) adopt Gini indicators to measure whether the Chinese export structure has shown a pattern of diversification or specialization during two distinct periods (1992 and 2005), finding evidence that the shift in the export structure consisted of an increase in the quantity of existing varieties (the *intensive margin*).

A highly debated issue is that China's rise in the world economy has influenced the global terms of trade, lowering the prices in the manufacturing sector, in line with the so-called 'fallacy of composition' hypothesis (Faini, 1990). This hypothesis is based on the view that, as developing countries try to enter international markets they might face insufficient and/or highly elastic demand and start a 'race to the bottom' driving prices of exports downward (Mayer, 2003). This trend is supported by the findings of Kaplinsky and Santos-Paulino (2006). Using imports of EU (at the 8-digit HS from Eurostat) in order to test for recent trends in unit values, they show that prices of manufactures are likely to decrease more in those sectors in which China is a relevant exporter.

A first attempt to extend this analysis to other groups of countries is an empirical work by Fu et al. (2010), using data on the unit value of exports at a disaggregated level for EU, US and Japan's imports, to show that over the last twenty years Chinese price and market competition has influenced not only the export prices of low- and middle-income in sectors at different levels of technology, but also the prices of high-income countries in low-technology sectors.

Most recently, a series of analyses based on firms' level data has tested specifically how developed countries have reacted to the Chinese competitive pressure. Bloom et al. (2011) use data on European firms over the period 1996-2007 and find that EU firms tackled China's competition

(measured through China's import shares in the host markets) upgrading their production; the upgrading was measured by significant increases in key indicators such as TFP, adoption of information technology and their R&D performance. On the other hand, Bloom et al (2011) also find that firms in sectors most affected by Chinese import competition have experienced reductions in export prices, employment and profitability. Along similar lines, two works on Belgian firms find that competition from China in the domestic (Mion and Zhu, 2011) and in foreign markets (Abraham and Van Hove, 2010) has contributed to an increase in skilled workers and differentiation by increasing the number of varieties exported. Lastly, and most relevant for this paper, Martin and Méjean (2011) have measured the effect of competition from lower income countries to a sample of French firms over the period 1995-2005. They find that the increase of market shares of low-income countries has an impact on the prices of French exports, which they estimate to have increased by about 2 percentage points, the largest share of which is due to competition from China only.

Taking stock of these findings, in what follows we estimate the impact of China on the export prices of Italy using data on unit values of exports finely disaggregated by host markets and sectors. Within an international context where large economies export more at the extensive margin and at highest unit prices (Hummels and Klenow, 2005), Italy represents a case of interest, given its high persistence in specialization in traditional sectors (Di Maio and Tamagni, 2008). This has resulted in a rising similarity with the export structures of major emerging economies, one of the factors contributing to large losses of market shares over the last years (Cheptea et al., 2010), despite recent research did not find evidence of "adverse export elasticity" compared to other main manufacturing exporters (Feletthigh and Federico, 2010). Previous research, using firms' level data, shows that the prices of domestic firms have been affected by China's competition in the home market, reducing their margins in more traditional sectors (Bugamelli et al., 2010).

3. Data, model and empirical analysis

3.1 Model

The aim of the empirical analysis is that of determining Italy's export prices. Along the lines of Fu et al. (2010), we determine the prices of internationally traded goods taking into account both demand and supply factors. Let the demand function be:

$$d_t = a + by_t - cp_t + dX_t + \varepsilon_t^d \tag{1}$$

Where d is the demand, y the income, p the price, X a vector of exogenous variables affecting demand, and ε^d is a random term.

The supply function is:

$$s_t = e + fp_t + gp_t^e + hZ_t + \varepsilon_t^s \tag{2}$$

where *s* is the supply, *p* the price, p^e the expected price and *Z* a vector of exogenous variables affecting supply. Again, ε^s is a random term taking into account the unobservable factors having an impact on supply.

Expected prices are affected by their lagged levels as well as by prices of competitors. Z includes, among other variables, also exports from China and from other OECD countries. This allows us to take into account, on the one hand, the impact of larger volumes of trade arising from China's entry in the world markets and, on the other, to control for the influence of Italy's main competitors from the OECD.

We assume that the elasticity of substitution among varieties of products traded internationally is positive, meaning that for each product imports are differentiated among countries of supply (Armington, 1969).

Equalizing demand and supply in equilibrium, the price is represented by a reduced-form singleequation model, which can be written as:

$$p_{i,j,x,t} = p_{i,j,x,t-k} + y_{j,t} + y_{pc} + d_{i,j} + llock_j + er_{i,t} + q_{j,x,t} + p_{j,x,t}^{ch} + share_{j,x,t}^{ch} + p_{j,x,t}^{oecd} + share_{j,x,t}^{oecd} + \varepsilon_{i,j,x,t}$$
(3)

where the price (p) of export is function of its lagged value (the lags varying according to the autocorrelation function), absolute and per capita levels of income $(y \text{ and } y_pc)$, distance (d) and geographical remoteness (*llock*) of the importers, the nominal exchange rate (er) of the exporter and the corresponding volume of trade (q) for any given couple of product/market/year. Two ad-hoc variables are included to account for the possible impact of China on the price function: (1) the corresponding price of China's export (p^{ch}) ; and (2) the market share $(share^{ch})$ of China for product x in market j at time t. Similarly, we introduce prices and market shares $(p^{oecd} \text{ and } share^{oecd})$ computed for high income OECD countries net of Italy.

