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The age of the dragon: Chinese competition and the pricing behavior of the Italian firms

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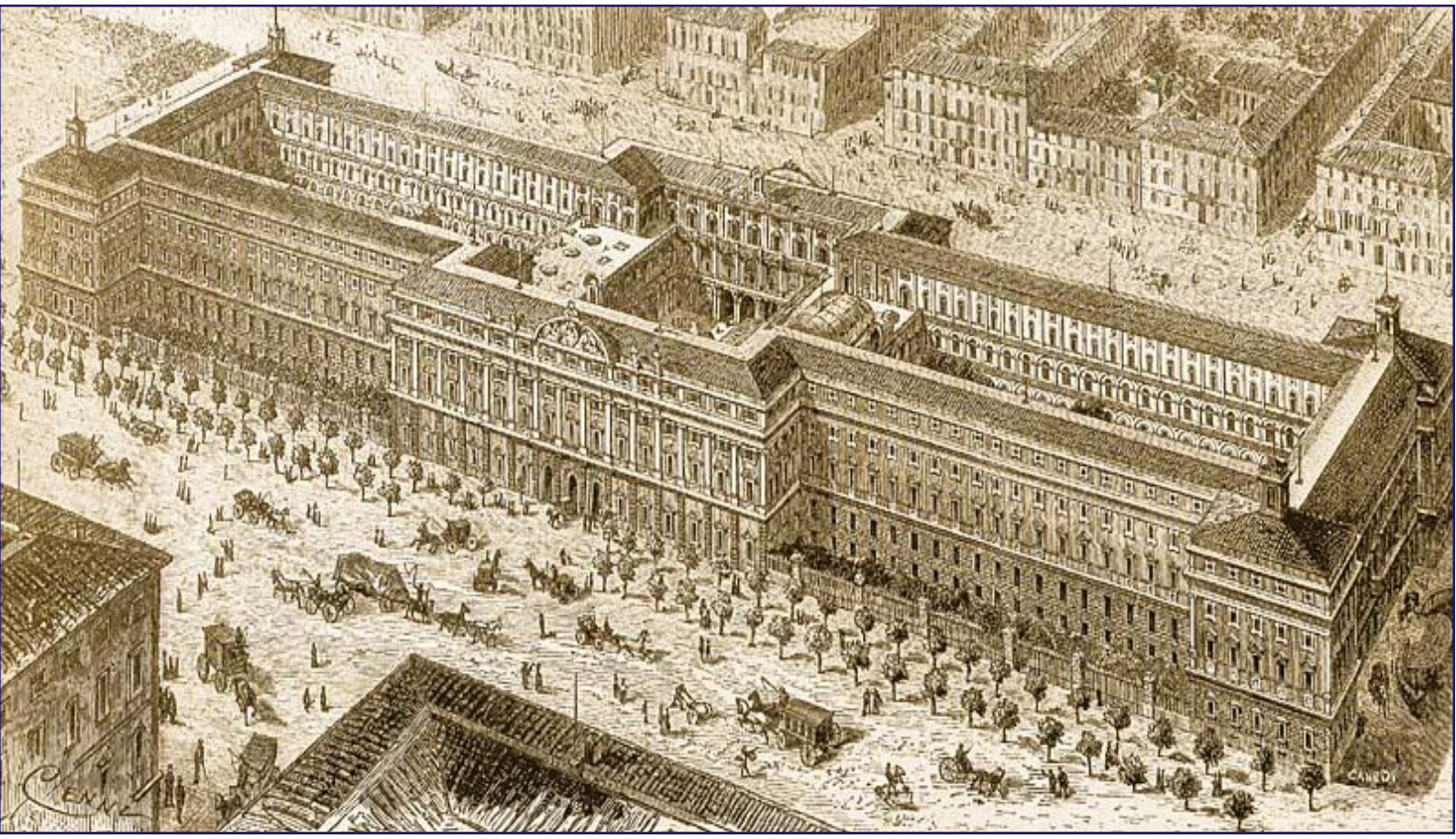

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The age of the dragon: Chinese competition and the pricing behavior of Italian firms[1]

Matteo Bugamelli, Silvia Fabiani, Enrico Sette*

Abstract

In this paper we use a unique dataset of Italian manufacturing firms that includes firm-level price data to investigate whether increased penetration of Chinese products affects the competitive environment in an advanced country like Italy. Instrumenting import penetration from China to account for potential endogeneity biases, we find that the increase of the penetration of Chinese products has a negative and sizeable causal impact on Italian firms~ price dynamics: firms operating in a sector where such penetration is 10 per cent higher contain output price growth by about 0.35 percentage points per year. In line with the factor proportions hypothesis we show that this impact is stronger on less skill-intensive sectors. Finally, as predicted by the recent theoretical trade literature with heterogeneous firms, we find that, especially in low skill-intensive sectors, less productive firms are the ones that are forced to reduce prices more.

JEL Classification: F14, F15, L2, E31.
Keywords: import penetration, competition, China, prices and productivity.

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1 INTRODUCTION

Does increased penetration of Chinese products affect the competitive environment in advanced countries? More precisely, does product competition from China cause a reduction of firms' prices? Are these effects stronger in less skill-intensive sectors where China holds a comparative advantage? Are they stronger on less productive firms? We answer positively to all these questions using a unique micro-level dataset of Italian manufacturing firms over the period 1994-2006.

The pro-competitive effect of trade is theoretically well-grounded. In the seminal paper by Krugman (1979), trade integration raises the number of product varieties available, thereby increasing competition. Recent trade models (Bernard, Eaton, Jensen and Kortum, 2003; Melitz, 2003; Melitz and Ottaviano, 2008) have proposed a new and richer perspective emphasizing the importance of firm heterogeneity. In these models enhanced foreign competition raises aggregate industry productivity by means of within-industry reallocation of resources from low- to high-productivity firms. The empirical support to the pro-competitive effect of trade is growing and, following theoretical developments, has progressively restricted the focus from countries to sectors and then to firms[2].

In this paper, we address this issue focusing on the impact of foreign competition on Italian firms' prices. We estimate a model of firm-level pricing that accounts for demand and cost shocks, for domestic and foreign competition, for firms' size and productivity. We distinguish between competition from China and from the rest of the world and find a sizeable effect of the former: Italian firms operating in a sector where import penetration from China is 10 per cent higher contain output price growth by 0.34-0.38 percentage points per year. We then exploit the sectoral and firm-level dimension of our dataset and test whether this effect is heterogeneous across sectors and firms. Confirming the predictions brought forward by a standard Heckscher-Ohlin model, we find that Chinese competitive pressures are stronger in less skill-intensive industries, where China holds a comparative advantage thanks to its relative abundance of unskilled labor (Schott, 2008). We do not find, instead, any empirical support to the hypothesis that it is easier to escape from low- wage competition in sectors with more scope for quality differentiation (Khandelwal, 2010). In line with recent international trade models with heterogenous firms, our results show that the effect of stepped-up competition of Chinese provenance is stronger on less productive firms, in particular within low skill-intensive sectors.

The primary contribution of this paper to the empirical literature hinges upon the use of firm-level actual price data. Thanks to our focus on prices, we complement firm-level analysis on the effects of import competition from low-wage countries on quantity-based variables such as output, employment, and firms' survival. Bernard, Jensen and Schott (2006a) use US plant-level manufacturing data and show that sectoral exposure to increasing imports from low-wage countries is positively (negatively) correlated with the probability of plant death (employment

[2] See Bernard, Jensen, Redding and Schott (2007) for a comprehensive survey.

growth)[3]. They also find that these effects are stronger in less capital- and skill-intensive sectors and on low-productivity firms. Bloom, Draca and Van Reenen (2008) use firm-level data from 11 EU countries and find that Chinese import competition reduces employment growth and increases, though to a lesser extent, the propensity to adopt ICT and plant exit. Applying Bernard, Jensen and Schott (2006a) empirical strategy on Italian sectoral data, Federico (2010) finds that a one standard deviation increase in low-wage import penetration in a given sector decreases annual employment by 4 per cent and this effect is smaller in sectors that are more capital- and skill-intensive and have a longer quality ladder.

With respect to these studies, we provide a direct test of the first step of the reallocation process proposed by trade models with heterogeneous firms: stronger foreign competition forces domestic firms to reduce prices and profits[4] until low-productivity firms get closer to their break-even and eventually exit the market, thus giving a start to a redistribution of market shares that leads to sectoral productivity improvements. Our firm-level evidence on prices (and, indirectly, markups)[5] is particularly important because, as pointed out by Bernard, Jensen, Redding and Schott (2007), "welfare gains arising from the reallocation of market shares toward high-productivity firms, may be magnified if the increase in the product market competition induced by trade liberalization leads to lower markups of price over marginal costs".

Recently, a number of papers have analysed the price effect of import competition, but they have done so on the basis of sectoral data. Using a panel of manufacturing industries for seven European countries during the 1990s, Chen, Imbs and Scott (2009) show that increased imports raise industry productivity, reduce industry markups, (temporarily) slow down (production) prices. Auer and Fischer (2010) find that US industrial sectors more exposed to competition from emerging countries record higher productivity growth, as well as lower price inflation. Using the same empirical framework, Auer, Degen and Fischer (2010) confirm the impact of import penetration from low-wage countries, and China in particular, on European producer prices. Compared to these studies, the firm- level dimension of our paper allows to analyse whether increased penetration of Chinese imports has a differential impact on heterogenous firms. Moreover, it allows to control for firm-specific features affecting price dynamics beyond time and sector fixed effects.

We focus specifically on China, whereas most of the existing empirical literature has analyzed the effects of import penetration from low-wage countries. We believe that this has two main advantages. First, the rise of China as a global player in world trade is a dramatic and well identified shock. Schott (2008) shows that in the last 30 years Chinese products' penetration in the US has been impressive, much higher than that recorded by the Latin American countries altogether: China's share of total exports to the US has grown by almost 20 percentage points, against only 8 of Mexico. According to WTO data, the Chinese share of total world exports of

[3] Bernard, Jensen and Schott (2006b) perform a similar exercise using as an external trade shock a reduction of inbound trade costs. They find that this shock is positively associated with industry- and firm-level productivity growth, the probability of plant death, the probability of entry of new exporters, and export growth by incumbent exporters.

