Endogenous markups, international trade and the product mix

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Abstract

We investigate the effects of import penetration on the estimated price-cost margins of some 28,000 firms operating in the Italian manufacturing sector, controlling for the potential endogeneity of the productivity shock. In the period considered (1998-2003), we find broad evidence of pro-competitive gains from trade at the aggregate level. However, when performing the same analysis at a more detailed industry level, we find a substantial heterogeneity of responses: in some industries the increased exposure to international trade is associated with higher, rather than lower, markups, while in others the relationship is not significant. In particular, the industries in which we find a positive impact of import penetration on markups exhibit, on average, a high export-ratio, a larger variation in the composition of their product-mix, and decreasing productivity. We show how all these features can be nested into existing theoretical models of firms heterogeneity.

JEL classification: F15, L11

Keywords: price cost margins, trade openness, firms' heterogeneity

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1 Introduction

> "Fifteen years ago, almost 90% of Benetton's colourful clothes were produced in its home market. Today, Italian makers supply less than 30% and this will fall to 10% over the next few years...this is the harsh reality of competition in the global textiles and clothing industry..." [The Economist, February 26th 2006, p. 65]

The latter quotation is just one of the many examples describing how changes in competition induced by an increased exposure to international trade can affect the strategy of domestic firms. The issue has been widely studied in the empirical literature, surveyed by Tybout (2003), with the effects of trade liberalization on average price-cost margins, exports, firm sizes, productivity and net entry dynamics thoroughly explored across industries.

More recently, however, the increasing availability of firm-level datasets and the development of models accounting for firm heterogeneity have allowed scholars to further broaden the scope of the previous analysis (Helpman, 2006): researchers have discovered a much higher extent of within-industry heterogeneity than previously thought, and a huge variation across industries in the distribution of firms by size or productivity. As a result, a new wave of research has spun, which explores different dimensions of firm heterogeneity together with the relevant implications for aggregate results.

In particular, from a theoretical point of view Melitz and Ottaviano (2005) 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[1]. 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 Bernard et al. (2005 and 2006), who show that some firms might react to international competition endogenously self-selecting into the production of a different product mix composed of asymmetric products, each one developed according to a different technology.

Such new theoretical insights can contribute to better explain the increasingly available empirical evidence which may contrast with the previously established aggregate results. For example, in the quoted case of the Italian textile industry, the exit rate of firms resulting from the increased international competition is certainly substantial, but far from what one could expect given the reported harsh reduction in suppliers' volumes[2]. Moreover, the finding of a net exit of firms is matched by a 19 per cent increase in the total export values of the same industry in the period 2000-2005. The reported empirical evidence seems thus more consistent with a scenario in which firms are reacting to international pressures by switching their product mix towards products characterized by lower elasticities of substitution and, as a result, higher markups. If this is the case, the traditional finding of a general pro-competitive effect of trade would then be reverted.

[1] 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.

[2] Official statistics show that the Italian textile industry (NACE17) displays in the period 1996-2005 an average net entry rate of -3.7 per cent, a figure larger than the average of the Italian manufacturing industry (-0.8 per cent).

Given the latter possibility, the goal of this paper is therefore to combine the feature of endogenous markups with the dimension of product heterogeneity since the interaction of these two elements might yield, with respect to previous findings, a richer set of dynamics in a context of trade liberalization.

From a methodological point of view, the analysis can also capitalize on two recent empirical papers by Konings et al. (2005a and 2005b), who have refined an algorithm allowing to consistently measure average price-cost margins starting from balance-sheet, firm-level observations. The algorithm overcomes the traditional critique of the Hall (1988) type of approach for estimating markups, i.e. a potential simultaneity bias between output growth and the growth in the input factors[3]. It also avoids relying on imperfect measures of firms' marginal costs in order to observe firms' markups, since price-cost margins can be estimated consistently starting from nominal balance sheets data on sales and input factors[4]. As a result, the potential downward bias in the estimated markups due to the omitted price variable bias (Tybout, 2003; De Loecker, 2006) can also be circumvented, since no price deflators are needed to implement the algorithm.

Following the latter procedure, we have estimated price-cost margins for a sample of roughly 28,000 firms operating in the Italian manufacturing sector over the period 1998-2003. In line with the standard results of the literature, we have found broad evidence of pro-competitive gains from trade at the aggregate level, i.e. firms' markups tend to be negatively associated with an increase of import penetration indexes. However, when performing the same exercise at a more disaggregated level, the analysis has revealed a huge variation of responses: in some industries (among which textiles), the standard pro-competitive result is reverted, with an increased exposure to international trade associated with higher price-cost margins. For a third group of industries, the effect does not seem to be significant.

We have then tried to relate this evidence to some structural characteristics of firms. While no significant differences consistent with the previous results have emerged across the industry groups, we have found that, in line with the most recent theoretical developments, the industries displaying a positive impact of import penetration on price-cost margins exhibit, on average, a high export-ratio and a larger variation in the composition of their product-mix. We are therefore able to validate through empirical evidence the theoretical claim that, within specific industries, firms already operating on the international markets are able to react to increased international competitive pressures endogenously switching their product mix towards products characterized by lower elasticity of demand: the change in product mix has a positive impact on firms' markups, thus reverting the traditional finding of pro-competitive effects of trade.