The literature on prices determinants shows consistent results across standard explanatory variables. So, for instance, prices tend to decrease with the size of the importer's market (Baldwin and Harrigan, 2011) and with an increase in the volume of exports (Ito, 2011), while they increase in markets with higher levels of per capita income (Schott, 2008; Bekkers et al.; 2012¹) and in more distant ones (Manova and Zhang, 2009).

With respect to the variables representing the China's competitive effect, their signs depend upon the likely impact on the exporter price strategy and are expected to vary according to different sectors and markets. Other things equal, a positive sign of Chinese price and/or a negative sign of the share of Chinese exports could represent a direct competitive pressure on Italian export prices. On the other hand, a positive and significant sign of the share of China exports and/or a negative sign of Chinese price indicates that, when the competitive pressure increases, Italian companies react by rising up their prices, a strategy that suggests exports upgrading. According to Bloom et al. (2011) rising market shares of lower income countries decrease the profitability to produce low value added products, freeing-up resources which can be employed in more high-tech productions therefore reducing the opportunity cost of innovation. This is not likely to happen when competition is coming from other developed countries, given that it does not reduce the profitability of producing traditional goods relative to more advanced ones (Bloom et al., 2011).

¹ Bekkers et al. (2012) find also that there is an inverse relationship between unit values and income inequality, a result suggesting that prices of goods consumed by all income groups tend to reduce with higher inequality.

3.2 Data and Methodology

Data on international prices are not easily available and they are often proxied by data on unit values. Unit values are computed as the ratio between the value and the quantity of goods traded and are considered closer proxies of export prices the more disaggregated the data used to compute them. Analyses based on unit values tend to assume a direct relation between the price of exports and the quality of products, although this relationship might be influenced by other relevant factors such as exchange rate movements, trade related policies and vertical fragmentation of production (Schott, 2008).

This paper uses data on unit values from the Trade Unit Value Database published by CEPII (Berthou and Emlinger, 2011), covering the period 2000-08 for each product classified at the six digit level of the harmonized system (HS) for a large number of countries.

Data on the corresponding trade volumes come from BACI (Gaulierand Zignano, 2010) and information on geographic variables comes from CEPII (Mayer and Zignano, 2011). Data on other independent variables, including GDPs and exchange rates, are from the World Bank's World Development Indicators and Penn World Tables. Table 1 reports the descriptive statistics of all the variables.

Table 1 here

In order to compare products and markets subject to direct competition, our database has been built by including all the products at the six digits level contemporaneously exported by Italy and China to the same market.

As for the methodology, equation (3) presents several sources of misspecification related to the possible presence of autocorrelation, endogeneity and heteroskedasticity within panels. In order to overcome these problems the Arellano-Bover/Blundell-Bond system GMM approach (Wooldridge, 2002) was adopted. The system GMM approach allows for greater efficiency in the choice of instruments in a panel with large N and small T, increasing the overall performance of the estimator vis-a-vis alternative approaches including instrumental variables or the Arellano-Bond "difference GMM". As price strategies of international competitors are often intertwined, and it is therefore difficult to discern the direction of causality (Fu et al., 2010), we treat variables representing prices (including the lagged level of Italy's prices) as endogenous using their lags as instruments. Other independent variables are considered strictly exogenous and used as instruments. As a standard test for the strict exogeneity of the instruments for a system GMM we report results of the Hansen J test for overidentifying restrictions (Wooldridge, 2002). Additionally, the Arellano-Bond test for autocorrelation to the residual is reported to detect second order autocorrelation (AR(2)) of the residuals. Finally, as suggested by Roodman (2006), we include time dummies in all the specifications so to avoid contemporaneous correlation among individuals across time, an assumption that is not taken into account in the autocorrelation test.

4. Empirical Analysis

The large number of sectors and markets covered by the dataset allows us to perform a very detailed and innovate analysis.

Our analysis focuses on the manufacturing sector, which covers around 82% of the observations of the dataset, and that includes goods classified at different levels of technology. Figure 1 reports the distribution of products included in our dataset according to their technology level and shows that the largest share of products for which China and Italy compete in the international markets incorporates low levels of technology or is characterized by high intensity of labor. Such products are mostly concentrated in the group of consumer goods (SITC-8). On the other hand, only the 22% of products belongs to the group including high technology goods, the largest portion of which is included in the group of machinery & transport equipment (SITC-7).

Figure 1 here

In line with this analysis, we run model (3) for the two main groups of the manufacturing sector according to the Standard International Trade Classification (SITC) revision 3, i.e. the one including machinery and transport equipment (SITC-7) and the miscellaneous manufacturing articles (SITC-8), which includes the consumer goods.

We grouped destination markets according to their income levels following the World Bank classification, and estimate our model (i) for a group including middle income countries (the middle lower and the middle up income groups) and (ii) the group of high income countries belonging to the OECD. Observing the geographical distributions of the products exported it is possible to notice how these two groups represent together more than 80% of total observations (Figure 2).

Figure 2 here

Before commenting the results, it is worth to further address whether the competitive effect on prices we look at has been equally affecting products at different levels of quality. As remarked in the previous paragraphs, despite a recent upgrading of Chinese manufacturing exports, there is some evidence that more advanced countries are still exporting more sophisticated goods (see Bernard et al., 2006; Schott, 2008). This seems true in the case of Italy, whereas there is cross-sectoral evidence of an overall increase in export prices despite an increase in the competitive pressure in the international markets, a strategy that underlines a restructuring process of the industrial sector towards more sophisticated productions (Lanza and Quintieri, 2007).