[4] In the seminal paper by Melitz (2003) markups are time-invariant. This hypothesis has been relaxed by Melitz and Ottaviano (2008).

[5] Through the use of actual prices and the estimation of a pricing equation that controls for all determinants of costs, we can also draw, though indirectly, conclusions on the effects of import competition on markups without appealing to estimation methods as the one proposed by Hall (1988) and used by Abraham, Konings and Vanormelingen (2009) to show that import competition from low-wage countries reduces markups and workers' barganining power among Belgian firms.

manufacturing goods increased from 1.9 per cent in 1990 to 9.6 in 2005[6]. On the contrary, import penetration from some low-wage countries (especially African countries) is still pretty low and shows little dynamics when compared to China, at least in Italy: on the basis of the less restrictive definition of low-wage countries implemented by Federico (2010) on Italian data - those where GDP per capita is less than 10 per cent that of the US in 2006, whereas Bernard, Jensen and Schott (2006a) and Khandelwal (2010) adopt a 5 per cent threshold - China accounts for above 40 per cent of total low-wage imports.

Second, as shown by Schott (2008), a product-level comparison between China and other OECD countries' exports to the US reveals a very similar product specialization, but Chinese prices are much lower. This suggests that competitive pressures exerted by China on world markets are in the same product range as advanced countries and mostly price-based, thus making our investigation of firms' price reactions particularly appropriate. The similarity of product specialization is particularly high in the case of Italy, since both Chinese exports and Italian production are concentrated in less technologically advanced sectors such as textile, apparel, leather, footwear and furniture.

In the empirical analysis we deal with possible endogeneity biases caused by the evolution of price competitiveness of Italian firms feeding back into export patterns of China and other countries in Italy, as well as by omitted variables. We instrument import penetration in Italy from China and other countries by means of three instrumental variables. Sector-year measures of freight rates, computed on US trade data, are meant to capture differences in the bulkiness of goods or in transportation technology that are independent of economic developments in Italy. This instrument has also been used by Bernard, Jensen and Schott (2006a), Chen, Imbs and Scott (2009) and Khandelwal (2010). Chinese import penetration in the US aims at isolating determinants of China's exports that are related with industrial development and trade policy in that country (i.e., push factors in China's trade developments). Finally, the Chinese share of US imports captures the crowding-out effect of Chinese exports on other countries' exports.

The paper is organized as follows. Next section presents the estimating equation. Section 3 describes the firm-level and trade data used in the empirical analysis. The results for the baseline specification are discussed in section 4, while extensions in section 5. Concluding remarks are left to the last section.

2 EMPIRICAL SPECIFICATION

As our goal is to isolate the effect of import competition on firms' pricing strategies, we set up an empirical specification that accounts for all determinants of prices: demand, costs, productivity and market power. In a standard model with imperfect competition a firm's profit maximization yields an optimal price that is a markup over marginal costs (i.e., $p_{i,t} = \mu_{i,t} * c_{i,t}$); after taking logs and first-differencing, we get:

$$\Delta \log p_{i,t} = \Delta \log \mu_{i,t} + \Delta \log c_{i,t}$$

While we observe prices at the firm level, we need to proxy for markups and unit costs. To

[6] Since 2005 China's world export share in manufacturing has kept increasing at a very high annual rate (more than 30 per cent), and has reached 12.7 per cent in 2008.

this aim, we take stock of the rich industrial organization literature on markups (Domowitz, Hubbard and Petersen, 1988; Rotemberg and Woodford, 1992; for Italy, Marchetti, 2001) and define markups as a function of a time-invariant sector component related to technology and market structure, the level of demand (cyclical markups) (demand) and competition. We make a distinction between domestic (domcomp) and foreign competition, and we further break down the latter into Italy's import penetration from China (impen_china) and from the rest of the world (impen_other). This distinction is conceptually analogous to that between low-wage and other countries used by Bernard, Jensen and Schott (2006a), Khandelwal (2010) and Federico (2010) and allows to estimate the effect of an increase of import penetration from China holding constant import penetration from other countries. In line with industrial organization models and related empirical evidence, we also assume markups to be increasing in firm size (size). Notationally, we obtain[7]:

$$\Delta \log \mu_{i,t} = \alpha_o + \beta \Delta \log demand_{i,t} + \gamma_0 \Delta \log domcomp_{s,t} + \gamma_1 \Delta \log impen\_china_{s,t} + \gamma_2 \Delta \log impen\_other_{s,t} + \delta \Delta \log size_{i,t} + \varepsilon_{i,t} \quad (1)$$

where s indexes the 2-digit Nace sector a firm i belongs to. It is worth highlighting that we use a firm-level measure of demand, proxied by changes in the capacity utilization rate. Competition, both domestic and foreign, is measured at the sectoral level.

We then model changes in unit costs as follows:

$$\Delta \log c_{i,t} = \alpha_1 + \kappa \Delta \log wage_{i,t} + \chi \Delta \log inputcost_{i,t} + \xi \Delta \log tfp_{i,t} + \psi_t + u_{i,t} \quad (2)$$

where wage is the unit wage, inputcost is the unit cost of intermediate inputs, t fp is total factor productivity. Year dummies ψ_t capture changes in costs that are common to all firms. Importantly, inputcost controls for the effect of cheaper intermediate inputs, including those from China, on costs and prices (Abraham, Konings and Vanormelingen, 2009).

When we combine equations (1) and (2) to derive our base empirical specification, we take one-period lags of all the regressors. This choice, that helps reduce simultaneity bias, is substantiated by the empirical evidence arising from a large number of recent studies on firms' pricing policies in the euro area, based on both survey and quantitative micro data (see Fabiani et al., 2007 and references therein). According to these studies, firms' prices do not react immediately to cost or demand shocks: both in Italy and in other European countries firms adjust prices on average once a year.

Given that the firm-level output price change recorded in our database is expressed in percentage terms, in the estimating equation we define all regressors as percentage changes. Notationally:

[7] The time-invariant sector components affecting the level of markups are swept away by first-differencing.

$$\Delta p_{i,t} = \alpha + \beta \Delta demand_{i,t-1} + \gamma_0 \Delta domcomp_{s,t-1} + \gamma_1 \Delta impen\_china_{s,t-1} + \gamma_2 \Delta impen\_other_{s,t-1} + \delta \Delta size_{i,t-1} + \kappa \Delta wage_{i,t-1} + \chi \Delta inputcost_{i,t-1} + \xi \Delta tfp_{i,t-1} + \psi_t + \eta_{i,t} \quad (3)$$

We always cluster standard errors by sector, as we aim at identifying the effect of a sectoral variable (Δimpen_china) in a firm-level dataset. In order to account for the possibility that changes in costs are characterized by sectoral trends - induced, for example, by technological change - we also estimate a version of equation (3) that includes a full set of sector dummies (19 sectors from the 2-digit Nace-Rev.1 classification).

2.1 Causality

The key parameter of interest in equation (3) is γ_1. This is the coefficient of the annual percentage change of Chinese import penetration in Italy (Δimpen_china), which in our interpretation measures the effect of a change in competitive pressures from China (through imports) on Italian firms~ price variations. We expect it to be negative.

Even after controlling for other determinants of firm-level price dynamics, import penetration from China could still be correlated with the error term, thus inducing a bias in the estimate of γ_1. The main concern is reverse causality: Chinese products may gain larger market shares in those sectors where Italian firms raise prices more (or decrease them less). Hence, we would expect an upward bias in γ_1. A second concern is related to the potential omission, among our set of controls, of time-varying sectoral factors that affect at the same time both output price dynamics and Italian imports from China. Finally, measurement errors in Δimpen_china could imply an attenuation bias. The same concerns apply to γ_2, the coefficient of the annual percentage change of import penetration from other countries (Δimpen_other).

We address these issues by instrumenting Δimpen_china and Δimpen_other. We use three instrumental variables, all based on US data. The first is freight rates at the sectoral level, computed as the ratio of the difference between imports CIF and imports FOB to imports CIF. This measure has been used by Bernard, Jensen and Schott (2006b) as a direct exogenous measure of the reduction in inbound trade costs and by Bernard, Jensen and Schott (2006a), Chen, Imbs and Scott (2009) and Khandelwal (2010) as instrument for import penetration. Unlike the latter papers, where freight rates are computed on national trade data, we base our measure on US data, which are more likely to be exogenous to economic developments and prices in Italy. Moreover, we do not construct two separate freight rates for low-wage (China, in our case) and other countries as done in the papers above, but we use other instruments in order to account for such differences in import penetration. The variable is expressed as annual percentage change (Δcif fob) and we expect it to be negatively correlated with the increase of overall import penetration, which in our specification is more closely proxied by Δimpen_other.

The other two instruments are import penetration in the US from China (impen_china_us) and the Chinese share of US total imports (share_china_us), both computed at

the sectoral level and included in the regression as annual percentage changes. Import penetration in the US aims at capturing push factors related to industrial development in China, which led this country to stand as a leading player in world trade over the last decades. The Chinese share of total US imports is instead meant to reflect the possible crowding-out effect of the expansion of imports from China on imports from other countries: we therefore expect Δshare_ china _us to be negatively correlated with Δimpen_other[8].

Our identification strategy is therefore based on the idea that while Δcif fob captures exogenous and product-specific changes in worldwide transportation technologies, import penetration from China in the US is related to that in Italy only through China-specific supply-side factors and not through demand or supply shocks common to Italy and the US. In this respect, we observe that the latter two economies are very little integrated. On the one side, Italy's weight over total US imports is very small (around 2 per cent). Italy's effect on Chinese exports to the US is hence negligible: if China's import penetration in Italy is relevant for Italian firms' pricing strategies, price competitiveness of Italian firms does not affect China's import penetration in the US. On the other side, the US market absorbs about 5 per cent of Italian total exports of goods and therefore its weight on Italy's GDP is very small (0.5 per cent).

Having argued that our instruments evolve independently of Italian developments, we also consider the possibility that some global unobserved time-varying sectoral factors could still bias our estimates. To account for this, in the empirical analysis we test whether our results are robust to the inclusion of a sectoral measure of world trade.