Moreover, we also explore the relationship between product mix and productivity, showing that the switch in products is likely to entail higher fixed costs, since the industries displaying a positive impact of import penetration on price-cost margins (i.e. those where the product mix has changed) are also characterized by a decreasing productivity, a theoretical outcome already postulated by Bernard et al. (2005). Alternatively, the same result could be obtained within the

[3]The refinement is originally due to Roeger (1995), who overcomes the problem by subtracting the dual Solow residual from the primal, thus being able to eliminate the unobserved productivity shock, source of the bias, from the estimating equation. Konings et al. (2005a and 2005b) exploit the algorithm in order to estimate, respectively, the effects of anti-dumping protection and of changes in the corporate governance on domestic firms' markups.

[4]A common approach is to use the 'observed' firm level price-cost margin, defined as sales net of labor and material costs over sales. The latter implies that labor and material costs are good proxies of a firms' short-term marginal costs. See Tybout (2003) for an overview of markup estimation with firm-level data.

Melitz and Ottaviano (2005) model, if one considers product heterogeneity related to the dispersion of the Pareto distribution of costs. If the new product mix entails a higher dispersion of costs, in their framework the latter would generate exactly the same results: lower average productivity and higher average markups.

The structure of the paper is as follows: Section 2 presents in detail the methodology through which consistent price-cost margins are estimated. Section 3 discusses the dataset and its validation with respect to official data, while Section 4 presents our results on the relation between import penetration and price-cost margins, and the relative robustness checks. Section 5 discusses in some more detail our product mix hypothesis, nesting it into the existing literature, while Section 6 concludes.

2 Econometric model

Our methodology is the same introduced by Roeger (1995), who built on the work of Hall (1988). The methodology has been recently used also by Konings et al. (2005a and 2005b). All these authors start from a standard production function:

$$Q_{it} = A_{it} \cdot F(N_{it}, M_{it}, K_{it}) \tag{1}$$

where Q_{it} is the output of firm i at time t, N_{it},M_{it} and K_{it} are the labour, material and capital inputs and A_{it} is the firm's productivity.

By assuming perfect competition and constant returns to scale, the familiar Solow decomposition leads to the following expression for the output growth rate:

$$\frac{dQ_{it}}{Q_{it}} = \alpha_{Nit}\frac{dN_{it}}{N_{it}} + \alpha_{Mit}\frac{dM_{it}}{M_{it}} + \alpha_{Kit}\frac{dK_{it}}{K_{it}} + g_{it} \tag{2}$$

where g_{it} is the productivity growth and α_{jit} stands for the cost share of input j in the total value of production.

When the assumption of perfect competition is relaxed and prices can raise over marginal costs, equation (2), as suggested by Hall (1988), becomes:

$$\frac{dQ_{it}}{Q_{it}} = \mu_{it}\left(\alpha_{Nit}\frac{dN_{it}}{N_{it}} + \alpha_{Mit}\frac{dM_{it}}{M_{it}} + \alpha_{Kit}\frac{dK_{it}}{K_{it}}\right) + g_{it} \tag{3}$$

where $\mu_{it} = \frac{P_{it}}{c_{it}}$ is the markup of output price over marginal cost. After some simple algebra, that still requires the assumption of constant returns to scale, equation (3) may be written as follows:

$$\frac{dQ_{it}}{Q_{it}} - \alpha_{Nit}\frac{dN_{it}}{N_{it}} - \alpha_{Mit}\frac{dM_{it}}{M_{it}} - (1-\alpha_{Nit}-\alpha_{Mit})\frac{dK_{it}}{K_{it}} = \beta_{it}\left(\frac{dQ_{it}}{Q_{it}} - \frac{dK_{it}}{K_{it}}\right) + (1-\beta_{it})g_{it} \tag{4}$$

The term β_{it} is the Lerner Index, or price-cost margin (PCM) of firm i at time t, that is $\beta_{it} = \frac{P_{it}-c_{it}}{P_{it}} = 1 - \frac{1}{\mu_{it}}$.

Equation (4) thus decomposes the Solow residual into two terms: a pure technology component g_{it} and a markup factor (1− β_{it}). The problem in estimating equations (3) or (4) as in Levinsohn (1993) is that unobserved productivity shocks g_{it} may be correlated with the input factors.

The latter is the traditional critique to the Hall's (1998) approach for estimating markups, which is difficult to overcome since instrumental variables are hard to find at the firm-level. However, the potential endogeneity of the error term can be overcome following Roeger (1995), who is able to decompose the price-based (or dual) Solow residual according to the following expression, comparable to equation (4):

$$\alpha_{Nit}\frac{dP_{Nit}}{P_{Nit}}+\alpha_{Mit}\frac{dP_{Mit}}{P_{Mit}}+(1-\alpha_{Nit}-\alpha_{Mit})\frac{dP_{Kit}}{P_{Kit}}-\frac{dP_{it}}{P_{it}}=-\beta_{it}\left(\frac{dP_{it}}{P_{it}}-\frac{dP_{Kit}}{P_{Kit}}\right)+(1-\beta_{it})g_{it} \quad (5)$$

where P_{Jit} (with $J = N, M, K$) is the unit cost of input factor J. By subtracting eq. (5) from eq. (4), one ends up with:

$$\left(\frac{dQ_{it}}{Q_{it}}+\frac{dP_{it}}{P_{it}}\right)-\alpha_{Nit}\left(\frac{dN_{it}}{N_{it}}+\frac{dP_{Nit}}{P_{Nit}}\right)-\alpha_{Mit}\left(\frac{dM_{it}}{M_{it}}+\frac{dP_{Mit}}{P_{Mit}}\right)-(1-\alpha_{Nit}-\alpha_{Mit})\left(\frac{dK_{it}}{K_{it}}+\frac{dP_{Kit}}{P_{Kit}}\right)$$

$$=\beta_{it}\left[\left(\frac{dQ_{it}}{Q_{it}}+\frac{dP_{it}}{P_{it}}\right)-\left(\frac{dK_{it}}{K_{it}}+\frac{dP_{Kit}}{P_{Kit}}\right)\right] \quad (6)$$