Given that a specific objective of this paper is to explore whether the competitive pressure on export prices is also affecting those goods for which the quality differential between products exported by China and Italy is larger, we compute the ratio between the unit values of Italian and Chinese exports (r) for each product at the 6-digit level shipped to the same market at the same time. Figure 3 plots the median value of r for the whole sample and for the two manufacturing sectors analyzed in this paper, differentiating products belonging to their technology content. Surprisingly, panel (a) of the figure shows that products belonging to high technology sectors are those where the price differential between China and Italy is smaller, whereas low- tech and labor intensive products are instead characterized by a larger gap, which has even increased over the most recent years. This has much to do with the specialization of Italy's exports, given that higher quality

products are concentrated in traditional labor-intensive sectors, especially within the consumer group. Panel (b) of figure 3, plotting the same data for products included in the subset of consumer goods, shows indeed that the gap for labor-intensive products (a group including for instance apparel and footwear) becomes even stronger. These results are also supported by the existing evidence pointing out that prices of labor intensive and low technology products exported by China have kept very low, often keeping a decreasing trend (Kaplinsky and Santos-Paulino, 2006; Amiti and Freund, 2008). Conversely, the lower gap in higher technology products which stands out from the three panels of figure 3 can be due to lower levels of specialization and upgrading of Italy in more technology intensive sectors compared to other main exporters from developed countries (Ricotta et al., 2008), as well as to the growing "sophistication" of Chinese goods, which has reflected in an increase in export prices of medium and high technology sectors, although this is mainly related to the role of foreign firms (Van Aschee and Gagnes, 2007).

Figure 3 here

4.1 Results for the group of consumer goods by income levels of importers

Table 1 below reports the results of the estimation of model (3) for exports directed to highincome OECD countries in the group including consumer goods, disaggegated by their levels of technology.

Tests' statistics, reported at the end of the table, show that in general the choice of instrument is valid and there is no second order autocorrelation in the residuals.

Considering first signs and significance of the control variables used, table 2 shows that Italian export prices to other OECD countries are largely influenced by their past levels and that they tend to increase in larger markets. The sign of the per capita income level is positive and significant for the whole group, indicating that an increase of income translates in higher export prices, but has a negative sign in more technology intensive sectors. In line with our expectations, we find that in general prices increase with the remoteness of the importers and tend to decrease in more distant markets, this being probably due the fact that unit values are reported CIF rather than FOB. The coefficient of the Italian exchange rate is negative and significant in most of the cases, indicating that a depreciation contributes to a reduction in export prices, despite the group includes EU members that share the same currency with Italy. In line with existing evidence (Ito, 2011), we find a consistent negative relation between the quantity exported and the price.

Table 2 here

Turning to the variables of interest, prices of main competitors from other high income OECD countries tend to move in the same direction of Italian prices, with no relevant distinctions due to the level of technology of products, suggesting that the prices of Italian exports in consumer goods and in richer markets tends to be responsive to that of other developed countries exporting similar goods. However, it is possible to observe as well that the pass-through is not complete, as shown by the fact that the coefficient of price adjustment is significantly lower than one, this suggesting the existence of some degrees of differentiation among similar products exported to the same markets. In addition, we find that only products belonging to low and medium technology sectors are

affected by price competition from China, with a coefficient nonetheless lower compared to the OECD equivalent.

In order to make such overall results more clear, we have run model (3) for all the products grouped according to each two-digits division of the SITC revision 3 classification. Results, reported in table A in the appendix, confirm that price competition from other developed countries is spread over all the divisions, whereas Chinese price movements affect Italy's strategies in the groups including footwear and more sophisticated products such as the ones included in SITC-87 and 88. Other products, including those in belonging to the traditional specialization in the furniture or the apparel are not directly affected by China's export prices.

It is also interesting to look at the reaction of Italian export prices to an increase of China's market shares. Results in this case are quite heterogeneous. Looking at the more aggregated picture, we notice that a stronger market pressure from other OECD countries has determined a downward pressure on Italy's price strategies. On the other hand, in line with some existing literature (Schott, 2008; Bernard et al., 2006), the impressive rise of China's market shares in this group of products and countries seems to have pushed Italian firms to reallocate their exports towards more sophisticated products to escape from low cost competition, as documented by the positive sign of the coefficient. Looking at the results by technology content from table 1, it is interesting to notice that the coefficient reporting Chinese market shares keeps its positive sign only for labor intensive and low technology products (thought being significant only for the latter group) and turns negative (but not significant) for medium and high technology groups of sectors.

Again, a more detailed picture is provided when results are reported by each division, as showed in table A. Such results demonstrate that an increase of China's market competition translates in rising prices of Italy's exports in the groups including prefabricated buildings (81) and photographic apparatus and optical goods (88). On the other hand, the same table shows that China's rapid increase in the exports of consumer goods to OECD markets has put a downward pressure on Italian prices in some divisions, ranging from travel goods (SITC-83) and footwear (85), two labor intensive divisions which include quality differentiated goods, to more sophisticated products included in the professional and scientific apparatus division (87) up to the highly heterogeneous group of miscellaneous manufacturing (89), a group including both products at high intensity of low skill labor (such as the production of toys), at medium technology (articles of plastic n.e.c.) as well as at higher quality (such as the jewelries). This is in line with the theory of price competition: firms threatened by the increase of market shares of competitors, not to lose their shares adjust their prices (Warmedinger, 2004).