Since the IV model is overidentified (we are using three instruments for two endogenous variables) and the data are heteroskedastic, as indicated by both the Breusch-Pagan-Godfrey and by the White-Koenker tests, we estimate the model by two-step GMM, which yields efficient estimates. However, results using 2SLS are qualitatively and quantitatively very similar.

3 THE DATA

We combine data from various sources and merge firm-level information with sectoral trade figures. Firm-level data, available from 1982 to 2006, are obtained from the Bank of Italy's Survey on Investment in Manufacturing Firms (SIM) and the Company Account Data Service (CADS). Sectoral trade data are from Schott's website in the case of the US and from Eurostat in the case of Italy. US data range from 1972 to 2005. Eurostat's trade data for Italy cover the period 1988-

[8] An alternative identification strategy would rely on using the expiration of the Multifiber Agreement in 2005, as an event that had a strong impact on the surge of Chinese exports (Brambilla, Khandelwal and Schott, 2009; Raff and Wagner, 2009). However, that is beyond the reach of our data. For developing countries, endogeneity concerns have been solved using (exogenous) one-off trade liberalization events (Levinsohn, 1993; Harrison, 1994; Krishna and Mitra, 1998; Pavcnik, 2002).

2006, while turnover data start from 1995. We focus only on 2-digit Nace Rev.1 manufacturing industries and exclude three sectors: "tobacco products", which in Italy is mostly government-owned, "petroleum and coal products", whose performance is too sensitive to international oil prices, and "computing and office equipment", which includes too few firms in Italy.

Since we estimate a lagged differenced model and want to exclude from the analysis the evolution of prices during the 1992-1993 devaluation of the Italian currency, the dependent variable (i.e., the annual rate of change in firms' output prices) ranges from 1996 to 2006. After excluding observations below the 1st and above the 99th percentile of the distributions of the growth rate of each firm-level regressor, we are left with 5,071 observations (about 1,410 firms that are sampled on average for 3.6 consecutive years).

3.1 Firm-level data

SIM is an open panel (managed by the Bank of Italy) of firms with at least 50 employees. SIM's questionnaires, submitted to companies at the beginning of each calendar year and relative to the previous year's data, collect a wide range of information: year of foundation, nationality, location, sector of activity, ownership structure, employment (yearly average), investment (realized and planned), sales (domestic and foreign), capacity utilization rate, indebtedness[9]. CADS is the organization in charge of gathering and managing firms' accounting data in Italy. It was established in the early 1980s jointly by the Bank of Italy, the Italian Banking Association (ABI) and a pool of leading banks with the aim of collecting and sharing information on borrowers. For about 15,000 manufacturing firms per year, CADS collects balance sheets re-classified in order to reduce the dependence on accounting conventions used by each firm to record income figures and asset values.

Descriptive statistics on the merged CADS-SIM dataset are presented in Tables 1 and 2. The sample tends to be biased towards relatively large and old firms reflecting the fact that we observe the balance sheets of those firms that obtain bank loans. The sectoral composition is broadly representative of Italy's product specialization, with most firms operating in machinery, food and beverages, other non-metallic mineral products (such as tiles) and the so called Made in Italy (textile, apparel, leather, footwear). The number of firms is not constant over time, due to the fact that SIM is an open panel and to the requirement we impose in our analysis that each firm participates to the survey for at least three years in a row.

Importantly, since 1987 the SIM survey has collected quantitative information on firms' output price change with respect to the previous year. This is the dependent variable in equation (3). The price change is expressed in percentage terms, euro-denominated and averaged across products and destination markets. The absence of a product breakdown

[9] Given the strict, personal relationship between officials of the Bank of Italy and the single firm, the intense process of data revision carried out by statisticians of the Bank of Italy and the special effort to keep information as closely comparable across time as possible, SIM turns out to be a very high quality dataset. Among others, papers based on SIM are Guiso and Parigi (1999) and Iranzo, Schivardi and Tosetti (2008).

may raise some concern: as firms are classified in the sector their main product belongs to, they could partly be misplaced if they produce goods falling in two or more different 2- digit categories. Fortunately, as shown by ISAE (2009), this is extremely rare among Italian firms.

Figure 1 shows the price distribution across firms by year: the overall average is about 2 per cent, but there is quite a high degree of variability, both over time and across sectors and firms. The largest price increases are reported by firms operating in the metal industry and are concentrated in 2003 and 2004 when raw material prices increased sharply. The largest price cuts are recorded in the metal industry and in the production of paper and chemical products in 1996. In the empirical analysis we control for these time and sectoral effects. The advantage of working with firm-level price data can be appreciated in Figure 2 that reports the overall (all years) distribution of price changes under three specifications: raw data, controlling for year fixed effects and controlling for year and sector fixed effects. Including year and (to a lesser extent) sector fixed effects helps smooth out some spikes in the raw data but does not seem to have a large explanatory power. In other words, there is still a lot of heterogeneity to be exploited within years and sectors, that is, across firms.

The reliability of our firm-level price measure can be assessed by comparing it with its macroeconomic counterpart, the official Producer Price Index (PPI), computed and published by the Italian National Statistical Institute (ISTAT). Figure 3 shows that PPI and SIM prices go hand in hand in all sectors over the sample period.

All the regressors at the firm level are constructed from the merged CADS-SIM dataset. Firm size (size) is measured as the number of employees[10]. Unit wage (wage) is obtained as the ratio between total labor costs and the number of employees. The short-run changes in demand (Δdemand) are proxied by changes in the firm's capacity utilization rate[11]. Total factor productivity (t fp) is Bank of Italy's internal computation based on the method proposed by Olley and Pakes (1996) and applied to CADS data on value added, capital stock and labor. Unit input costs (inputcost) are computed as the ratio of total costs for intermediate inputs, reported in balance sheets, to the number of employees. This is not a precise measure of unit input costs, since the average price of intermediate inputs is multiplied by the ratio between the physical quantity of intermediate inputs and the number of employees. In other terms, changes in inputcost can be related both to changes in input prices (possibly due to cheaper Chinese products) and to changes in factor (intermediate inputs vs labor) proportions related, for example, to changes in firms' outsourcing strategies (again possibly due to cheaper Chinese products). Hence, the coefficient

[10] As a measure of firm size, we prefer to use employment instead of total sales. Being the product between output and prices, sales could be positively correlated with prices, even with their changes.

[11] The firm-level rate of capacity utilization is derived from SIM as the answer to the following question: "What is the ratio between actual production and the level of production which would be possible by fully using the available capital goods without changing labor inputs?". The correlation between its annual across-firm average and a standard macro measure of capacity utilization in manufacturing (computed by the Bank of Italy on the basis of industrial production and ISAE's quarterly surveys) is about 0.8. Gaiotti (2010) shows that movements in SIM's capacity utilization also track quite well the behavior of the output gap in the whole economy.

of this variable can be interpreted as the effect of changes in input prices only under the assumption that, from year to year, factor proportions are fixed.

The intensity of domestic competition (domcomp) is measured by a sectoral concentration index (the market share of the four largest firms in terms of sales) computed on the basis of the full CADS sample at the 2-digit level.

3.2 Sectoral data

Import penetration in Italy (from both China and the rest of the world) is based on Eurostat Structural Business Statistics (SBS) and External Trade Statistics (COMEXT)[12]. SBS provides the value of domestic production for each 4-digit sector of the Nace Rev.1 classification for the period 1995-2007. COMEXT contains Italy's export and import values by product and partner country for the period 1988-2006. COMEXT product breakdown follows the Combined Nomenclature (CN) classification[13], which is mapped into the 4-digit CPA classification using the concordance tables provided by Eurostat. Given the one-to-one correspondence between CPA and Nace, it is possible to compute import penetration from China for each 2-digit Nace Rev.1 sector as the ratio between imports from China and domestic demand (the sum of domestic production and total net imports). Import penetration from other (than China) countries is analogously constructed, using imports from the rest of the world instead of imports from China. Notationally:

$$impen\_china_{s,t} = \frac{import\_china_{s,t}}{\overline{sales_s} + \overline{import_s} - \overline{\exp ort_s}}$$

$$impen\_other_{s,t} = \frac{import\_other_{s,t}}{\overline{sales_s} + \overline{import_s} - \overline{\exp ort_s}}$$

Like in Auer and Fischer (2010) and Auer, Dengen and Fischer (2010), the denominator is the sectoral (across time) average of the value of domestic shipments plus imports so as to neutralize the potential correlation between both measures and the dependent variable, arising from the fact that the value of sales move with prices. At the same time, this also avoids that the dynamics of import penetration is affected by the yearly evolution of domestic demand.

The US-based instrumental variables are built on the basis of the data used by Bernard, Jensen and Schott (2006a and 2006b) and downloadable from Schott's

[12] Italian data is produced and provided to Eurostat by ISTAT. SBS data for Italy are collected using two firm-level surveys: the System of Economic Accounts in Enterprises for firms with at least 100 employees, and the Sample Survey on Small and Medium Enterprises for firms with less than 100 employees. These survey data are then integrated with administrative balance sheet data and treated with statistical techniques for non-responses and extrapolation to the universe.

[13] CN is based on the Harmonized System (HS) classification and includes about 10,000 8-digit codes.

website[14]. The data refer to US export and import flows by partner and product, and the total value of shipments by product. The products are classified according to the 4-digit Standard Industrial Classification (SIC87): we group them at the 2-digit level that easily maps into the 2-digit Nace Rev.1 classification. We therefore compute US import penetration from China (impen_china_us) as we do for Italy. The Chinese share of US imports (china_share_us) is the ratio of US imports from China to US total imports. The additional instrument (cif fob) is constructed as the ratio of the difference between imports CIF and imports FOB to imports CIF.

Table 3 reports import penetration from China in Italy and in the US, by sector and for the years 1995, 2000 and 2005. Not surprisingly, it is largest and fast-growing in "leather and footwear", "wearing apparel" and "other manufacturing" which includes toys and furniture. It is instead still very low in the most technologically advanced sectors, like "chemicals and chemical products", "motor vehicles and transportation equipment". It is in general smaller in Italy than in the US. The difference in the levels is striking in those sectors where Italy holds a strong comparative advantage, like "leather and footwear", "wearing apparel" and "other manufacturing". Figure 4 shows the evolution of Chinese import penetration in Italy and in the US, in each 2-digit Nace sector. Overall, the dynamics of the two series are quite similar, even though US figures depict a stronger increase, especially in the most recent years, than Italian ones. The largest discrepancies are recorded in sectors, like "food and beverages", "motor vehicles" and "other transportation equipment", where however import penetration from China is very small, almost negligible, both in Italy and in the US[15].