In equation (6) the unobserved productivity shock g_{it} is canceled out and therefore the simultaneity bias previously discussed disappear. The Lerner index can thus be estimated consistently. Moreover, equation (6) implies that estimating the price-cost margin requires information about the growth rates of production value, wage bill, material costs and the value of capital. Since no deflation is required, also the omitted price variable bias is not a source of trouble[5].

As for the rental price of capital P_{Kit}, following Hall and Jorgenson (1967), Hsieh (2002) and Konings (2005b), it can be computed as $P_{Kit} = P_I\,(r_{it} + \delta_{it})$, where P_I is an investment good price index retrieved from the EU AMECO database, δ_{it} is a firm-level depreciation rate computed as depreciation over net tangible fixed asset in the previous year and r_{it} is the firm-level real interest rate, an information retrieved from our dataset[6]. If we label the LHS of eq. (6) as DY and the RHS as DX, we obtain a very simple testable equation for estimating the price-cost margins:

$$DY_{it}=\beta_{it}DX_{it}+\epsilon_{it} \quad (7)$$

In order to estimate eq.(7), however, we have to assume constant markups over the group of firms considered, an assumption typical of all applications of this type (Levinsohn, 1993 or Konings et al., 2005b), since without this assumption it would not be possible to have enough degrees of freedom for the regressions[7].

Since we are interested in assessing the evolution over time of the price cost margins in order to gauge the impact of trade openness, we have modified eq. (7) as follows:

$$DY_{ijt}=\beta_1 DX_{ijt}+\delta_t DX_{ijt}\cdot T_t+\beta_2 DX_{ijt}\cdot IMP_{jt}+\gamma_i+\epsilon_{ijt} \quad (8)$$

[5] Tybout (2003) points out that, lacking specific information on firms' prices, which is common, it could be the case that firms that rapidly increase their inputs tend to drive down their output prices more rapidly than the industry averages, yielding a downward bias in the estimated markups. Klette and Griliches (1996) have been the first to discuss a similar omitted price variable bias in production functions estimation. De Loecker (2006) discusses the problem within semi-parametric estimations of TFP.

[6] The firm-level real interest rate is retrieved by subtracting the CPI variation from the reported balance sheet item "interest rate paid".

[7] We will in any case check the robustness of this assumption by comparing the mark-ups so obtained with the "observed" firm-specific mark-ups inferred from balance sheet data.

In equation (8) the dimension j represents the industry to which the firm i belongs at time t, T_t is a set of time dummies which allow us to control for cyclical demand effects[8], while IMP_{jt} measures the import penetration index in industry j at time t calculated as:

$$IMP_{jt} = \frac{IMPORTS_{jt}}{IMPORTS_{jt} + PRODUCTION_{jt} - EXPORTS_{jt}} \tag{9}$$

i.e. the total imports, exports and production value of industry j at time t. Finally, γ_i stands for an unobservable firm-specific fixed effect.

The coefficient $\hat{\beta}_2$ in equation (8) therefore captures the marginal impact of import penetration on the PCM's estimates, with the latter retrievable through the sequence of the coefficients $(\hat{\beta}_1+\hat{\delta}_t)$, where $\hat{\beta}_1$ is the estimated PCM in the first period for the group of firms considered and $\hat{\delta}_t$ are the coefficient of the time dummies[9].

Before turning to the description of the dataset and the results obtained, it is necessary to stress some caveats that should be taken in mind when considering this analysis. The first one is related to eq.(7), in which, in principle, the error term should not appear. However, Roeger (1995) clarifies that although a variety of reasons justify the presence of ϵ_{it}, in particular possible measurement errors in the variables employed, the latter should not affect the consistency of the estimates, thus allowing for the implementation of the model.

The second criticism that may arise is related to the maintained assumption of constant returns to scale. As discussed by Konings et al. (2005b), not allowing for varying returns to scale may generate an upward or downward bias in the markup levels, depending on whether returns to scale are respectively decreasing or increasing. However, to the extent that returns to scale do not change dramatically over the sample period, the latter bias, if present, can be considered as relatively constant, and thus should not affect the validity of our results, since we are interested in the variation over time of the markup, rather than its point estimate. Moreover, as a robustness check we compare our estimated markups with the ones inferred from firms' balance sheet data.

Finally, market-power might be product rather than firm-specific, while we base our estimates on firm-level data. Taking into account this potential criticism implies interpreting our results as the impact of import penetration on the average PCM of the group of firms considered.

3 Data description

3.1 Import penetration indexes for the Italian manufacturing industries

In order to compute import penetration indexes according to eq. (10), we need information on trade flows and production at the industry level. As for imports and exports, the Italian National Institute for Statistics (ISTAT) provides the value of import and export at detailed industry level according to the NACE Rev 1.1 classification for several years. Data on production are instead collected from EUROSTAT, whose detailed industrial statistics database reports several variables

[8] Shapiro (1987) argues that the primal and the dual Solow residual might be affected differently by the state of demand, yielding a non-zero error term. The introduction of time dummies controls for this potential source of inconsistency in our estimates.

