On the pro-competitive effects of trade with heterogeneous firms: a cross-country, cross-sector analysis

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Abstract

This paper tests the effects of different measures of import penetration (horizontal and vertical, in both goods and services) on a number of firm-specific competition indicators, the price-cost margin and a new measure of competition, the Relative Profit Differences (RPD) proposed by Boone (2008). The paper takes a comparative perspective across sectors, using data for firms operating in both manufacturing and services, and across countries, in that it tests these effects in two large European economies: Italy and Germany.

**JEL classification:** F15, L11

**Keywords:** price cost margins, trade openness, firms’ heterogeneity

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1 Introduction

The positive effects on competition induced by an increased exposure to international trade have been widely studied in the literature. A survey by Tybout (2003) in particular explores the effects of trade liberalization on average price-cost margins, exports, firm sizes, productivity and net entry dynamics.

However, ‘new-new’ trade models, which explicitly take into account a number of dimensions according to which firms are heterogeneous, yield a potentially richer set of competitive effects induced by trade exposure. In particular, Melitz and Ottaviano (2008) have combined the supply-side features of the Melitz’s (2003) model of firm heterogeneity with a demand system different than the traditional CES demand function, thus adding the dimension of heterogeneous markups in imperfect competition models of trade\footnote{In their framework, monopolistically competitive firms produce one variety of a single product with heterogeneous productivity levels; markups, rather than being driven exogenously by the distribution of firms’ marginal costs, are endogenous over the different product varieties, depending among others on the ‘toughness’ of competition across countries or industries and hence on the exposure to international trade.}. A similar result has been obtained by Bernard, Eaton, Jensen and Kortum (2003), who extended a Ricardian trade model in order to explain the evidence of enormous plant-level heterogeneity in the exporting and productivity of US firms.

A further dimension of firm heterogeneity has been pointed out by a number of papers (Bernard et al., 2006; Eckel and Neary, 2009; Iacovone and Javorcik, 2008; Baldwin and Gu, 2009), who have discussed theoretically and empirically how multi-product firms might react to international competition endogenously changing their product mix, composed of asymmetric, different products.

Working with a general equilibrium model of multi-product firms that incorporates both supply and demand linkages, Eckel and Neary (2009) have indeed shown that intra-firm adjustments imply quite different predictions regarding the impact of international trade on factor prices and product diversity than traditional models of international trade. In particular, in a world of single-product firms in monopolistic competition international market integration would increase the choices available to consumers. In a world characterized, as it is the case, by multi-product firms, however, it exists a so-called ‘cannibalization’ effect: a larger output of one variety tends to lower the demand for all other varieties, and thus a multi-product firm has an additional incentive to restrict its output of each variety, not only producing less of each product, but also ending-up in producing fewer products.

Bernard et al (2006) theoretically analyze the effects of trade liberalization for multi-product firms, in a CES setting (i.e. with constant markups and thus no cannibalization effect). In their model, endogenous changes in the product mix choices are driven by a feature of fixed costs of production which are allowed to vary with the product range of multi-product firms; however, they also find that trade liberalization will induce firms to reduce the number/mass of products they produce. Iacovone and Javorcik (2008) and Baldwin and Gu (2009) have found empirical evidence of these effects for the case, respectively, of Canadian and Mexican firms under NAFTA.

The ensuing implication of these findings for competition is that, while an increased trade exposure should lower the prices of domestic firms (the pro-competitive effect of trade), firms might react to these increased competitive pressures by endogenously compressing their product mix towards products characterized by a lower elasticity of demand. At the same time, multi-product exporting firms might also restrict their availability of traded products, with the result...
that an increased trade pressure has a non-obvious impact on firms’ markups. Along the same lines, an increase in price-cost margins might not necessarily signal a problem in competition in the short run, as long as the effect is driven by an adjustment of costs to the now available cheaper inputs.