4 EMPIRICAL RESULTS

Before turning to estimates of equation (3), we assess whether raw data provide any preliminary evidence suggesting that import penetration from China has a bearing on Italian firms' pricing strategies. We split the sample into two groups according to the size of the average sectoral annual change of Chinese penetration over the sample period, using the median as cutoff point. Simple unconditional means indicate that indeed the average annual price increase in the group of sectors that recorded a larger (than the median) increase in competitive pressures from China is equal to 1.7 per cent, against 2.2 per cent in the other group.

Another way to examine the data is to test whether the relationship we are looking for already holds in a simple regression framework. Table 4 reports the coefficients of OLS and IV regressions of the firm-level price change only on the lagged change of import penetration in Italy from China and from other countries. The results display a statistically significant relationship only when we control for year fixed effects (columns 2 and 4); in such cases, the R-

[14] For a detailed description of the data, see Schott (2008).

[15] In the "leather products" sector, the very different scale between import penetration in the US and that in Italy does not allow to appreciate the large increase recorded in the latter country.

squared rises significantly, too. Sector fixed effects, despite being statistically significant, contribute very marginally (columns 3 and 4). The IV estimate (column 5) is highly significant and even more negative. Neither OLS nor IV estimates show any effect of import penetration from other countries on Italian prices.

4.1 Base regression

We now focus on the estimation of equation (3). The first two columns of Table 5 report OLS estimates without (column 1) and with (column 2) sector fixed effects. The estimated coefficient of Δimpen_china is always negative (-0.013-0.017) and statistically significant, while that of Δimpen_other is never significantly different from zero.

As discussed in Section 2.1, if the entry of foreign products on the Italian market is, ceteris paribus, more intense in sectors where Italian firms are less price competitive, i.e. where domestic prices increase relatively more, then the OLS estimates of the parameters γ_1 and γ_2 are upward-biased. We therefore turn to IV estimation. The results, shown in Table 5, are again displayed without (column 3) and with (column 4) sector fixed effects. The coefficient of Δimpen_china remains highly significant and becomes much larger in absolute value, thereby indicating an upward bias in the OLS estimates[16]. The effect of imports from China amounts to about 0.034-0.038, to say that a 10 per cent increase in the penetration of Chinese products brings about a 0.35 percentage points reduction of price dynamics. This is quite a sizeable effect as the average price change across years and sectors in our sample is 2 per cent. We still find no significant effect of Δimpen_other.

Since we are estimating the model via GMM, we cannot evaluate the robustness of our instruments by examining a first-stage regression. Nevertheless, the results of a pseudo first-stage regression, reported in Table 6, are in line with our expectations, validating the instrumental strategy adopted. The F-statistics of excluded instruments are well above the threshold of 10 recommended by Staiger and Stock (1997) to avoid weak instrument concerns[17]. The Sargan-Hansen test of overidentifying restrictions does not reject the null hypothesis that the instruments are correctly excluded from the estimated equation.

Going back to Table 5, the OLS and IV coefficients of the other regressors are pretty similar. An increase in firm size (Δsize) raises market power and therefore the firm's ability to charge, ceteris paribus, higher prices. According to Kugler and Verhoogen (2008), a positive correlation between firm size and output prices might also follow from the fact that larger firms are those producing better quality goods that are reasonably sold at higher prices[18].

Output prices react positively to shocks to wages and intermediate input costs.

[16] Such an upward bias could be due to both reverse causality and measurement error.

[17] Estimations of the model by 2SLS and CUE-GMM yield very similar coefficients. This is a further sign that the two-step GMM estimates are unlikely to suffer from weak instrument problems.

[18] If we exclude Osize from the base specification, on account of its potential endogeneity, results for all the other regressors remain unchanged.

The price elasticity to labor costs (Δwage) is small, around 0.03. This result is consistent with previous empirical evidence showing that the finer the disaggregation of the data, the lower the estimated response of prices to changes in wages (Bils and Chang, 2000). Similar results, based on Italian firm-level data, are obtained by Rosolia and Venditti (2009) using actual wages and by Gaiotti and Secchi (2006) and Gaiotti (2010) using nationally bargained wages. The coefficient of Δinputcost is around 0.014. This variable, as stated in section 3, captures the dynamics of input prices and changes in factor proportions related for example to outsourcing, which could both reflect, among other things, increased imports from China. Its inclusion, therefore, supports our claim that the coefficient of Δimpen_china identifies a purely pro-competitive effect of Chinese imports on firms' prices.

The remaining variables do not significantly affect firms' prices. In the case of TFP, the statistically not significant coefficient may reflect the fact that the sign of the relationship between price and TFP changes is a priori ambiguous: as clearly pointed out by Melitz (2000), it captures both increases in productivity (with a negative effect on prices) and quality upgrades (with a positive effect). Importantly, our price data do not allow to control for the potential shift of multi-product firms' production activity towards goods that are less exposed to increased competition. However, we believe that our focus on China reduces the relevance of this issue: in the face of low-wage competitive pressures multi-product firms more likely move towards higher-quality products, thus inducing a positive bias in the estimated coefficient of Δimpen_china, that would go against the result we find.

All in all, the results in Tables 5 and 6 point to a causal link between changes in import penetration from China and the dynamics of output prices in Italy. In the remainder of the paper we present robustness tests and extensions to the base estimation. To streamline the presentation of results, hereafter we focus only on IV estimates.

4.2 Robustsness

A first exercise deals with the presence of a possible survivorship bias. If firms that are not able to compress margins enough may decide, or be forced, to exit the market, then we could be overestimating the pro-competitive effect of Δimpen_china. We address this issue using information on firms' history, contained in CADS, that allows to explicitly control for exit from the market. In particular, we include among the regressors a dummy variable exit constructed in two alternative ways[19]. In the first, more restrictive, definition, exit takes value 1 if the firm is liquidated or goes bankrupt after exiting the sample and 0 otherwise. In the second, exit takes value 1 also if the firm is subsequently acquired by another firm. Results are displayed in Table 7: in both cases (columns 1-2 for the first definition, and 3-4 for the second) all the results are unchanged and the coefficient of exit is never significantly different from

[19] The variable exit can be interpreted as the hazard rate in a Heckman selection model. The difference is that here the probability of exit is perfectly observed and it does not need to be estimated.

zero.

A second robustness exercise has to do with the fact that our dependent variable refers to the average price charged by each firm for its products, independently of the market in which they have been sold. Since we focus on Chinese competitive pressure in Italy, we should instead focus only on domestic prices, excluding the impact on export prices. In the absence of information on prices broken down by destination markets and given that we can not exclude the numerous exporting firms without restricting too much the sample size, we indirectly test the relevance of this issue by estimating a weighted version of equation (3) where firm-level weights are constructed as the share of domestic sales in total sales. Results, reported in columns 5 and 6 of Table 7, are again unchanged.

We then consider the possibility that an omitted variable bias, related to a global unobserved sectoral time-varying shock, could be simultaneously driving both China's exports across the world (and therefore in Italy and in the US) and Italian prices. Columns 7 and 8 include the annual percentage change in world trade by sector[20] as a proxy for such sectoral time-varying shocks. This variable is not statistically significant, the coefficient of Δimpen_china is still highly significant and of the same size as in the base regression.

Other robustness checks carried out but not reported in the text are the following. To allow for price dynamics that are geographically heterogeneous, we control for firm's location including macro-area dummies (North-West, North-East, Center and South). We also estimate the baseline model with firm fixed effects, so as to capture firm-specific time trends, and allowing for clustering of standard errors at the firm level. Finally, we exclude sector-year cells with fewer than 20 firms. In all cases, results are unchanged.

5 EXTENSIONS

With the aims of improving our understanding of the mechanisms through which Chinese competitive pressures influence prices in Italy and further strengthening our main results, we now exploit the availability of firm-level data to explore how the effect of import penetration from China varies across sectors and firms.

5.1 Heterogeneity across sectors

Is the price effect of Chinese competition different across sectors? Providing an answer to this question represents not only a further indirect test on the plausibility of the causal relationship we are identifying but also a way of testing the predictions of theoretical

[20] This variable is constructed using the World Trade Analyzer database, developed and managed by Statistics Canada, which provides data on export and import flows, in current dollars, for a very large set of countries and the world, disaggregated by destination market and type of product for the period 1985-2005. The product breakdown corresponds to the 4-digit SITC-Rev.3 classification, which we map into the 3-digit Nace-Rev.1 using the concordance tables provided by the United Nations.

models. In particular, we provide evidence on the relative explanatory power of two different theoretical arguments.

Firstly, the factor proportions framework that descends from the Heckscher-Ohlin trade model implies that a relatively low-skilled labor abundant country like China (Schott, 2008) should specialize in manufacturing industries whose technology is less capital- and skill- intensive. As a result, when Chinese goods massively enter a relatively more capital- and skill-abundant country like Italy, Italian industries more severely hit should be those that are less capital- and skill-intensive. Romalis (2004) shows that factor proportions explain quite well the structure of commodity trade. Using US plant data, Bernard, Jensen and Schott (2006b) find that, in the face of a high exposure to imports from low-wage countries, plant survival and growth is lower in industries that are less capital- and skill-intensive.

The second argument is based on vertical differentiation: focusing on product quality, Khandelwal (2010) argues that the ability of advanced countries' firms to escape from low- wage countries' competition is increasing in the industry scope for vertical differentiation. He finds that the negative impact of import penetration from low-wage countries is stronger in US sectors where the quality ladder is shorter, that is where the scope for quality upgrading is more limited. He shows that his indicator of length of quality ladder is not fully explained by capital- and skill-intensity indicators (despite being positively correlated to them) and that the results above also hold when explicitly controlling for factor proportions.