[9] The PCM in each year t is thus retrieved as $\hat{\beta}_1 + \hat{\delta}_t + \hat{\beta}_2 \overline{IMP\_PEN}_t$, the average of the import penetration index across the considered industries.

(such as value of production, value added, employment) for the same industries, with a year coverage ranging from 1996 to 2003, which therefore constitutes our period of reference.

Table 1 reports some descriptive statistics on the calculated import penetration ratios at the NACE2-digit level of aggregation[10].

[Table 1 and Graph 1 about here]

The analysis reveals an ample heterogeneity in the exposure of each industry to international trade flows, with average import penetration ratios ranging from 57.2% in sector 34 to 3.8% in sector 22. Even within each NACE2 manufacturing industry the import penetration ratios might differ a lot when calculated at the NACE3 level of aggregation, as it can be seen looking at the standard deviation of the index for example in industries 19 or 32.

As for the evolution over time of the import penetration ratios, Graph 1 reports the dynamics in the different industries. Also in this case we find a substantial heterogeneity, with clearly upward trends in some industries vs. a more or less constant exposure in others[11].

3.2 The sample of italian manufacturing firms

A commercial dataset 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. The total sample was made up by 61,335 firms, classified in each NACE3 or 4 industry[12]. Taking 2001 as reference year and comparing the sample data with the 2001 Industrial Census, these firms accounted for the 73% of total manufacturing value added and the 54% of manufacturing employment. However, due to the quality of data, extensive data cleaning has been necessary in order to apply the methodology previously introduced.

We adopted a multi-stage data cleaning procedure. First of all, we concentrated on those firms for which information was available for every variable of interest in at least one and same year. After having calculated the growth rate of each input variable, we controlled for possible outliers by dropping all those firms for which any percentage variation was larger than 200%. We then computed the cost shares α_{Nit}, α_{Mit} and (by difference) α_{Kit} and dropped from the analysis those firms with shares belonging to the 1^{st} or to the 99^{th} percentile of the relevant distributions. After these steps, the resulting sample was almost halved to 28,076 firms, which are those employed in the analysis.

As for the validation of the cleaned sample, these firms account for 34.6% of total Italian manufacturing value added and for 25.8% of total manufacturing employment. We then checked the representativeness of the sample along three dimensions: geographical location, industrial activity and firms' size.

[10] From here on we will present the results at this level of aggregation, although in the regressions we use the more disaggregated NACE3 level data. Descriptive statistics for more detailed levels of disaggregation are available upon request.

[11] Not surprisingly, the heterogeneity in the patterns further increases over time if one looks at the NACE3 level of disaggregation, not reported here.

[12] For some firms the NACE4 code is available (e.g. 1512), for others only the NACE3 classification is reported (e.g. 1510).

Table 2 reports the distribution across regions of the firms included in the sample. The number of firms in each Region ranges from 33 (in Valle d'Aosta) to 8,128 (in Lombardy). Comparing this distribution with the distribution registered during the 2001 Industrial Census the correlation obtained is 0.96, significant at the 1 per cent level.

[Table 2, 3 and 4 about here]

Table 3 shows instead the distribution of the cleaned sample across the NACE2 industries. Due to lack of sufficient observations, we had to drop NACE2 industries 16 (Tobacco), 23 (Petroleum) and 30 (Office machinery). As Table 3 shows, the number of sample firms in each industry ranges from 379 in sector 35 (Other transport equipment) to 4,259 in sector 29 (Machinery and equipment). The correlation between the sample's distribution and the one of the Census (compared at the more detailed NACE3 level) is 0.71, always significant at the 1 per cent level.

Finally, in terms of firms' size, Table 4 shows the distribution of our sample firms across the size classes adopted by the Italian National Institute of Statistics and measured in terms of employment. Looking at data in 2001, in order to have a comparison with the Italian Census, in our sample there is a fair number of micro firms (11.4%), although the latter in Italy account for more than 80% of total firms. The relative over-representation of large firms in our dataset is clearly a drawback that must be taken in mind when discussing our results. However, since we are interested in the effects of an increased international trade exposure on firms' pricing behavior, the under-representation of micro firms in our sample should not bias our main findings.

Before turning to present the results of the econometric analysis, Table 5 shows some descriptive statistics of the variables used for our estimation of markups as from eq. (6). From panel A we can see that the average turnover of the firms in the sample is 13.7 million of euros, and the average employment is 63. The huge heterogeneity among firms is witnessed by the high standard deviations reported, together with the values of the 1st and 99th percentiles. Panel B reports instead the percentage variations over time of these variables.

[Table 5 about here]

4 Results

4.1 Aggregate results

We start by presenting the results obtained at the aggregate level, pooling all our firms' observations. Table 6 reports the results for the baseline model of eq.(8). In particular, the first column reports the estimates using firm-fixed effects and time dummies to control for a possible time trend, and clustering the standard errors at firm level to avoid their possible downward bias induced by regressing firm-level observations on industry-specific import penetration ratios[13]. The estimated Lerner index for the baseline year (1998) is reasonable, being equal to 34%[14], and statistically

[13] We have employed throughout the analysis the import penetration indexes calculated at the NACE3 level.

[14] Since the methodology exploits growth rates, the 1996 data are used to build the firm-specific variables for 1997, which then yield 1998 as the baseline year in which we observe the Lerner index. The time span goes until 2003, the last year in which trade data are available.

significant. The interaction term capturing the marginal impact of the import penetration index on the markup (DX_IMP) displays a negative and statistically significant coefficient.