In order to gather some evidence on all these possible effects, this paper tests the effects of different measures of import penetration (horizontal and vertical, for both services and manufacturing) on a number of firm-specific competition indicators, the price-cost margin and a new measure of competition, the Relative Profit Differences (RPD) proposed by Boone (2008). The paper takes a comparative perspective, in that it tests these effects for firms operating in two large European economies: Italy and Germany. The analysis also covers firms operating in the services sector, since recent institutional and technological (ICT) developments at the global level have brought about an increasing tradeability of services, as shown by Breinlich and Criscuolo (2009).

The structure of the paper is as follows: Section 2 shows our firm-level data and discusses our indicators of trade penetration, as well as our general estimation strategy. Section 3 presents our results on the relation between import penetration and price-cost margins, and discusses the extension of the analysis to the RPD measure. Section 4 concludes.

2 Data and estimation strategy

2.1 Import penetration indexes

Information on trade flows has been provided by the COMEXT database of Eurostat as regards manufacturing, and the UN Service Trade Database for service industries. Values of imports and exports of the manufacturing sector were collected at a detailed product level according to the CN 8-digit classification used for custom purposes, for the period 1999-2007, considering the trade flows of Italy and Germany with the rest of the World. The data were then reclassified at the 2-digit NACE rev. 1.1 level, using the relative correspondence tables provided by EUROSTAT. UN Service Trade Database provides data on trade in services classified according to the Extended Balance of Payments Services Classification (EBOPS): we build a concordance between this classification and 2-digit NACE. Overall, we are able to obtain trade statistics for 18 service industries expressed in 2-digit NACE classification.\footnote{See Appendix for a complete list of the industries.}

Data on production in manufacturing were collected using EUROSTAT with its PRODCOM database at a 8-digit product classification, whose codes were once again converted at NACE industry detailed levels as done for trade flows. As regards services, data in production are retrieved from EUROSTAT National Account statistics.

Import penetration indexes have then been constructed for both manufacturing and services industries (see Appendix) taking into account both a measure of horizontal import penetration and one of vertical import penetration, $H_{impzjt}$ and $V_{impzjt}$ respectively, from country $z$ in industry $j$ at time $t$. The horizontal penetration index (i.e. import penetration ratios considering the industry of affiliation) is calculated as:

$$H_{impzjt} = \frac{IMP_{zjt}}{IMP_{zjt} + PROD_{zjt}}$$ (1)
where $IMP_{zjt}$ are the total imports of Germany or Italy ($z$) in industry $j$ in year $t$, while $PROD_{zjt}$ is the national output of industry $j$ in year $t$ retrieved from the PRODCOM database. The index is therefore bounded between 0 and 1.\(^3\)

The measure of the vertical import penetration, $V_{imp_{zjt}}$, is somewhat more complicated, since it reflects the linkages present in the up-stream industries. Following Smarzynska (2004), who has used a similar indicator in order to measure "vertical" FDI presence, the index is computed as the weighted average of the up-stream industries’ horizontal import penetration ratios using as weights the time-varying input-output coefficients retrieved from the Italian and German Input-Output matrices, which distinguish between general figures for intermediates and specific amounts of imports used by economic activities for production purposes.\(^4\) The indicator has thus been constructed as

$$V_{imp_{zjt}} = \sum_{k \neq j} a_{kjt} \cdot H_{imp_{zkt}}$$

where $a_{kjt}$ is the weight of industry $k$ as input of industry $j$ at time $t$.

### 2.2 The sample of firms

A commercial database called AIDA, collected by the Bureau van Dijk, was used in order to retrieve firm level information about production value, material costs, cost of employees, value added, tangible fixed asset, depreciation, interest paid over debt and employment for firms located in Italy. As regards Germany, we collect information from AMADEUS database, maintained by Bureau van Dijk.

We have cleaned our data by removing all those observations for which declared variable costs are negative, as these are clearly errors in the reporting activity. Additionally, we decide to remove from our sample all those observations for which sales were lower than the cost of employees, as a firm with sales lower than this threshold is unable to pay its workers, and can therefore be considered out of the market.