In the empirical analysis, we interact Δimpen_china with sectoral indicators of capital intensity, skill intensity and importance of product quality. In the spirit of Rajan and Zingales (1998), all indicators are computed on US data to avoid endogeneity problems. In particular, we take the measures of capital intensity (capint) and length of quality ladder (qualad) from Khandelwal (2010)[21]. With regard to skill intensity, we compute from the March 2008 release of the EU KLEMS database the 1990-2005 average share of high- and medium-skilled workers — defined as those that have at least completed high school — over total workers (mhskill) and the same share for only high-skilled workers (hskill) — defined as those with at least a college degree. The advertising/sales ratio (adv), computed by Kugler and Verhoogen (2008) from the 1975 FTC Line of Business Survey, is a further proxy for the scope for quality differentiation.

Table 8 reports the sectoral measures. Capital intensity is highest in the production of chemicals, basic metals, pulp and paper, and lowest in apparel, leather products and footwear. The latter industries, along with the production of textiles, employ the lowest percentage of medium-high skilled workers, which is instead highest for firms producing medical, precision and optical instruments, chemicals and communication equipment. Overall, the correlation between capint and mhskill is about 0.4. The sectors with the longest quality ladder are textiles, chemicals, medical, precision and optical instruments, while the shortest is for printing, publishing, fabricated metal products, leather products and footwear. The advertising/sales ratio is

[21] The two measures refer to year 1989 and are from the NBER Manufacturing database (Bartelsman, Becker and Gray, 1996).

positively correlated with the length of quality ladder; it is highest in printing and publishing, food products and beverages and lowest in the production of leather products and footwear, basic metals and wood products.

The results of the regressions with heterogeneous effects by sector are reported in Table 9, where the coefficient of interest (Δimpen—china *sect) refers to the interaction between Δimpen—china and the (continuous) sectoral measure indicated in the column heading[22].

While we find no significant heterogeneity in terms of capital intensity (column 1) and product quality (columns 4 and 5), the estimates support the factor proportions hypothesis with regard to skill intensity. As it appears in column (3), the causal impact of imports from China decreases as the share of high- and medium-skilled workers increases: as a result, the impact of higher import penetration from China ranges from -0.02 for "medical, precision and optical instruments" to -0.09 for "wearing apparel and dressing"[23].

All in all, our estimates indicate that the pro-competitive effect of imports from China is stronger in low-skill sectors where China holds a comparative advantage due to the relative abundance of unskilled labor (Schott, 2008).

5.2 Heterogeneity across firms

Recent trade models focus on the relationship between trade and firms' heterogenous productivity. Looking at the effects of a trade liberalization through the lenses of firm-level adjustments, Melitz (2003), Bernard, Eaton, Jensen and Kortum (2003) and Melitz and Ottaviano (2008) show that, within an industry, the effects of increased foreign competition are magnified by the reallocation of market shares from less productive to more productive firms.

In line with these theoretical developments, and thanks to the growing availability of micro datasets, a number of empirical studies highlights the importance of firm heterogeneity to understand the effect of trade. Following the seminal paper by Bernard and Jensen (1995), a large cross-country literature shows that exporters are on average more productive than non-exporters and that this is not the result of the exporting activity but rather an ex-ante feature (self-selection) related to the fact that only the most productive firms are able to overcome the costs of starting to export. On US data, Bernard, Jensen and Schott (2006a) find that the effect of low-wage country competition is indeed weaker on high-productivity and relatively more capital-intensive plants and that plants tend to move away from industries more exposed to low-wage country competition, towards more capital intensive productions. In a companion paper Bernard, Jensen and Schott (2006b) find that the impact on plant death is smaller for more productive plants.

All in all, productivity turns out to be a key element to identify which firms

[22] The variable sect is not included among the regressors because we always control for sectoral dummies.

[23] The effect of import penetration from China does not seem to be significantly different across sectors when the latter are ranked according to the share of only high-skilled workers. A stronger pro-competitive effect of China on low skilled sectors is found (not reported) instead when we proxy skill intensity with the sectoral share of non-production workers used by Khandelwal (2010).

are able to access foreign markets and which gain from trade-induced reallocations. In this vein, we investigate whether and how productivity affects the way firms' prices react to China's import competition. We include among our regressors the interactions between sectoral and firm-level characteristics, that is we estimate the following equation[24]:

$$\begin{aligned}\Delta p_{i,t} &= \alpha + \beta\Delta demand_{i,t-1} + \gamma_0 \Delta domcomp_{s,t-1} + \gamma_1 \Delta impen\_china_{s,t-1} + \\ &+ \gamma_{1s}\Delta impen\_china_{s,t-1} * sect + \gamma_{1i}\Delta impen\_china_{s,t-1} * tfp_{i,t-1} + \\ &+ \gamma_{1si}\Delta impen\_china_{s,t-1} * sect * tfp_{i,t-1} + \gamma_2 \Delta impen\_other_{s,t-1} \\ &+ \delta\Delta size_{i,t-1} + \kappa\Delta wage_{i,t-1} + \chi\Delta inputcost_{i,t-1} + \xi\Delta tfp_{i,t-1} + \psi_t + \eta_{i,t}\end{aligned}$$

where we add to the specification discussed in the previous section the interaction between Δimpen_china and the (lagged log) TFP level and the interaction between Δimpen_china, TFP and the sectoral measures. The aim is to test whether the effect of Chinese competition differs across firms with different productivity in a way that may depend on sectoral features.

We expect the coefficient γ_{1i} to be positive, to say that high-TFP firms are better able to face Chinese competitive pressures, while γ_{1si} to be negative since the shield coming from firms' productivity should be less important in sectors that, for technological or product quality reasons, are less exposed to such pressures.

The results shown in Table 10 confirm these hypotheses. The positive coefficient on Δimpen_china * sect in column (3) confirms the finding of the previous section: sectoral differences in skill intensity are relevant in shaping the impact of import penetration from China. In the same column, the statistically significant and positive coefficient of Δimpen_china * t fp indicates that the impact is smaller for high-TFP firms. In other words, low-productivity firms are the ones forced to cut prices the most in the face of Chinese competitive pressures. As expected, the coefficient γ_{1si} of the triple interaction is negative (and significant), indicating that the differential impact of TFP becomes less important as sectoral skill intensity increases. This result holds also, even though weakly, when we proxy skill intensity with both the share of high-skilled workers and the share of non-production workers (not reported). On the contrary, it does not hold when sectors are distinguished according to capital intensity, or to measures of the ability of firms to upgrade the quality, actual or perceived, of their products.

Using the estimated values of γ_1, γ_{1s}, γ_{1i} and γ_{1si} it turns out that an increase in TFP significantly softens the negative impact of import penetration from China on prices only for the sectors with the lowest skill intensity, that is, in decreasing order, for "apparel", "textiles", "leather products", "wood products", "food and beverages", "other manufacturing including furniture" and "other non-metallic mineral products". The order of magnitude of this effect is non-negligible: in the "apparel" sector, a 10 per cent increase in import penetration from China reduces price dynamics by 0.96 percentage points for a firm with a TFP level equal to the 25th percentile of the overall TFP distribution, and by 0.02 percentage points for a firm at the 75th percentile; in the "textiles" and "leather products and footwear" sectors, price dynamics

[24] The equation is estimated via 2SLS, since the number of clusters is not sufficient to allow computation of GMM estimates, as the interaction terms increased the number of regressors.

is reduced by 0.61 and 0.03 percentage points, respectively.

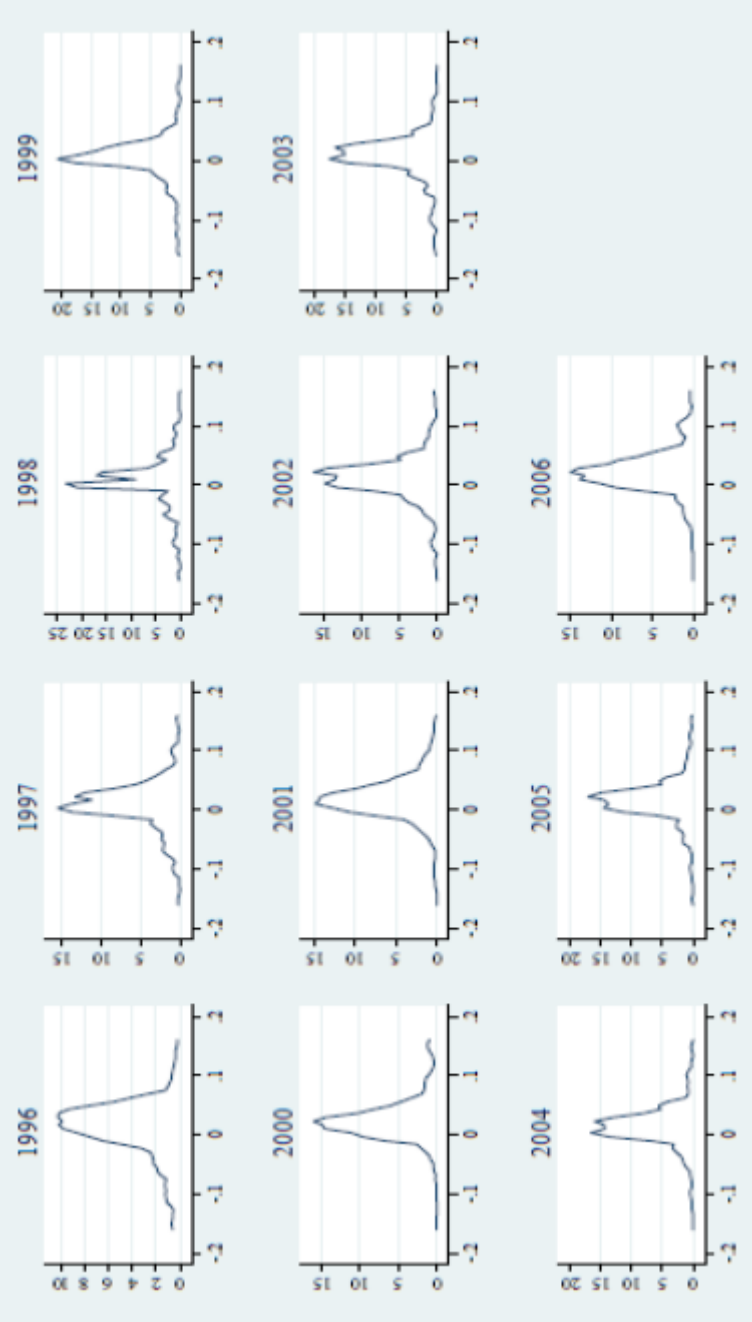
6 CONCLUSIONS

In this paper we show that growing competitive pressures exerted by Chinese products on an advanced economy like Italy has contributed to soften, ceteris paribus, firms' output prices. The impact we estimate is non-negligible: a 10 per cent increase in import penetration from China reduces price dynamics by about 0.35 percentage points per year (the average annual inflation rate over the sample period is 2 per cent). To the best of our knowledge, this is the first empirical test of the pro-competitive impact of foreign competition on firm-level prices.