The results obtained are not affected by alternative treatments of the panel dimension (random effects) and provide broad evidence of pro-competitive gains from trade at the aggregate level in line with the standard results of the literature.

[Table 6 about here]

The first robustness check deals with the assumption of constant returns to scale implicit in our algorithm for estimating the markup. Since the latter assumption may generate an upward or downward bias in the estimates, we have compared our estimated markup with an approximation of the price-cost inferred directly from the available balance sheet data. To this extent, a possible approximation of the PCM can be obtained at the firm level taking the difference between production value and total variable costs (employment plus material costs) divided by production value (Tybout, 2003):

$$PCM_{it} = \frac{P_{it} - c_{it}}{P_{it}} \simeq \frac{P_{it}X_{it} - c_{it}X_{it}}{P_{it}X_{it}} \tag{10}$$

Graph 2 presents a comparison between the markups estimated for each NACE2 industry in each year, and the ones calculated as in (10)[15]. Both PCM measures are increasing in the considered time period and, as the graph shows, are highly correlated (0.85), with no significant biases emerging from our estimated measure.

[Graph 2 about here]

As further robustness checks, column 2 of Table 6 performs the same analysis of column 1, but restricted to the balanced panel resulting from dropping all those firms that did not have data for every time period. As it can be seen, the negative impact of import penetration on the average price-cost margins still holds.

We have then tested whether our results are sensitive to the methodology employed in the calculation of the import penetration ratio. In column 3 of Table 6 we report the results obtained using as proxy for import penetration the same index calculated at 4-digits level of details, thus excluding those firms for which a NACE4 industry classification is not available. The point estimate of the import penetration index is lower, but the negative and significant relation between price-cost margin and import penetration persists. The specification in the fourth column of Table 6 exploits a different indicator of import penetration, obtained as the ratio of total import over the sum of import and production, thus bounding the index between 0 and 1 avoiding to subtract exports. The impact of import penetration on price-cost margins is larger than before, but sign and significance are unchanged. Finally, in order to rule out the potential endogeneity of the import penetration index we have lagged this measure one year, thus using firms' observations for the period 1998-2004. The results, reported in Column 5 of Table 6, are again entirely similar to our baseline specification.

Our model seems therefore able to trace fairly well the evolution of the average PCM of Italian

[15] In order to get a meaningful value of (10) at the aggregate level, we have calculated weighted averages at industry level using as weights the firms' sales shares

firms, while at the same time the econometric exercise is able to show how the import penetration has acted as an effective source of competition in Italy. However, given the heterogeneity present across industries and firms, it is interesting to perform the same analysis at a more detailed industry level.

4.2 Industry level results

We have estimated eq. (8) for each NACE2 industry, always using firm-fixed effects and time dummies to control for a possible time trend, and clustering the standard errors to avoid their possible downward bias. Table 7 presents the results of this estimation reporting the estimated Lerner index (DX) for the baseline year (1998), as well as the coefficient of the interaction term with the import penetration index (DX_IMP).

To check the robustness of these estimates, an alternative specification has been employed, where random effects have been used where appropriate according to the Hausman test, as reported in Table 7. Moreover, Table 7 also reports the results obtained running each industry-specific estimation only on the balanced sample of firms, again in order to exclude that our results are driven by entry and exit dynamics of firms.

Based on these results, robust across the different specifications, it is immediate to see that the estimated PCM are always significant and vary across industries, which is expected. However, it is quite striking to notice that the sign and significance of the interaction terms with the import penetration index display a huge degree of heterogeneity.

In particular, three different groups of industries are present. In a first group the impact of import penetration on the price-cost margin appears always negative and statistically significant across all specifications, in line with the standard results of the literature (the group is labelled "Weakened", in accordance with the impact of import penetration). A second group ("Neutral") is characterized by industries in which the impact of import penetration on the price cost margin is not significant. Finally, in a third group, which we refer to as "Strengthened" industries, a higher import penetration is always significantly associated to a higher price cost margin.

[Table 7 about here]

Since the latter result is quite controversial, the next section explores its possible determinants.

5 Industry markups and the product mix

We have explored whether some structural characteristics at the industry level might explain the results obtained in the previous section. To this extent, we have analyzed the dynamics of net entry, observed price-cost margins and the Herfindahl index, aggregating firm-level observations and pooling industries together into the three identified groups via weighted averages[16]. The results

[16] We have calculated sales weighted averages for each NACE2 industry. When calculating the values for each industry group (W, S or N), the weight attached to each NACE2 industry is the share of the industry in the total sales of the relevant industry group.

are reported in Tables 8a and 8b.

[Tables 8a and 8b about here]

As it can be seen, the most controversial of our industry grouping (the "Strengthened" industries) displays substantial negative net entry dynamics over time, and increasing price-cost margins. However, the latter do not seem to be associated with an increase in concentration of firms, since the dynamics of the Herfindahl index are decreasing, a finding common to all the industry groups (Table 8a). We can therefore exclude that the positive effect of import penetration on price-cost margins in the "S" group of industries derives from a spurious correlation, in which an increased import penetration leads to a concentration of the industry, and thus to an increase in the markup of the surviving firms. As shown by Table 8b, we can also exclude that the increased price-cost margins observed in the "Strengthened" industries derive from gains in firms' variable costs, since the latter tend to grow over time in line, or even more, than other industry groupings. Rather, the "Strengthened" industries display the highest average growth rate of the value of production in the considered period. As a result, the reported increase in markups experienced by firms operating in this industry group seems to derive from the effect of higher prices, rather than lower costs.