We did not find evidence of an impact of China by market competition on export price strategies for the products included in two of the traditional divisions of the made in Italy, including the furniture (SITC-82) and, most notably, the apparel (84). Considering that for these two divisions we did not find either evidence of an impact from Chinese prices, we could interpret this as a lack of direct competition between the products exported by the two countries, possibly due to the existence of high quality differentials, reflecting thus the observed high price gaps as depicted in figure 3(b).

Despite the fact that results highlight a relevant competitive pressure from China in some sectors, when we look more in details at the data, observing product-specific dynamics, the extent to which this translate in a fall of Italy's export prices is confined to a small number of cases, while in about half of the observations they seem to suggest an upgrading of Italian exported products. Figure 4 reports the distribution of products whose export price has increased compared to the previous year. In the case of products included in the consumer group and exported to the OECD markets it has happened on average for 70% of the products in each division. Figure XX includes also those cases where such increase has occurred together with (a) an increase in market shares and; (b) an increase in the quantity exported. Both cases can be interpreted as the capacity of a country to "set" the price, and are therefore good proxies for quality upgrading. Figure 4 shows that this happens on average for the 50% and 40% of the cases, respectively. Lastly, figure 4 includes also those cases where the Italian prices have reduced in correspondence with an increase in the share of Chinese exports. This occurrence regards on average 30% of the observations for each divisions, a number substantially lower in the cases of footwear and scientific instruments.

Figure 4 here

The results considering middle-income countries as destination markets are reported in table 3. The controls are much in line with those observed in table 2, with the exception of the coefficient of the nominal exchange rate, now being not significant in all the specifications.

Table 3 here

Similarly to results reported in table 2, there is a significant price competition from other OECD countries spread across all the groups, the coefficient being particularly strong in the case of labor intensive goods, whereas a 1% increase (or decrease) in their prices translates in an increase (decrease) of 0.7% in the price of the corresponding product exported by Italy. We find on the other hand that Italy's price strategies are affected by the Chinese prices in a more extensive way compared to the previous case. While results of table 3 show that China's price competition affects the sector as a whole (first column) and the groups including low- and high- technology products, more detailed results from table B in appendix, show that – with the exception of goods belonging to the apparel (SITC-84) and the precision instruments (88) – all the other divisions are equally affected by China's export prices. On this respect, it is interesting to notice how this price completion is always less relevant if compared to the coefficient of other OECD countries', except for the group including miscellaneous manufacturing goods, where the effect of a movement in Chinese prices has a stronger impact.

On the other hand, the increasing market competition from China seems to contribute significantly to a reduction of Italy's export prices in both labor intensive and high- technology sectors (the same results, with similar magnitudes, being observed for the OECD market share coefficient). In addition, table B shows that such competition affects a number of divisions, including the apparel (SITC-84), professional apparatus (87) and miscellaneous products (89). Only in one division, that of prefabricated buildings (81), we find a push towards quality upgrading as a consequence of competitive pressure by Chinese exports.

4.2 Results for the machinery & transport equipment group by income levels of importers

The machinery and equipment sector has experienced an interesting performance over the last few decades. However, it has not yet received adequate attention, compared to more traditional consumer goods, despite its increasing role in Italy's specialization as well as its largest shares in terms of value added and employment in the country. A recent analysis based on aggregated data shows that, in this group, Italy specializes in high-quality products keeping its exported volumes high within the divisions including industrial machineries and electronics, while it specializes in lower quality products to keep the volumes high in the division including instrumental machineries (Cossio et al., 2008). Additional evidence from Ricotta et al. (2008) shows that in sub-sectors where Italy has higher comparative advantages it has recorded an outstanding performance in terms of quality of its export measured by their unit values at the 6-digit level of the HS classification. These divisions are machineries for specialized industries, industrial machinery and other transport equipment. On the other hand, Italy keeps some niche-markets but it is overall under specialized in other sectors such as office machines, telecommunications and electrical machines, all divisions where China's comparative advantage has rapidly increased over the last decade. Overall, however, generalization is difficult given that the machinery group is quite heterogeneous and includes either goods at different technological level and, above all, largely characterized by trade in parts and components.

Table 4 shows the results for the estimation of Italian prices for exports when destination markets are OECD countries. Once again, most of the controls enter the regression with the expected sign. This is the case of the lagged values of prices and the size of the market – both leading to an increase in the unit values of export – or of the Italian real exchange rate, whose depreciation puts a downward pressure on export prices in all the divisions within the machinery group. Conversely, a not well-defined trend emerges from the observation of the coefficients on per capita income, the distance and the lack of an access to the sea, whose coefficients vary across the different grouping structures.

Table 4 here

Looking at our variables of interest, we find that the unit prices of Chinese and OECD exports move in the same direction than Italian ones for both the sector as a whole (first column of table 3), the three technology levels² and for most of the two-digits divisions included in the sector (with the exception of products included in the metalworking, electrical machineries and the other transport equipment).

More interestingly, we find that the rapid increase in China's export shares in many of the divisions of the machinery and equipment group in the OECD markets has determined a competitive effect on Italy's export prices for high technology products (table 3) and for products included in the case of very specific sectors such as power machines, specialized machineries and metalworking as well as more heterogeneous ones as the electronics, a result in line with the findings by Abraham and Van Hove (2011) who find a strong competitive effect on market shares

² According to UNCTAD's classification, in the sector including machineries and transport equipment there are no divisions including labor-intensive products.

from China in a number of similar sectors for a sample including intra-OECD trade. At the same time, we find that market competition from other developed countries has pushed Italian prices down only in the group including transport equipment.