Importantly, in recent theoretical trade models, the adjustments of prices (and markups) to enhanced foreign competition is the trigger of the reallocation process that brings about increases in aggregate productivity.

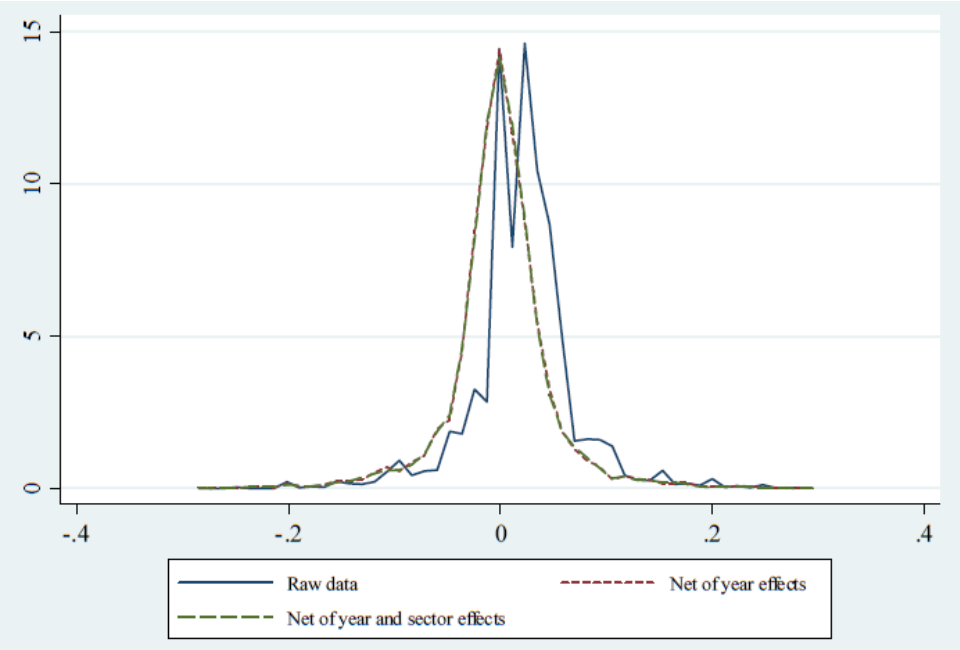
A further contribution of this paper is the evidence on sector and firm heterogeneity. This is again in line with recent developments in theoretical and empirical trade literature. We find that the impact of Chinese competitive pressures is stronger in low-skill sectors such as textile, apparel, leather goods, furniture. We interpret this as an empirical support to the factor proportions hypothesis: China's relative abundance of unskilled labor shapes the differential impact of its exports in advanced economies across sectors. We also find that this impact is highly heterogeneous across firms depending on their productivity level. The effect is much more severe for low-productivity firms that are presumably less able to escape competition by upgrading the quality of their products. The role of productivity is larger within less skill intensive sectors, and it declines as skill intensity rises.

Fig. 1 **Distribution of annual price changes, by year**



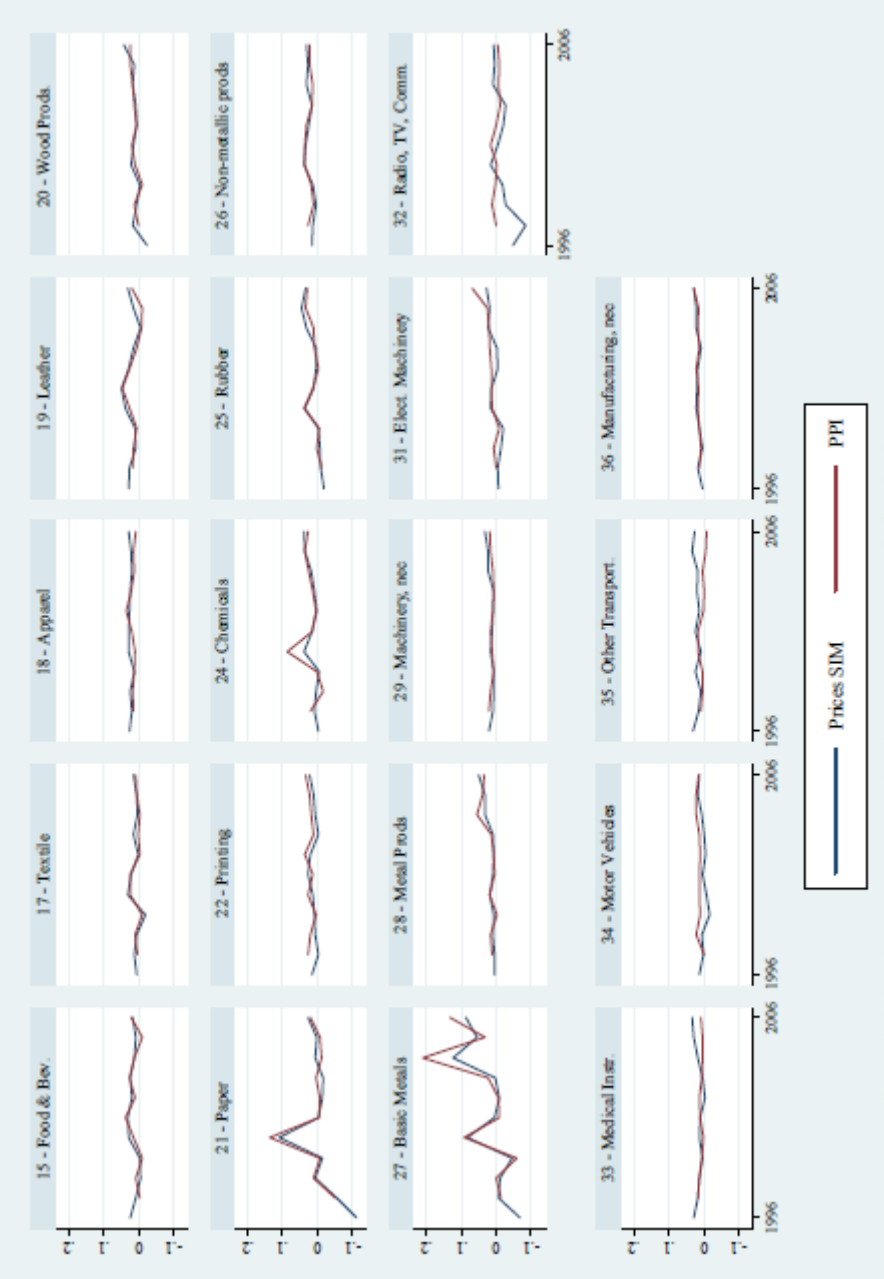
Source: SIM – Price changes are measured at the firm-level and refer to the average across all goods produced by a firm.

Fig. 2 **Distribution of price changes over all year**



Source: SIM.

Fig. 3 **Annual price change, sectoral averages: SIM vs official production prices**



Source: SIM and Italian Statistical Institute (ISTAT). SIM price changes are measured at the firm-level.