Overall, we are able to construct price-cost margins for more than 672,000 firms in Italy: around 153,000 manufacturing firms and 519,500 service firms. Concerning Germany, our sample includes almost 191,000 firms (153,000 in services and 38,000 in manufacturing). Our data cover the time period spanning from 2000 to 2007.

### 2.3 Estimation strategy

Once endowed with our import penetration indexes, calculated both horizontal and vertical and for both manufacturing and services trade, we relate these measures to competition by estimating for each country $z$ the following general model:

$$Comp_{ijt} = \alpha_0 + \alpha_1 H_{imp_{jyt}} + V_{imp_{jyt}} + X_{it} + \delta_t + \epsilon_{ijt}$$

\(^3\)Results are robust when using an import penetration index calculated excluding exports from the denominator.

\(^4\)In order to check whether the latter display a clear time-trend, we have checked the correlation between the 1996 and the 2003 input-output coefficients, which turned out to be very high and significant. However, a process of technological change is in some cases quite relevant, with differences in coefficients ranging from -15% (the weight of sector 23 - petroleum products - as input of itself) to +12% (the weight of sector 34 - motor vehicles - as input of itself).
where $Comp_{ijt}$ is our firm-level proxy measuring competition, $H_{imp_{jt}}$ and $V_{imp_{jt}}$ are the industry-specific import penetration measures discussed above, $X_{it}$ are controls at the firm-level, while $\delta_t$ are time-fixed effects.

In terms of our dependent variable, our first proxy of competition is an empirical version of the Lerner Index. To this extent, two approaches are available in the literature, and both can be directly used at the firm-level of analysis, since they only need the availability of balance sheet data. The basic one is a simple ratio between profits and sales of a single firm, as in the case of Aghion et al. (2005) and Nickell (1996). A similar approach, suggested by Tybout (2003), in which the PCM at the firm level is estimated taking the difference between production value and total variable costs (employment plus material costs) divided by production value, has the same computational advantages, and will be used as our baseline.

As a result, starting from yearly balance sheet data the firm-level PCM can be proxied as:

$$PCM_{it} \approx \frac{sales_{it} - variable\_costs_{it}}{sales_{it}} = \frac{(p \cdot q)_{it} - (c \cdot q)_{it}}{(p \cdot q)_{it}} = \frac{p_{it} - c_{it}}{p_{it}}$$ (4)

for the firm $i$ at time $t$, where quantity is simplified within the ratio, leaving in the expression unit price $p$ and unit variable cost $c$. The latter represents the sum of costs for materials and costs for employees, therefore excluding the cost of capital that is considered as a fixed cost\(^5\).

Using the same firm-level data necessary to calculate the PCM, it is possible to retrieve an alternative proxy for our competition measure, based on an index of “Relative Profit Differences” (RPD, as proposed by Boone, 2008). The latter is useful to assess the robustness of our PCM-based results with respect to the actual dynamics of competition. For example, it could be the case that more efficient firms would report lower costs (then having a higher firm-level PCM) whereas less efficient ones would show higher costs (therefore lower firm-level PCM). Given a competition shock in the sector due to a higher trade penetration with consequent lower prices, less efficient firms would exit and their market shares would be redistributed among more efficient ones, hence eventually increasing the aggregate PCM.

That is a case where a positive competition shock determines a higher sector-level PCM, implying that, under particular circumstance, the PCM measure is not monotonous in competition. The RPD measure, instead increases (decreases) not only for the enhanced (lower) competition that arises from lower entry barriers, but also for competition that reallocates output to more efficient incumbent firms within the sector, thus ensuring the respect of monotonicity with respect to the direction of the competition shock\(^6\).

The firm-level measure is constructed as follows:

$$RPD_{it} = \frac{\pi_t(i_U) - \pi_t(i_L)}{\pi_t(i) - \pi_t(i_L)}$$

where $\pi_t$ is profit at time $t$, $i$ is the firm in object and $[i_L, i_U]$ is the set of firms belonging to a given industry and ranked by cost-efficiency, from the less efficient $i_L$ to the more efficient $i_U$.