These results however do not account for the large share of intra-industry trade and the role of intermediate goods. China's rising role within global production chains has been largely debated in the literature. Some have objected for instance that the growing importance of the country within this more sophisticated sector, now the largest in relative terms for Chinese exports, has been characterized by high shares of processing trade often generated by foreign invested firms, whose role in the country's more sophisticated sector exports is substantial (Koopman et al., 2008). In order to account for this debate, we further specify our model by classifying products according to the Broad Economic Categories (BEC), a classification which considers the main end use of the products distinguishing among consumption, investment, intermediary and primary goods. More specifically, we construct two main groups, the first including investment goods, those used in gross capital formation, and the second intermediate ones, which in turn includes parts and accessories and processing goods. The main objective of this further analysis is to check whether the competition on prices and on quality is more relevant for one of the two groups.

Results for the group of OECD markets disaggregated according to their end use show that price and market competition from China hits Italy's price strategies in different divisions among the two groups of products (see table 5 for a summary of the main results), sometimes in a complementary way.

As capital goods are concerned, we find that those belonging to the divisions including general industrial machineries, office machines and telecommunications are subject to a contemporaneous pressure by both Chinese prices and market shares. These groups, which include mostly high-tech products, are exactly those where – as suggested in the first part of the paragraph – Italy is under specialized and China is rapidly catching-up, though its specialization is still in medium-quality products (Ricotta et al., 2008). On the other hand, we find that in the division including other transport equipment products, the pressure from China's market shares has led to an upgrade of exports, this result being strengthened by the negative and significant sign of the Chinese price variable. The fact that Chinese and Italian prices move in opposite directions could indicate that there is a large differentiation between products belonging to the same headings. Considering now the intermediate goods, we find a wider price competition, targeting most of the divisions not affected in the office machines, motor vehicles and, once again, other transport equipment groups have reacted to a stronger presence of Chinese companies on the OECD markets with an upgrading, presumably moving to a more value-added segment in other to not lose further market shares.

Table 5 here

Finally, we re-estimated the model when middle-income countries are the destination markets. Table 6 summarizes the results for the groups including intermediate and investment goods. Comparison is again interesting and shows that the divisions affected by China's competition are different compared to the previous case and that the same divisions are affected in a similar way almost independently of the end use of products. Electronics products in particular are affected by China's price and market competition in both the typologies of end use, while office machine products are not affected by China's price and are found to upgrade as a consequence of a rise in China's market shares irrespectively from their final use

Table 6 here

5. Conclusions

This paper analyzes the impact of Chinese competition on Italy's export price strategies for a number of sectors within manufacturing over the period 2000-2008. More specifically, we test direct price competition and indirect impact arising from an increase of China's market shares at a detailed product and market level.

Our results show that Italy's export price strategies are in general affected by Chinese price competition, though for some products and/or country's groups to a lesser extent than for price competition from other OECD countries. More specifically, for low technology and labor intensive products within the consumer goods the influence of China on Italy's export prices is marginal and it seems to stimulate quality upgrading, especially in high-income destination markets. We did not find any evidence of a change in export price strategies of Italian firms in OECD markets in some of the so-called traditional sectors of the made in Italy, in particular apparel, suggesting that the two countries are specialized in different segments of the market.

Conversely, in more technology intensive goods of the machinery and transport equipment sector, China's competition has induced a reduction of profit margins, especially for products characterized by a lower specialization level. In addition, when we look at the different impact on capital and intermediate goods, we find that there is a stronger pressure on products belonging to capital goods, while in the latter China's competition seems to induce an upgrading, especially in richer markets. In other words, firms seem to follow a strategy that could be interpreted as a search for niche specialization in the trade of more sophisticated inputs.

In line with other studies' findings, this paper shows that developed countries react in a variety of ways to the competitive pressure of lower income countries such as China. However, contrary to what observed for other high-income countries (Bloom et al., 2011; Mion and Zhu, 2011; Martin and Méjean, 2011), we find that Italy has followed a very specific strategy to face Chinese competition. Instead of changing sector of specialization moving up to the technology ladder, Italy has kept its specialization in traditional sectors and has upgraded the quality of its low-tech and labor-intensive products, when in direct competition with Chinese ones. For higher technology products, on the other hand, it has adjusted prices downward to reduce Chinese competitive pressure, especially where in segments where it does not hold a comparative advantage, while it has fostered differentiation only for some niche products within the sectors with higher specialization.

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Figure 1. Distribution of observation by technology intensity

Source: Author's elaboration

Note: The classification of the products by technology sector is based on UNCTAD



Figure 2. Distribution of observation by income level of importers

Source: Author's elaboration

Note: The classification of the importers by income level is based on the World Bank



Figure 3. Distribution of r by sectors



Source: Author's elaboration

Figure 4. Distribution of observation by trends in Italy's UV – High income OECD markets and consumer goods (SITC-8)



Source: Author's elaboration

-			5		
Variable	Obs	Mean	Std. Dev.	Min	Max
UV	966465	9.443448	1.761038	-4.400063	24.32009
Y	956826	25.83087	1.840811	19.35621	30.2961
Y_PC	956826	9.112012	1.365326	4.5307	11.45707
DIST	966465	7.941857	1.015651	6.199175	9.829418
LLOCK	966465	0.1152147	0.3192811	0	1
ER	958686	0.4644582	0.5108776	1.06E-10	3.643876
ER_CH	958686	4.407212	4.83935	1.03E-09	28.08551
Q	966056	2.295419	2.904757	-9.4151	15.50586
CH_UV	966465	8.457006	1.550969	-4.206255	24.58582
OECD_UV	966465	10.02214	1.687579	-4.49522	24.67563
SHARE_CH	966465	0.3183953	0.3397572	2.70E-07	1
SHARE_OECD	966465	0.688337	0.3949309	0	1