Fig. 4 China's import penetration

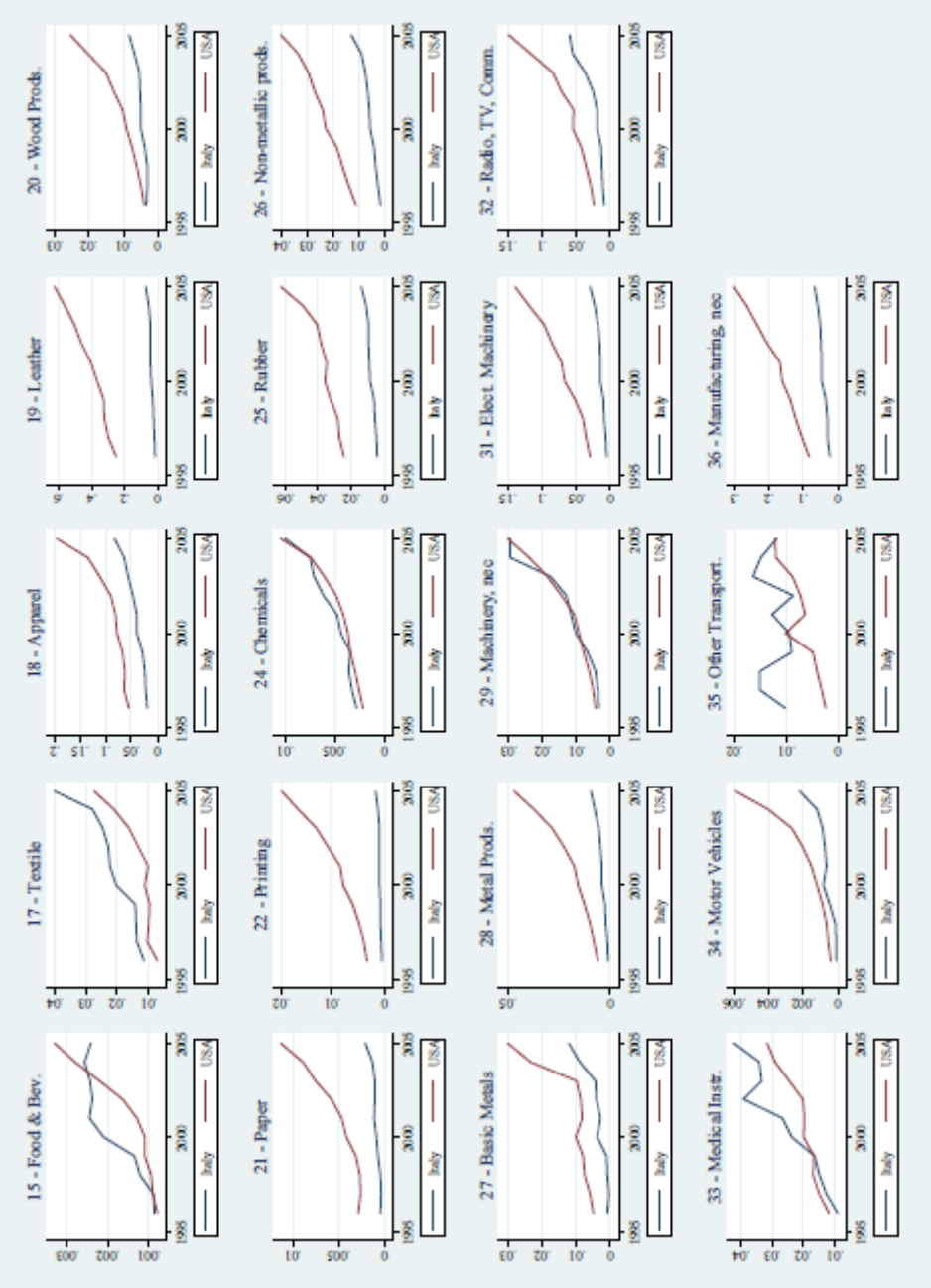


Table 1: Descriptive statistics of sampled firms

	1995	2000	2005
number of employees	330	591	314
number of employees (median)	253	212	156
age	44	42	41
sales (million of euros)	152.7	164.6	86.6
value added per worker (thousands of euros)	52.7	58.3	60.6
per capita wage (thousands of euros)	30.3	33.7	38.6
export/sales (percentage, only exporters)	36.6	39.1	41.4

Source: SIM - CADS

Table 2: Distribution of firms in terms of value added and employment, by sector

	Value added			Employment		
	1995	2000	2005	1995	2000	2005
Food products and beverages (15)	5.3	12.7	10.1	3.8	10.5	9.0
Textiles (17)	5.8	6.4	3.5	6.9	8.0	5.5
Wearing apparel, dressing (18)	4.6	3.3	2.8	5.0	4.1	4.0
Leather, leather products and footwear (19)	1.0	1.3	1.5	1.9	2.6	2.5
Wood and products of wood and cork (20)	0.5	0.7	0.9	0.6	1.1	1.1
Pulp, paper and paper products (21)	5.3	3.7	3.0	3.4	3.0	2.7
Printing, publishing and reproduction (22)	1.2	5.0	2.8	1.2	4.7	1.8
Chemicals and chemical products (24)	7.9	11.3	6.9	5.4	7.5	4.7
Rubber and plastics products (25)	7.8	7.6	4.0	6.5	8.5	4.6
Other non-metallic mineral products (26)	4.5	9.9	8.7	3.4	7.5	7.2
Basic metals (27)	5.1	12.4	9.3	3.0	13.7	7.3
Fabricated metal products (28)	2.2	2.3	4.9	2.3	2.7	5.8
Machinery, n.e.c. (29)	13.8	9.0	20.7	12.2	9.8	21.0
Electrical machinery (31)	3.9	2.2	3.2	3.6	2.3	2.9
Radio, television and communication equipment (32)	2.4	1.5	0.8	5.4	1.3	1.0
Medical, precision and optical instruments (33)	1.4	3.0	4.2	1.7	3.8	3.8
Motor vehicles, trailers and semi-trailers (34)	21.8	2.5	7.2	28.0	2.3	7.4
Other transport equipment (35)	4.5	2.2	1.8	4.9	3.5	2.3
Manufacturing n.e.c., including furniture (36)	1.0	3.1	2.3	0.9	3.3	5.4

Source: SIM

Table 3: Import penetration in Italy and US, by sector

	Italy			USA		
	1995	2000	2005	1995	2000	2005
Food products and beverages (15)	0.07	0.21	0.24	0.07	0.11	0.33
Textiles (17)	1.43	2.05	4.02	0.80	1.13	2.74
Wearing apparel, dressing (18)	1.99	3.96	8.37	5.22	7.80	19.57
Leather, leather products and footwear (19)	1.58	3.74	7.28	23.62	36.63	62.66
Wood and products of wood and cork (20)	0.31	0.48	0.83	0.36	0.91	2.54
Pulp, paper and paper products (21)	0.03	0.08	0.20	0.23	0.41	1.13
Printing, publishing and reproduction (22)	0.04	0.08	0.16	0.30	0.79	1.98
Chemicals and chemical products (24)	0.27	0.44	0.99	0.18	0.36	1.04
Rubber and plastics products (25)	0.36	0.83	1.38	2.13	3.58	6.25
Other non-metallic mineral products (26)	0.15	0.53	1.28	0.96	2.26	4.02
Basic metals (27)	0.20	0.41	1.23	0.47	1.03	2.99
Fabricated metal products (28)	0.14	0.44	0.97	0.56	1.60	4.68
Machinery, n.e.c. (29)	0.31	1.03	2.96	0.35	0.94	3.04
Electrical machinery (31)	0.58	1.57	3.02	2.60	6.68	13.91
Radio, television and communication equipment (32)	1.08	1.99	5.97	2.29	5.59	14.91
Medical, precision and optical instruments (33)	0.77	2.37	4.22	0.99	1.99	3.16
Motor vehicles, trailers and semi-trailers (34)	0.00	0.08	0.22	0.03	0.12	0.59
Other transport equipment (35)	0.80	0.93	1.18	0.22	1.01	1.22
Manufacturing n.e.c., including furniture (36)	2.22	4.62	6.66	6.99	16.16	30.02

Source: Eurostat, Istat, Schott (2008)

Table 4: Univariate regression

	dep. var.: $\Delta price$				
	OLS				IV-GMM
	(1)	(2)	(3)	(4)	(5)
$\Delta impen\_china$	-0.007	-0.013**	-0.010	-0.016**	-0.037*
	(0.005)	(0.005)	(0.008)	(0.007)	(0.021)
$\Delta impen\_others$	-0.019	0.007	-0.017	0.004	0.048
	(0.022)	(0.035)	(0.022)	(0.037)	(0.120)
Constant	0.018***	0.003	0.018***	0.003	0.002
	(0.002)	(0.005)	(0.001)	(0.004)	(0.016)
Year FE	no	yes	no	yes	yes
Sector FE	no	no	yes	yes	yes
R^2	0.005	0.052	0.032	0.079	0.067
Observations	5,071	5,071	5,071	5,071	5,071
P-value test F(all year FE = 0)		0.000		0.000	
P-value test F(all sector FE = 0)			0.000	0.000	

Notes: OLS and IV-GMM estimates. Robust standard errors clustered at the sectoral level (2 digits of the Nace Rev.1 classification) are reported in brackets below the coefficients. Sector fixed effects are at 2 digits of the Nace Rev. 1 classification. $\Delta impen\_china$ and $\Delta impen\_other$ are, respectively, the annual percentage change in import penetration from China and from the other countries in Italy.

*** identifies significance of the coefficient at 1 per cent; ** identifies significance at 5 per cent, * identifies significance at 10 per cent.

Table 5: Base Regression

	dep. var.: $\Delta price$			
	OLS		IV-GMM	
	(1)	(2)	(3)	(4)
$\Delta impen\_china$	-0.013**	-0.017**	-0.034**	-0.038*
	(0.005)	(0.007)	(0.015)	(0.020)
$\Delta impen\_others$	-0.001	-0.003	0.037	0.020
	(0.035)	(0.037)	(0.051)	(0.102)
$\Delta domcomp$	-0.000	-0.003	-0.005	-0.008
	(0.010)	(0.009)	(0.012)	(0.012)
$\Delta demand$	0.002	0.004	0.003	0.004
	(0.008)	(0.008)	(0.008)	(0.008)
$\Delta size$	0.222***	0.226***	0.215***	0.219***
	(0.059)	(0.063)	(0.052)	(0.056)
$\Delta inputcost$	0.014**	0.014**	0.014***	0.013***
	(0.006)	(0.006)	(0.005)	(0.005)
$\Delta wage$	0.029**	0.032**	0.027**	0.029***
	(0.011)	(0.013)	(0.011)	(0.011)
Δtfp	-0.004	-0.004	-0.003	-0.002
	(0.004)	(0.004)	(0.003)	(0.003)
Sector FE	no	yes	no	yes
Observations	5,071	5,071	5,071	5,071
R^2	0.058	0.086		

Notes: OLS and IV-GMM estimates. Robust standard errors clustered at the sectoral level (2 digits of the Nace Rev.1 classification) are reported in brackets below the coefficients. All regressions include year fixed effects. Sector fixed effects are at 2 digits of the Nace Rev. 1 classification. $\Delta impen\_china$ and $\Delta impen\_other$ are, respectively, the annual percentage change in import penetration from China and from the other countries in Italy. The other explanatory variables are described in sections 2 and 3.
*** identifies significance of the coefficient at 1 per cent; ** identifies significance at 5 per cent, * identifies significance at 10 per cent.

Table 6: First Stage

	dep. var.: $\Delta impen\_china$		dep. var.: $\Delta impen\_other$	
	(1)	(2)	(3)	(4)
$\Delta ciffob$	-0.004	0.096	-0.110*	-0.134**
	(0.294)	(0.294)	(0.057)	(0.058)
$\Delta impen\_china\_us$	0.653*	0.552**	0.398***	0.426***
	(0.353)	(0.273)	(0.076)	(0.084)
$\Delta share\_china\_us$	0.305	0.230	-0.330***	-0.373***
	(0.267)	(0.391)	(0.096)	(0.106)
$\Delta domcomp$	-0.067	-0.120	0.052*	0.055*
	(0.196)	(0.200)	(0.028)	(0.028)
$\Delta demand$	-0.013	0.001	-0.013*	-0.015*
	(0.064)	(0.054)	(0.009)	(0.007)
$\Delta size$	-0.065	-0.013	0.195***	0.142**
	(0.283)	(0.244)	(0.058)	(0.058)
$\Delta inputcost$	0.075	0.055	0.029***	0.030***
	(0.044)	(0.037)	(0.009)	(0.009)
$\Delta wage$	-0.069	-0.023	0.011	0.006
	(0.075)	(0.059)	(0.010)	(0.010)
Δtfp	0.041	0.044	0.006	0.008*
	(0.025)	(0.030)	(0.005)	(0.004)
Sector FE	no	yes	no	yes
F- stat	14.73	15.69	17.24	21.49
Sargan-Hansen	0.05	0.165	0.05	0.165
Observations	5,071	5,071	5,071	5,071

Notes: Pseudo-First stage of IV-GMM estimates of equation 3. Robust standard errors clustered at the sectoral level (2 digits of the Nace Rev.1 classification) are reported in brackets below the coefficients. All regressions include year fixed effects. Sector fixed effects are at 2 digits of the Nace Rev. 1 classification. $\Delta impen\_china$ and $\Delta impen\_other$ are, respectively, the annual percentage change in import penetration from China and from the other countries in Italy. $\Delta impen\_china\_us$ and $\Delta share\_china\_us$ are, respectively, the annual change in import penetration from China in US and the annual change in the Chinese share over world imports to US. $\Delta ciffob$ is the annual percentage change in freight rates, computed on US trade data. The other explanatory variables are described in sections 2 and 3.