\(^5\)The theoretical PCM should take into account the unit marginal cost instead of the variable cost, but the former is not available when considering yearly balance sheet data.

\(^6\)Boone (2008) demonstrates that RPD is monotone in competition both if aggressiveness of incumbent firms changes and if more efficient firms enter into the market. Aggressiveness here can be modeled also as an increased elasticity of substitution within a sector, whereas decreased elasticity of substitution would mean defense by firms that can enter into market niches with less elastic consumers’ demand. See Boone (2008) for further details.
The graphical intuition is provided in Graph 1 below, where the inverse of normalized profits is plotted against the inverse of normalized efficiency \( RCE_{it} = \frac{C(i_U)-C(i_L)}{C(i_U)-C(i)} \), measured in terms of costs for a sector \( j \) at time \( t \).\(^7\)

![Figure 1: Relative Profit Differences in a given sector](image)

In this case, the more competitive a sector, the more the dotted line would be pulled to the bottom right. From the graph, then, levels of competition within a sector can be computed as the area below the RPD curve. The smaller the area below the curve, then, the higher it is the level of competition within a sector. In the extreme case of Bertrand competition, homogenous good and constant marginal costs, the area below the line would be zero and the curve would collapse on the bold axis.

In order to bring this concept into data, we need to measure the elasticity of firms’ profits to their costs, i.e. to regress the firm-level profits, once normalized on their yearly distributions, against the normalized costs after the ranking in terms of cost-efficiency, from the more efficient to the less efficient. Taking logs and thus proxying the relationship above with a log-linear one, the slope can be estimated through the following OLS equation for each year:

\[
\ln(RPD_{ij}) = \beta_0 + \beta_1 \ln(RCE_{ij}) + \varepsilon_{ij} \tag{5}
\]

where RPD is the firm-level Relative Profit Difference for firm \( i \) in sector \( j \), RCE is the firm-level relative cost-efficiency for firm \( i \) in sector \( j \), while \( \beta \) would be our estimated (relative) profit elasticity to (relative) cost-efficiency of the sector. The evolution along time of this elasticity would give us the evolution of the shape of the RDP curve for every sector \( j \), with a lower \( \beta \) indicating a flatter slope of the RDP line, and thus a more intense competition in the market. The latter can be used as a proxy of the level of competition in each industry and year, and thus related to our industry-specific trade penetration measures.

\(^7\)Following Boone (2008), the measure is plotted as inverse in the graph to take into account the possibility to have \( i_L = 0 \). The parameter \( \omega \) measures the ‘aggressiveness’ of firms’ conduct in the market, e.g. the substitution elasticity between goods from different producers or the type of competition (Cournot or Bertrand) played by firms (see Boone, 2008).
3 Results

3.1 PCM

We present results in two stages. First, we have calculated our firm-specific PCM as of Equation 4 and then aggregated those at the NACE2 level in order to derive an industry-specific indicator of competition. We have then related this average PCM to our industry-specific trade measures as in our Equation 3. Clearly, the latter is a first, purely descriptive exercise, whose results are reported in Table 1 below.

<table>
<thead>
<tr>
<th>Dep Var: weighted PCM</th>
<th>Italy import penetration</th>
<th>Italy osm</th>
<th>Italy oss</th>
<th>Germany import penetration</th>
<th>Germany osm</th>
<th>Germany oss</th>
<th>Germany Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.0304* (0.0155)</td>
<td>0.0958** (0.0394)</td>
<td>2.706** (1.161)</td>
<td>-0.0579*** (0.0190)</td>
<td>0.0403 (0.147)</td>
<td>-0.423 (1.723)</td>
<td>0.0877*** (0.0142)</td>
</tr>
<tr>
<td></td>
<td>-0.0436 (0.0597)</td>
<td></td>
<td></td>
<td>-0.0751 (0.110)</td>
<td></td>
<td></td>
<td>0.184*** (0.0557)</td>
</tr>
<tr>
<td></td>
<td>-0.0751 (0.110)</td>
<td></td>
<td></td>
<td>0.0877*** (0.0142)</td>
<td>0.0507*** (0.0156)</td>
<td>0.185*** (0.0568)</td>
<td></td>
</tr>
</tbody>
</table>