The three groups of industries display some differences in terms of export ratios (defined as $\frac{EXP_{jt}}{PROD_{jt}}$), as shown by Graph 3. In particular, the industries were the import penetration has a marginally negative effect on the markups (those defined "Weakened") are on average characterised by export ratios much lower than other industries. This might suggests that industries with a relatively lower access to foreign markets are less able to react to an increased import competition than other industries, where firms are instead able to maintain, or even increase, their markups. Although the latter evidence is not conclusive (we are discussing average values computed from industry level data), our finding that firms operating in industries which are relatively more export-intensive face less competition from trade is consistent with Gorg and Warzynski (2003). Using a panel of UK exporting and non-exporting firms, and the same algorithm for the calculation of the markup, they show in fact that, on average, exporters have higher markups than non-exporters, with the result holding in particular for some specific industries, i.e. those where differentiated goods are produced.

[Graph 3 and 4 about here]

Consistently with the findings reported in Table 8b, we have then tried to link the positive correlation between import penetration and average industry markups with the recent evidence, provided by Bernard et al. (2006), that firms adjust their product mix in response to trade pressures. In particular our hypothesis is that, in industries characterized by a higher range of products, firms might more easily contrast an increase of foreign competition with a switch of their product mix towards products characterized by lower elasticities of demand, and thus end up with higher average price-costs margins as a result of an increase in import penetration.

In order to test this hypothesis, we have used the Eurostat PRODCOM database, which collects data in time series on production at the 8-digits level of detail of the Combined Nomenclature, for every EU country[17]. We have thus calculated for each of our NACE2 industries the share of each

[17] The first 4 digits of the Combined Nomenclature correspond to the NACE4 REV1.1 industrial classification.

product code. The standard deviation of the product share distribution in each year can thus be considered as a proxy for the product heterogeneity of each industry ($PROD$). Graph 4 reports the evolution over time of this indicator for each of the three industry groupings previously identified[18]. Consistently with our hypothesis, the "Strengthened" industries, i.e. those where we find a positive correlation between import penetration and average industry markups, display a much higher level of product heterogeneity with respect to the other control groups, and a substantial change over time of the product dispersion.

We have then tried to assess the significance of this finding within our econometric model, modifying our eq. (8) as follows:

$$DY_{ijt} = \beta_1 DX_{ijt} + \delta_t DX_{ijt} \cdot T_t + \beta_2 DX_{ijt} \cdot IMP_{jt} + \beta_3 DX_{ijt} \cdot PROD_{jt} + \gamma_i + \epsilon_{ijt} \qquad (11)$$

As for the previous estimating equation, in Eq. (11) the dimension j represents the industry to which the firm i belongs at time t, T_t is a set of time dummies which allow us to control for cyclical demand effects, γ_i stands for an unobservable firm-specific fixed effect, and $\hat{\beta}_2$ captures the marginal impact of the import penetration on the PCM's estimates. The specification is then augmented with another interaction term ($DX_{ijt} \cdot PROD_{jt}$), capturing the marginal impact of each industry's product heterogeneity on the average markup.

Tables 9 reports the result of the estimation across all industries, always using firm-fixed effects and time dummies to control for a possible time trend, and clustering the standard errors. The overall impact of the product heterogeneity on the markup is positive and significant (Column 1), a result consistent with our hypothesis that a wider range of products within each industry is associated on average with higher firms' price-costs margins. Moreover, in line with the previous findings, the overall effect is driven essentially by those industries in which we originally found a positive correlation between the import penetration and the markups. The latter result is reported in Column 2 of Table 9, where we have introduced in the product-mix interaction term a dummy equal to 1 if the industry j belongs to the "Strenghtened" group: as it can be seen, only the term interacted with the dummy remains positive and significant. Column 3 performs a sensitivity check, i.e. it excludes from our dummy the industry NACE34, since the latter was the only one whose attribution in Table 7 was not robust across all the different specifications. The qualitative results are unchanged.

[Table 9 about here]

Insofar, we have thus established that in certain industries, which we have labelled "Strenghtened", there is a positive correlation between import penetration and markups, and between the extent of product heterogeneity and markups. To validate our claim that these correlations entail a precise direction of causality, i.e. that the switch in product mix, and thus the increase in the markups, is undertaken as a reaction to higher import penetration, we have checked the dynamics of total factor productivity.

The intuition is the following one. Consider the situation at time t, in which firms in equilibrium produce a given range of products. At time $t+n$, a part of these products has been substituted by consumers with imports. As a reaction, firms move their production towards products less subject

[18] As for the export ratios, we have calculated sales weighted averages of each industry measure in order to retrieve the group value.

to the international competitive pressure, and thus characterized by lower elasticities of demand and higher markups. For both product mix choices to be viable as an industry equilibrium, we should find that the range of products chosen by firms at $t+n$, when import competition is high, would have not been chosen at time t, when import competition was lower. In other words, we should find that the new product mix entails higher fixed costs (i.e. lower profits, partially compensated by the higher markups) than the original product choice, making the strategy optimal only as a consequence of the competitive pressures imposed by the higher import penetration. If this is the case, total factor productivity should decline in the industries where the product mix changes.