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Table 7: Robustness Checks

	dep. var.: $\Delta price$							
	liquidation or bankruptcy		liquidation, bankruptcy or acquisition		regressions weighted by exported revenues		controlling for Δworld trade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta impen\_china$	-0.034**	-0.035*	-0.034**	-0.035*	-0.032**	-0.035*	-0.033**	-0.036*
	(0.015)	(0.020)	(0.015)	(0.020)	(0.016)	(0.022)	(0.014)	(0.019)
$\Delta impen\_other$	0.037	0.020	0.037	0.019	0.021	-0.005	0.015	0.003
	(0.091)	(0.102)	(0.091)	(0.103)	(0.087)	(0.115)	(0.071)	(0.088)
$\Delta domcomp$	-0.005	-0.008	-0.005	-0.008	-0.003	-0.005	-0.004	-0.007
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.012)
$\Delta demand$	0.003	0.004	0.003	0.004	0.007	0.009	0.003	0.004
	(0.008)	(0.008)	(0.008)	(0.007)	(0.010)	(0.010)	(0.008)	(0.007)
$\Delta size$	0.212***	0.216***	0.216***	0.222***	0.188***	0.201***	0.218***	0.221***
	(0.053)	(0.057)	(0.052)	(0.056)	(0.056)	(0.060)	(0.051)	(0.055)
$\Delta inputcost$	0.014***	0.013***	0.014***	0.013***	0.015**	0.014**	0.014***	0.013***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)
$\Delta wage$	0.027**	0.029***	0.027**	0.029***	0.031**	0.033**	0.027**	0.030***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)	(0.011)	(0.011)
Δtfp	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$exit$	-0.002	-0.002	0.001	0.002				
	(0.004)	(0.004)	(0.002)	(0.002)				
$\Delta world\_trade$							0.017	0.008
							(0.030)	(0.031)
Constant	0.037***	0.038***	0.037***	0.038***	0.037***	0.040***	0.039***	0.040***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)
Sector FE	no	yes	no	yes	no	yes	no	yes
Observations	5,071	5,071	5,071	5,071	5,066	5,066	5,071	5,071

Notes: IV-GMM estimates. Robust standard errors clustered at the sectoral level (2 digits of the Nace Rev.1 classification) are reported in brackets below the coefficients. All regressions include year fixed effects. Sector fixed effects are at 2 digits of the Nace Rev. 1 classification. $\Delta impen\_china$ and $\Delta impen\_other$ are, respectively, the annual percentage change in import penetration from China and from the other countries in Italy. In columns 1 and 2 the dummy *exit* is equal to 1 if the firm is liquidated or goes bankrupt after exiting the sample and 0 otherwise; in columns 3 and 4 *exit* is equal to 1 also for firms that are subsequently acquired by another firm. In columns 5 and 6 observations are weighted by a firm's share of domestic over total sales. In columns 7 and 8 $\Delta world\_trade$ is the annual percentage in world trade. The other explanatory variables are described in sections 2 and 3.

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Table 8: Sectoral measures

	capital intensity	skill intensity		product quality	
	capint	hskill	mhskill	qualad	adv
Food products and beverages (15)	81.4	0.16	0.79	2.04	0.030
Textiles (17)	49.7	0.10	0.73	2.62	0.014
Wearing apparel, dressing (18)	11.2	0.12	0.67	2.28	0.010
Leather, leather products and footwear (19)	18.6	0.10	0.73	1.69	0.001
Wood and products of wood and cork (20)	36.3	0.09	0.76	1.81	0.002
Pulp, paper and paper products (21)	126.0	0.17	0.87	1.88	0.002
Printing, publishing and reproduction (22)	33.2	0.33	0.92	1.33	0.028
Chemicals and chemical products (24)	166.1	0.39	0.93	2.46	0.010
Rubber and plastics products (25)	48.5	0.14	0.84	2.32	0.010
Other non-metallic mineral products (26)	78.6	0.13	0.83	2.15	0.007
Basic metals (27)	157.1	0.14	0.85	2.21	0.001
Fabricated metal products (28)	53.0	0.12	0.84	1.42	0.011
Machinery, n.e.c. (29)	63.1	0.18	0.90	2.40	0.007
Electrical machinery (31)	57.7	0.23	0.89	2.01	0.009
Radio, television and communication equip. (32)	57.7	0.37	0.93	2.01	0.009
Medical, precision and optical instrum. (33)	45.3	0.36	0.93	2.40	0.013
Motor vehicles, trailers and semi-trailers (34)	69.6	0.18	0.89	2.09	0.009
Other transport equipment (35)	69.6	0.32	0.92	2.09	0.009
Manufacturing n.e.c., including furniture (36)	22.1	0.15	0.80	2.40	0.015

Source: EU KLEMS, Kugler and Verhoogen (2008), and Khandelwal (2010).

Table 9: Sector heterogeneity

	dep. var.: Δprice				
	capital intensity	skill intensity		product quality	
	capint	hskill	mhskill	qualad	adv
	(1)	(2)	(3)	(4)	(5)
$\Delta impen\_china$	-0.007	-0.025**	-0.277**	-0.162*	-0.028***
	(0.028)	(0.012)	(0.110)	(0.095)	(0.007)
$\Delta impen\_china * sec$	-0.000	-0.031	0.281**	0.054	0.079
	(0.000)	(0.112)	(0.133)	(0.043)	(0.297)
$\Delta impen\_others$	-0.020	-0.020	0.051	0.038	0.025
	(0.024)	(0.079)	(0.039)	(0.068)	(0.032)
$\Delta domcomp$	-0.005	-0.004	-0.010	-0.002	-0.011
	(0.012)	(0.011)	(0.009)	(0.011)	(0.008)
$\Delta demand$	0.003	0.006	-0.000	0.006	0.006
	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)
$\Delta size$	0.200***	0.222***	0.220***	0.238***	0.222***
	(0.053)	(0.056)	(0.053)	(0.053)	(0.059)
$\Delta inputcost$	0.011***	0.012***	0.014***	0.011***	0.011**
	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
$\Delta wage$	0.032***	0.035***	0.025**	0.033***	0.026***
	(0.008)	(0.008)	(0.010)	(0.010)	(0.010)
Δtfp	-0.005	-0.003	-0.001	-0.003	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	5,071	5,071	5,071	5,071	5,071

Notes: IV-GMM estimates. Robust standard errors clustered at the sectoral level (2 digits of the Nace Rev.1 classification) are reported in brackets below the coefficients. All regressions include year and sector fixed effects. $\Delta impen\_china$ and $\Delta impen\_other$ are, respectively, the annual percentage change in import penetration from China and from the other countries in Italy. The variable sect is equal to the one indicated in the heading of each column; more details on the sectoral indicators are provided in section 5.1. The other explanatory variables are described in sections 2 and 3.

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Table 10: Firm and sector heterogeneity

	capital intensity	skill intensity		product quality	
	capint	hskill	mhskill	queled	adv
	(1)	(2)	(3)	(4)	(5)
$\Delta impen\_china$	-0.046	-0.075***	-0.658***	0.044	0.007
	(0.055)	(0.021)	(0.231)	(0.143)	(0.030)
$\Delta impen\_china * tfp$	0.000	0.001**	0.016**	-0.007	-0.000
	(0.001)	(0.000)	(0.007)	(0.009)	(0.000)
$\Delta impen\_china * sec$	0.000	0.499*	0.783**	-0.021	-0.607
	(0.000)	(0.264)	(0.306)	(0.062)	(1.919)
$\Delta impen\_china * tfp * sec$	-0.000	-0.009***	-0.019**	0.003	-0.007
	(0.000)	(0.002)	(0.008)	(0.004)	(0.013)
$\Delta impen\_others$	-0.073	-0.033	-0.024	-0.039	-0.059
	(0.073)	(0.111)	(0.115)	(0.082)	(0.074)
$\Delta domcomp$	-0.002	0.007	0.008	-0.004	0.002
	(0.012)	(0.011)	(0.013)	(0.015)	(0.010)
$\Delta demand$	0.004	0.002	0.003	0.002	0.002
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)
$\Delta size$	0.237***	0.226***	0.226***	0.236***	0.235***
	(0.060)	(0.058)	(0.058)	(0.061)	(0.060)
$\Delta inputcost$	0.017***	0.014***	0.014***	0.015***	0.015***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$\Delta wage$	0.029**	0.030**	0.031**	0.032**	0.030**
	(0.012)	(0.013)	(0.013)	(0.014)	(0.012)
Δtfp	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
tfp	0.000	-0.000	-0.003**	0.001	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
$tfp * sec$	0.000	0.002***	0.003**	-0.000	0.003
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	5,071	5,071	5,071	5,071	5,071

Notes: IV-GMM estimates. Robust standard errors clustered at the sectoral level (2 digits of the Nace Rev.1 classification) are reported in brackets below the coefficients. All regressions include year and sector fixed effects. The variable *sect* is equal to the one indicated in the heading of each column; more details on the sectoral indicators are provided in section 5.1. tfp is the lagged log-level of firm-level total factor productivity. The other explanatory variables are described in sections 2 and 3.

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