The results show that, as expected, there is a negative relationship between horizontal trade penetration and average PCM, as, on the one hand, competitive trade pressures might force prices down in the same industry, or industries characterized by lower prices (and thus higher elasticity of substitution) might be more exposed to imports. The results are instead positive when considering vertical trade penetration, for both imports of goods and services, a finding consistent with the idea of access to cheaper intermediates, or high quality sourcing, induced by vertical trade flows.

In general, data for Italy are significant, while German coefficients, although consistently signed, seem to be characterized by a higher volatility.

As for firms operating in the service sector, Table 2 shows that import penetration, nor horizontal (i.e. the trade of services of the same industry) neither vertical, does not affect industry level price-cost margins, thus suggesting that competitive pressure from trade openness is not biting in services. This is not surprising, since trade in services is much more limited, both for intrinsic non tradeability of some services, and the stiffer trade barriers still present in these sectors. Interestingly, we find that vertical trade penetration in service industries from other services reduces average industry markups in Germany, a result which deserves further analysis.

The results above are mere correlations, and are clearly affected by the underlying heterogeneity of firms within each NACE2 industry. Hence, we have re-estimated our model using directly firm-level PCM as a proxy for competition. To wipe out firm-level fixed effects potentially inducing a serial correlation in the error term, we have first-differenced our dependent variable. Firm-level characteristics are however accounted for including a control for firm size, proxied by the logarithm
of employees at time t-1. We have also clustered the standard errors at the industry level in order to take into account the fact that we are regressing firm-specific observations against industry-level covariates, a fact that might induce a spurious downward bias in our standard errors.

We estimate an OLS specification with time dummies in order to control for the presence of a time trend. Alternatively, we estimate a between effects estimator, which produces regressions on firm means. Notice that by considering firm means over time, we are already taking into account time variability, and time dummies are therefore redundant.

Table 3 presents the results of the above specification, again for both Italy and Germany in the manufacturing sector.

Results show that import penetration may affect a firm’s price-cost margins in different and contrasting ways, consistently with the idea that working with heterogeneous firm-level data, the presence of multi-product firms might generate outcomes different from traditional representative
firms’ models. Indeed, we find horizontal import penetration to be positively related with the change in price-cost margins, although this effect is statistically significant only in the Italian sample\(^8\). On the other hand, vertical import penetration from other manufacturing industries is associated with a fall in firm’s PCMs. Interestingly, we find that vertical import penetration in services has different effects across the two countries considered: while it leads to a reduction in PCMs in Italy, it is related to a rise in PCMs in Germany.

For firms operating in the services sectors, we do not obtain any significant impact of import penetration on PCMs, in any way measured. Table 4 tells us that changes in price-cost margins in service industries are not influenced by neither horizontal nor vertical import penetration. The results concerning horizontal import penetration and vertical import penetration are coherent with previous findings. The index of import penetration in service industries is much more limited in size, being on average equal to 0.08 and 0.13 in Italy and Germany respectively, against 0.32 and 0.40 in manufacturing, respectively. Thus, it is not surprising that import penetration in services fails to affect PCMs.