Bernard et al. (2005) theoretically model the possibility that, in switching products, the resulting average industry productivity might be lower, since the new products might be characterized by higher fixed costs. Alternatively, one could think at the Melitz and Ottaviano (2005) framework, in which markups and productivity both depend on the cutoff cost level c_D of the firm who is just indifferent about remaining in the industry, and the parameter k measuring the dispersion of the underlying Pareto distribution of cost draws. If, ceteris paribus, the new product mix entails a higher dispersion of costs, it is relatively straightforward to show that, in their model, this leads to a higher cutoff c_D, higher average markups and lower average productivity.

To validate such a claim, Table 10 shows the evolution of TFP indexes and nominal value-added for the three considered group of industries. Total factor productivity has been calculated at the firm-level through the Olley and Pakes (1996) semiparametric algorithm, and (sales) weighted averages calculated at the industry level, with the values of 1998 normalized to 100[19]. The results are consistent with our prior that international trade pressures are associated in certain industries to changes in the product mix, leading to higher markups but also higher fixed costs, and thus a drop in the average industries' productivity.

[Table 10 about here]

6 Conclusions

The present work applies to a large sample of Italian manufacturing firms a methodology able to deliver consistent estimates of the Lerner index in order to investigate the impact of import penetration on price cost margins.

At the aggregate level, broad evidence of pro-competitive gains from trade has been found, in line with the traditional results of the literature. On the other hand, the industry-level analysis provides a good deal of heterogeneity of responses. In some industries, import penetration seems to have a negative impact on price cost margins while in other industries this result is reverted. In a third group, no significant impact has been found.

Exploring the possible structural characteristics of industries which might explain this result, the paper provides evidence that international trade pressures are associated in certain industries to changes in the product mix, leading to higher markups but also higher fixed costs, and thus a

[19] As a robustness check, the TFP index of the "Strenghtened" industry group has been calculated both including and excluding NACE34, given the ambiguous results obtained in Table 7. With the exception of 2003, when the TFP index of the "Weakened" industries is the lowest if one excludes NACE34, the result of a systematically lower TFP index for the "Strenghtened" industry group always holds. The result is also robust to a change in the estimation technique (OLS or Levinsohn-Petrin).

drop in the average industries' productivity.

These findings are consistent with some of the most recent developments in the literature of international trade (Melitz and Ottaviano, 2005; Bernard et al., 2005 and 2006), and shed a new light on the effects of trade liberalization on firms' strategies, which may contrast with previously established results.

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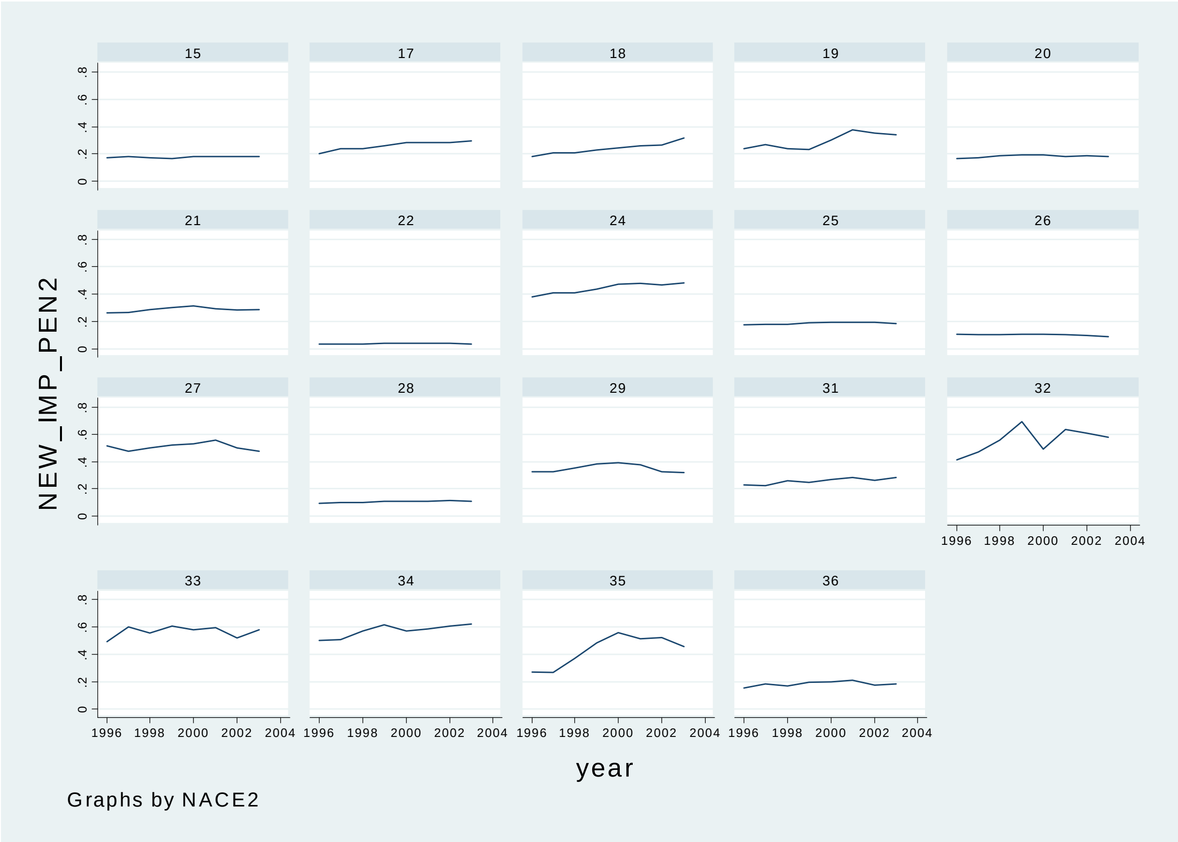
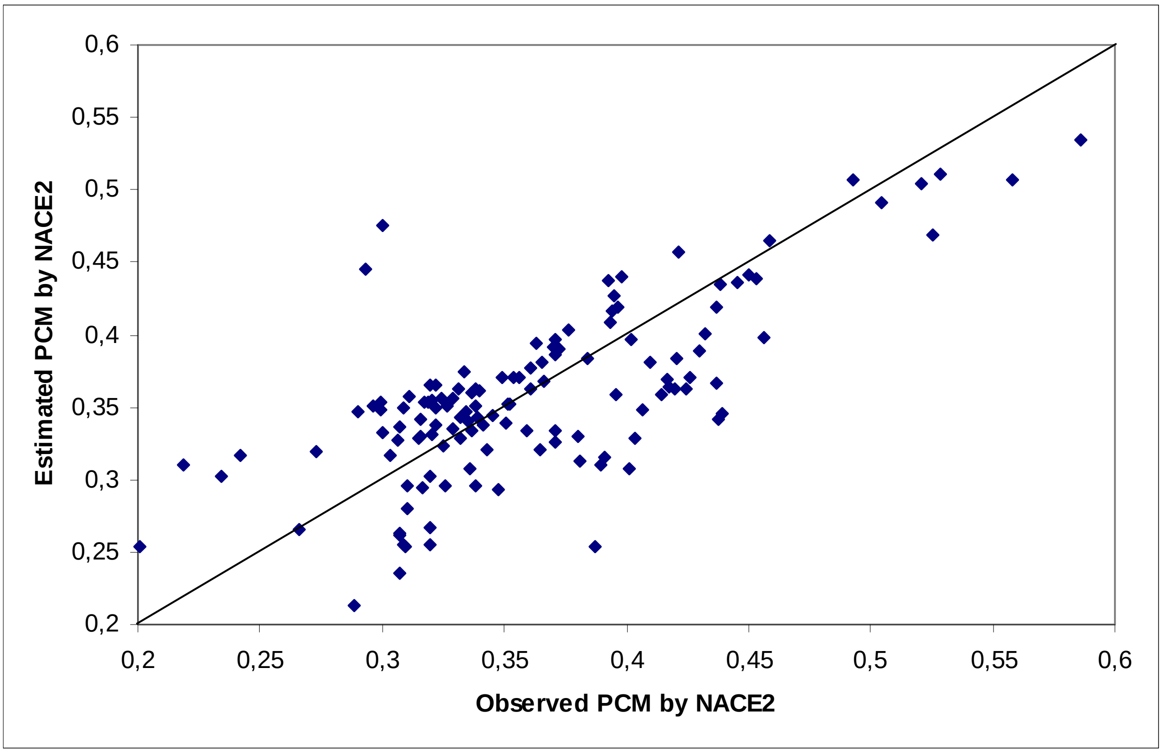
Graph 1. Import penetration ratios - 1996-2003 trend for NACE2 industries