Table 1. Summary statistics

Table 2. Regressions results for the consumer goods (SITC-8) High income OECD markets

	(1)	(2)	(3)	(4)	(5)
VARIABLES	SITC-8	Labor intensive	Low-tech	Medium-tech	High-tech
11.luv	0.468***	0.328***	0.356***	0.470***	0.405***
	(0.0192)	(0.0162)	(0.0298)	(0.0224)	(0.0271)
lgdp	0.00467	0.0825**	0.0479***	0.0568***	0.0710***
	(0.0154)	(0.0331)	(0.0138)	(0.0103)	(0.0170)
lgdp_pc	0.0479***	0.00999	-0.0430	-0.0882***	-0.0607*
	(0.0155)	(0.0606)	(0.0477)	(0.0278)	(0.0337)
ldist	-0.0313***	0.0310	-0.0330	-0.0342*	-0.0779***
	(0.00751)	(0.0484)	(0.0293)	(0.0184)	(0.0215)
landlocked	-0.00601	0.102***	0.0997	-0.0465	0.0710*
	(0.0240)	(0.0324)	(0.0620)	(0.0321)	(0.0410)
nominal_er_it	-0.0403***	-0.0880**	-0.196***	0.0368	-0.0619*
	(0.0132)	(0.0373)	(0.0498)	(0.0269)	(0.0348)
lq	-0.0236	-0.0547	-0.0993***	-0.0950***	-0.119***
	(0.0152)	(0.0435)	(0.00933)	(0.00686)	(0.0142)
lch_uv	0.0166	0.134	0.0645**	0.173***	0.0152
	(0.0151)	(0.0912)	(0.0324)	(0.0229)	(0.0244)
loecd_uv	0.357***	0.381***	0.180***	0.282***	0.254***
	(0.0167)	(0.0183)	(0.0289)	(0.0221)	(0.0296)
share_ch	0.0865***	0.0985	0.109***	-0.00740	-0.0548
	(0.0166)	(0.270)	(0.0316)	(0.0247)	(0.0368)
share_oecd	-0.0176**	0.348	-0.0232	-0.0254	0.000711
	(0.00855)	(0.332)	(0.0232)	(0.0174)	(0.0238)
Constant	-1.581***	-1.749**	3.843***	0.860*	1.600**
	(0.370)	(0.780)	(0.785)	(0.464)	(0.733)
Observations	36,236	27,207	1,634	2,515	8,122
hansenp	0.109	8.24e-08	0.0525	0.108	0.0913
ar2p	0.246	0.0531	0.246	0.905	0.553

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)
VARIABLES	SITC-8	Labor- intensive	Low tech	Medium-tech	High-tech
					<u> </u>
L.luv	0.336***	0.248***	0.264***	0.357***	0.362***
	(0.0107)	(0.0209)	(0.0330)	(0.0279)	(0.0260)
lgdp	0.0271***	0.0156**	0.00718	0.0564***	0.0898***
0 1	(0.0104)	(0.00757)	(0.0137)	(0.00823)	(0.0119)
lgdp pc	-0.0266	-0.00537	0.121***	0.0297	-0.0150
	(0.0274)	(0.0151)	(0.0377)	(0.0217)	(0.0217)
ldist	0.00255	-0.00750	-0.0266	-0.0355**	-0.0184*
	(0.0124)	(0.00600)	(0.0215)	(0.0144)	(0.0105)
landlocked	0.0367*	-0.0120	0.130***	0.00861	0.0421
	(0.0200)	(0.0153)	(0.0486)	(0.0303)	(0.0269)
nominal er it	0.00342	0.0147	0.0428	-0.00831	0.0340
	(0.0177)	(0.0170)	(0.0447)	(0.0297)	(0.0334)
lq	-0.0975***	-0.0796***	-0.127***	-0.116***	-0.139***
-	(0.0114)	(0.00861)	(0.0109)	(0.00748)	(0.0120)
lch uv	0.175***	-0.00155	0.0898**	0.0328	0.0915***
_	(0.0574)	(0.0215)	(0.0380)	(0.0318)	(0.0203)
loecd uv	0.406***	0.743***	0.245***	0.197***	0.240***
—	(0.0109)	(0.0814)	(0.0293)	(0.0272)	(0.0257)
share_ch	-0.177	-0.0522***	0.0762**	-0.0374	-0.0586*
	(0.203)	(0.0139)	(0.0376)	(0.0287)	(0.0320)
share_oecd	0.0770	-0.0239***	0.0198	-0.0431**	-0.0586***
	(0.281)	(0.00848)	(0.0237)	(0.0195)	(0.0211)
Constant	-0.357	-0.931***	3.074***	1.579***	-0.0741
	(0.288)	(0.228)	(0.510)	(0.458)	(0.390)
Observations	52,847	29,397	2,828	3,666	9,001
hansenp	0.0126	0.0511	0.0500	0.260	0.170
ar2p	0.570	0.822	0.266	0.390	0.881

 Table 3. Regressions results for the consumer goods (SITC-8) and selected divisions – Middle income markets, 2000/08