Table 4: Average PCM and Trade Penetration, Services

<table>
<thead>
<tr>
<th>Dep Var: PCM(<em>{1}-PCM</em>{t-1})</th>
<th>Italy</th>
<th>Italy</th>
<th>Germany</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>import penetration</td>
<td>0.159</td>
<td>0.347</td>
<td>3.292</td>
<td>0.730</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.53)</td>
<td>(3.78)</td>
<td>(0.83)</td>
</tr>
<tr>
<td>osm</td>
<td>-0.0125</td>
<td>-0.0594</td>
<td>0.205</td>
<td>1.409</td>
</tr>
<tr>
<td></td>
<td>(0.069)</td>
<td>(0.20)</td>
<td>(1.11)</td>
<td>(1.14)</td>
</tr>
<tr>
<td>oss</td>
<td>0.297</td>
<td>0.286</td>
<td>2.737</td>
<td>-0.332</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.70)</td>
<td>(4.41)</td>
<td>(1.18)</td>
</tr>
<tr>
<td>size(_{t-1})</td>
<td>-0.0105</td>
<td>-0.00484</td>
<td>0.00690</td>
<td>0.0190</td>
</tr>
<tr>
<td></td>
<td>(0.0097)</td>
<td>(0.015)</td>
<td>(0.012)</td>
<td>(0.031)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.00779</td>
<td>0.0189</td>
<td>-0.810</td>
<td>-0.245</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.067)</td>
<td>(0.87)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>Specification</td>
<td>OLS</td>
<td>BE</td>
<td>OLS</td>
<td>BE</td>
</tr>
<tr>
<td>Time dummies</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>150774</td>
<td>150774</td>
<td>4226</td>
<td>4226</td>
</tr>
<tr>
<td>Groups</td>
<td>57683</td>
<td>2340</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2 RPD

Given our firm-specific balance sheet data, we have calculated profit elasticities through Equation 5 taking as dependent variable (RPD) each firms’ EBITDA (Earnings Before Interests Taxes Depreciation and Amortization), while in terms of costs (RCE) we have used the same firm-specific variable costs already employed for the PCM measure (essentially cost of materials and costs of employees). One advantage of the RPD measure is that one does not need to observe all firms in an industry to calculate it properly, since the result holds for any subset of firms sampled: increasing competition would in any case pull down the whole curve.

\(^8\) Estimates are imprecise in the German sample, but we suspect that this may be due to the lower number of observations.
Endowed with our estimated elasticity of profits for every sector \( j \) and year \( t \), that is \( \hat{\beta}_{jt} \) estimated from Equation 5, we can then use the latter as a proxy for our competition indicator as of Equation 3 and regress this at the sector / time level against our trade penetration measures. Table 5 presents the results of this exercise for Italy and Germany, where the RPD measure has been retrieved for each NACE3 industry of the manufacturing sector, regressed against the horizontal penetration index of the same NACE3 industry\(^9\).

### Table 5: RPD and Horizontal Trade Penetration, Manufacturing - NACE3

<table>
<thead>
<tr>
<th>Dep var: RPD indicator</th>
<th>Italy</th>
<th>Germany</th>
<th>Italy</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import penetration</td>
<td>0.101***</td>
<td>-0.172</td>
<td>0.101**</td>
<td>-0.449**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.278)</td>
<td>(0.041)</td>
<td>(0.045)</td>
</tr>
<tr>
<td>Year2001</td>
<td>0.007</td>
<td>-0.647**</td>
<td>-0.055**</td>
<td>-0.307*</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.001)</td>
<td>(0.020)</td>
<td>(0.095)</td>
</tr>
<tr>
<td>Year2002</td>
<td>-0.072**</td>
<td>-0.496**</td>
<td>0.103**</td>
<td>-0.604**</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Year2003</td>
<td>-0.097***</td>
<td>-0.620**</td>
<td>-0.103***</td>
<td>-0.604**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Year2004</td>
<td>0.103***</td>
<td>-0.620**</td>
<td>-0.097***</td>
<td>-0.604**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Year2005</td>
<td>0.115***</td>
<td>-0.610**</td>
<td>0.103***</td>
<td>-0.604**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Year2006</td>
<td>-0.136***</td>
<td>-0.629**</td>
<td>-0.115***</td>
<td>-0.610**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Year2007</td>
<td>0.164***</td>
<td>0.977***</td>
<td>0.136***</td>
<td>-0.629**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.093***</td>
<td>0.565***</td>
<td>0.093***</td>
<td>0.565***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

| Specification          | OLS         | OLS         | BE          | BE          |
| Time dummies           | yes         | yes         | no          | no          |
| Observations           | 776         | 712         | 776         | 712         |