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

 Table 4. Regressions results for the machinery goods (SITC-7) and selected divisions – High income OECD

 markets
 2000/08

		markets, 2000/08	b	
	(1)	(2)	(3)	(4)
VARIABLES	SITC-7	Low-tech	Medium-tech	High-tech
L.luv	0.373***	0.403***	0.364***	0.343***
	(0.0160)	(0.0358)	(0.0152)	(0.0298)
lgdp	0.0480***	0.0322**	0.0548***	0.0500***
	(0.00494)	(0.0152)	(0.00630)	(0.0130)
lgdp_pc	-0.0153	0.0677	-0.0456***	0.0808*
	(0.0133)	(0.0505)	(0.0141)	(0.0413)
ldist	-0.0140*	0.0615**	-0.0267***	0.0903***
	(0.00741)	(0.0279)	(0.00793)	(0.0219)
landlocked	-0.00730	0.0585	-0.00186	0.0319
	(0.0131)	(0.0539)	(0.0136)	(0.0429)
nominal er it	-0.0285**	-0.0921**	-0.0449***	0.0858**
	(0.0116)	(0.0468)	(0.0118)	(0.0392)
lq	-0.0848***	-0.0648***	-0.0883***	-0.0844***
-	(0.00363)	(0.00970)	(0.00482)	(0.00686)
lch uv	0.127***	0.0534*	0.125***	0.137***
-	(0.00863)	(0.0317)	(0.0118)	(0.0160)
loecd uv	0.245***	0.336***	0.179***	0.401***
—	(0.0115)	(0.0394)	(0.0123)	(0.0218)
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share_ch	-0.0117 (0.0113)	0.00109 (0.0355)	-0.0194 (0.0119)	-0.0658* (0.0337)
share_oecd	0.00157	0.00407	0.00421	-0.0224
Constant	1.148***	0.313	2.164***	-1.582***
	(0.215)	(0.691)	(0.266)	(0.576)
Observations	42,756	2,786	34,896	7,600
hansenp	0.0313	0.395	0.0823	0.127
ar2p	0.703	0.292	0.219	0.374

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5. Summary of selected results for the machinery & equipment goods (SITC-7) and by end use-Hi	gh income
OECD markets	

	Investment goods	Intermediate goods
Price competition from China	Power (71); Specialized (72); Industrial (74); Office (75); Telecommunications (76)	Metalworking (73); Office (75); Telecommunications (76); Electrical (77); Road vehicles (78); Other transport eq. (79)
Competitive pressure by China reduces prices	Industrial (74); Office (75); Telecommunications (76); Road vehicles (78)	Metalworking (73); Electronics (77);
Competitive pressure by China pushes to upgrade	Other transport eq. (79)	Office mach. (75); Road vehicles (78); Other transport eq. (79)

Note: the table includes only those divisions where the variable "SHARE_CH" reported a significant coefficient

 Table 6. Summary of selected results for the machinery & equipment goods (SITC-7) and by end use– Middle income markets

	Mach. and transport eq Investment goods	Mach. and transport eq Intermediate goods
Price competition from China	Metalworking (73); Industrial (74); Telecommunications (76); Electrical (77); Road vehicles (78)	Metalworking (73); Telecommunications (76); Electrical (77); Road vehicles (78)
Competitive pressure by China reduces prices	Power (71); Metalworking (73); Electronics (77).	Telecommunications (76); Electronics (77); Motor vehicles (78)
Competitive pressure by China pushes to upgrade	Office mach. (75)	Office (75); Transport (79)

Note: the table includes only those divisions where the variable "SHARE_CH" reported a significant coefficient

	(1) SITC-81	(2) SITC-82	(3) SITC-83	(4) SITC-84	(5) SITC-85	(6) SITC-87	(7) SITC-88	(8) SITC-89
	5110-01	5110-62	5110-05	5110-04	5110-05	5110-07	5110-00	5110-07
L.luv	0.318***	0.332***	0.375***	0.224***	0.463***	0.248***	0.325***	0.419***
	(0.0296)	(0.0396)	(0.0276)	(0.0678)	(0.0247)	(0.0298)	(0.0323)	(0.0195)
lgdp	0.0514***	0.0668***	0.167***	0.0963***	0.0715***	0.201***	0.0591***	0.0709***
-8-r	(0.0147)	(0.0130)	(0.0252)	(0.0212)	(0.0107)	(0.0221)	(0.0192)	(0.0124)
lgdp pc	-0.0368	-0.0781*	-0.193***	0.0818**	-0.0725**	-0.125**	0.0516	-0.0138
0"F_F	(0.0496)	(0.0428)	(0.0638)	(0.0336)	(0.0325)	(0.0535)	(0.0583)	(0.0249)
ldist	-0.0209	0.0858***	0.190***	-0.0220	0.0143	-0.0518*	-0.0676*	-0.0248*
	(0.0309)	(0.0231)	(0.0396)	(0.0341)	(0.0198)	(0.0315)	(0.0351)	(0.0131)
landlocked	0.0554	0.197***	0.384***	0.0925**	0.144***	0.208***	0.0127	0.0245
	(0.0687)	(0.0503)	(0.0690)	(0.0459)	(0.0360)	(0.0556)	(0.0754)	(0.0238)
nominal er it	-0.166***	0.0279	-0.0625	-0.128***	-0.110***	-0.148***	0.0527	-0.00203
	(0.0515)	(0.0353)	(0.0551)	(0.0370)	(0.0303)	(0.0480)	(0.0605)	(0.0209)
la	-0.111***	-0.108***	-0.0956***	-0.0746***	-0.0594***	-0.187***	-0.148***	-0.103***
1	(0.0102)	(0.00972)	(0.0152)	(0.00767)	(0.00618)	(0.0120)	(0.0166)	(0.0112)
lch uv	0.0621*	0.0450	0.0842	0.0238	0.0527**	0.0477**	0.0785**	0.0344
-	(0.0325)	(0.0429)	(0.0686)	(0.0278)	(0.0254)	(0.0229)	(0.0338)	(0.0218)
loecd uv	0.190***	0.0681**	0.274***	0.386***	0.375***	0.149***	0.404***	0.328***
—	(0.0331)	(0.0282)	(0.0419)	(0.0286)	(0.0235)	(0.0341)	(0.0373)	(0.0219)
share ch	0.121***	-0.00808	-0.197***	-0.0309	-0.0496**	-0.204***	0.117***	-0.0518**
-	(0.0332)	(0.0247)	(0.0479)	(0.198)	(0.0245)	(0.0357)	(0.0445)	(0.0222)
share oecd	-0.0126	-0.0287*	-0.0575*	0.362	-0.0527***	-0.0171	0.0197	-0.0174
-	(0.0229)	(0.0155)	(0.0297)	(0.387)	(0.0185)	(0.0245)	(0.0319)	(0.0137)
Constant	3.895***	4.139***	-0.420	-2.317**	0.232	2.831***	0.282	-0.186
	(0.827)	(0.682)	(0.839)	(0.954)	(0.511)	(0.994)	(0.944)	(0.409)
Observations	1,747	2,775	1,545	15,150	1,862	6,772	4,166	13,450
hansenp	0.0878	0.564	0.221	0.241	0.101	0.334	0.169	0.0816
ar2p	0.771	0.274	0.421	0.0262	0.178	0.0883	0.0230	0.455