Interestingly, we find that import penetration affects RPDs differently in the two countries considered. While we observe an anti-competitive effect in Italy, both in the OLS and the BE specification, import penetration has a pro-competitive effect in Germany. This result confirms previous findings on changes in PCM reported in Table 3: horizontal import penetration leads to an increase in price-cost margins in Italy, not induced by a reduction of costs, but rather by a higher elasticity of profits to costs. The result is thus consistent with the idea that firms might react to these increased competitive pressures by endogenously compressing their product mix towards products characterized by a lower elasticity of demand, with a resulting positive change in markups.

### 4 Conclusions

In this paper we have provided preliminary evidence on the non-conventional results obtained when exploring the relation between trade penetration and competition using a large set of heterogeneous firm-level data for two major EU countries, Italy and Germany. Results also vary across sectors, with most of the effects evident in manufacturing, while not significant in the services sector.

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\(^9\)We cannot retrieve vertical penetration measures at the NACE3 level, as our available I/O tables are at NACE2, nor for the time being we have been able to retrieve trade data for services at the NACE3 level of disaggregation.
We derive two implications from our findings: first, working with heterogeneous firms data entails quite different predictions on the pro-competitive effects of trade with respect to traditional models. In particular, we have found a positive correlation between horizontal import penetration and firms’ profitability (measured both as PCM and elasticity of profits to costs) in the Italian manufacturing sector, while the standard pro-competitive effect of trade seems to operate across German manufacturing firms. The results is consistent with the predictions of Eckel and Neary (2009), showing that an economy characterized by multi-product firms has an incentive to restrict its output of each variety, not only producing less of each product, but also ending-up in producing fewer products, with the result that an increased trade pressure has a non-obvious impact on firms’ markups.

The second implication of our work is that, in both Italy and Germany, the services sector is characterized by a potentially increasing, but still very low, level of tradeability, so that none of the effects reported above for manufacturing can be considered significant. Whether the latter will change in the future due to technological advancements improving the tradeability of services, or whether instead the presence of important non-tariff barriers in service will prevent a thorough market integration, is an issue left to future research.
References


Appendix

Industries for which import penetration has been computed

Manufacturing industries: food products and beverages (15); tobacco products (16); textiles (17); wearing apparel, dressing, dyeing of fur (18); Tanning, dressing of leather, luggage (19); wood and products of wood and cork, except furniture, articles of straw and plaiting materials (20); pulp, paper and paper products (21); Publishing, printing, reproduction of recorded media (22); coke, refined petroleum products and nuclear fuel (23); chemicals and chemical products (24); rubber and plastic products (25); other non-metallic mineral products (26); basic metals (27); fabricated metal products, except machinery and equipment (28); machinery and equipment n.e.c. (29); office machinery and computers (30); electrical machinery and apparatus n.e.c. (31); radio, television and communication equipment and apparatus (32); medical, precision and optical instruments, watches and clocks (33); motor vehicles, trailers and semi-trailers (34); other transport equipment (35); furniture; manufacturing n.e.c. (36)

Service industries: Construction (45); Hotels and restaurants (55); Land transport; transport via pipelines (60); Water transport (61); Air transport (62); Supporting and auxiliary transport activities; activities of travel agencies (63); Post and telecommunications (64); Financial intermediation, except insurance and pension funding (65); Insurance and pension funding, except compulsory social security (66); Computer and related activities (72); Research and development (73); Other business activities (74); Public administration and defence; compulsory social security (75); Education (80); Health and social work (85); Sewage and refuse disposal, sanitation and similar activities (90); Recreational, cultural and sporting activities (92);