# **APPENDIX**

Table A. Regressions results for the two-digit divisions consumer goods (SITC-8)– High income OECD markets

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B. Regressions results for the two-digit divisions consumer goods (SITC-8)- Middle income mark	kets
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Table D. Re	<u>Gressions re</u>	Suits for the	the algit a		sumer goods	(6110-0)	initiaale mee	me markets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	SITC-81	SITC-82	SITC-83	SITC-84	SITC-85	SITC-87	SITC88	SITC-89
L1.luv	0.255***	0.306***	0.256***	0.211***	0.339***	0.324***	0.464***	0.244***
	(0.0327)	(0.0295)	(0.0299)	(0.0275)	(0.0287)	(0.0287)	(0.0364)	(0.0190)
lgdp	0.00427	0.0459***	0.0724***	0.0124	0.0443***	0.111***	0.0396**	0.0942***
	(0.0136)	(0.00859)	(0.0164)	(0.00767)	(0.00946)	(0.0135)	(0.0199)	(0.0123)
lgdp_pc	0.137***	0.0840***	0.0751**	-0.00499	-0.0460*	0.000274	-0.101**	-0.104**
	(0.0355)	(0.0271)	(0.0379)	(0.0177)	(0.0249)	(0.0236)	(0.0424)	(0.0491)
ldist	-0.0213	-0.0458***	0.0202	-0.0351***	-0.0497***	-0.0181	-0.0368*	0.0169
	(0.0214)	(0.0140)	(0.0257)	(0.0109)	(0.0143)	(0.0126)	(0.0193)	(0.0141)
landlocked	0.129***	-0.0702**	-0.110**	-0.0156	0.0764**	0.0362	0.0652	0.000128
	(0.0481)	(0.0325)	(0.0465)	(0.0191)	(0.0369)	(0.0311)	(0.0515)	(0.0280)
nominal_er_it	0.0283	-0.0142	0.0157	0.0178	0.0223	0.0326	-0.0276	0.0170
	(0.0446)	(0.0316)	(0.0512)	(0.0232)	(0.0388)	(0.0385)	(0.0684)	(0.0243)
lq	-0.127***	-0.100***	-0.148***	-0.0846***	-0.0895***	-0.152***	-0.0670***	-0.152***
	(0.0104)	(0.00925)	(0.0142)	(0.00630)	(0.00837)	(0.0114)	(0.0247)	(0.0131)
lch_uv	0.0768**	0.0771***	0.107***	-0.0258	0.115***	0.0951***	0.0377	0.397***
	(0.0374)	(0.0285)	(0.0355)	(0.0182)	(0.0238)	(0.0232)	(0.0375)	(0.0933)
loecd_uv	0.235***	0.263***	0.528***	0.924***	0.557***	0.191***	0.350***	0.293***
	(0.0280)	(0.0242)	(0.0422)	(0.105)	(0.0318)	(0.0279)	(0.0393)	(0.0184)
share_ch	0.106***	-0.0222	-0.0374	-0.0424**	-0.00669	-0.0679*	-0.0294	-0.501**
	(0.0379)	(0.0299)	(0.0567)	(0.0173)	(0.0292)	(0.0362)	(0.0501)	(0.248)
share_oecd	0.0182	0.00654	-0.00611	-0.0205*	-0.0252	-0.0362	-0.106***	-0.419
	(0.0234)	(0.0175)	(0.0303)	(0.0111)	(0.0216)	(0.0248)	(0.0371)	(0.281)
Constant	3.249***	1.282***	-1.198**	-2.050***	-0.164	0.586	-0.756*	0.108
	(0.497)	(0.349)	(0.551)	(0.412)	(0.409)	(0.447)	(0.448)	(0.440)
Observations	2,997	3,853	2,389	18,514	3,265	6,699	2,302	21,582
hansenp	0.0673	0.197	0.179	0.407	0.515	0.493	0.419	0.148
ar2p	0.157	0.235	0.108	0.847	0.418	0.440	0.557	0.838

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1