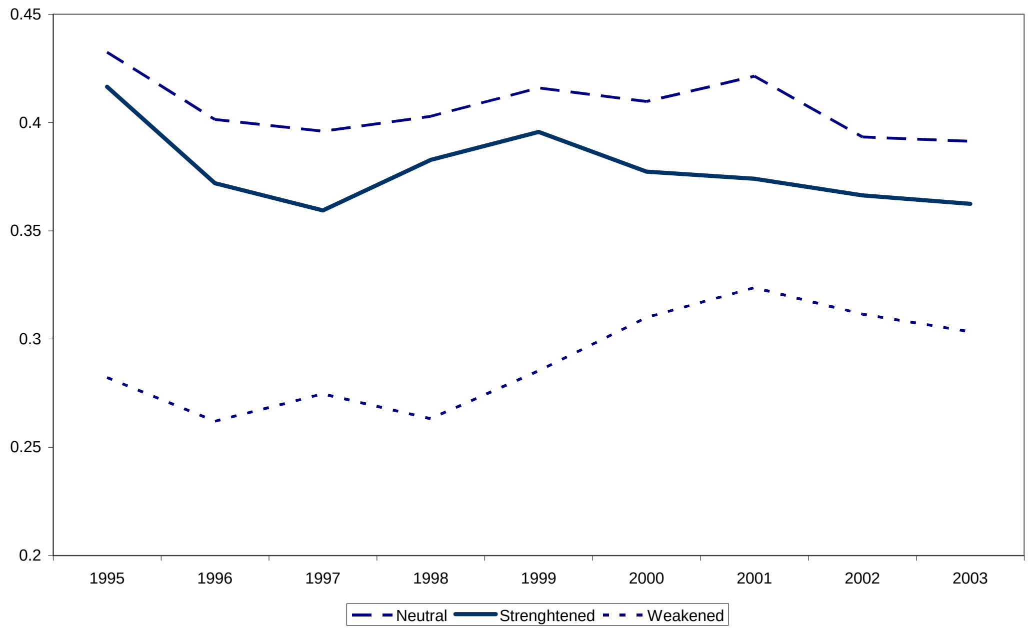
Source: authors' elaboration on ISTAT and EUROSTAT data at the NACE2-digit level of disaggregation

Graph 2. Estimated vs. Observed Price-Cost Margin, all NACE2 industries, 1996-2003



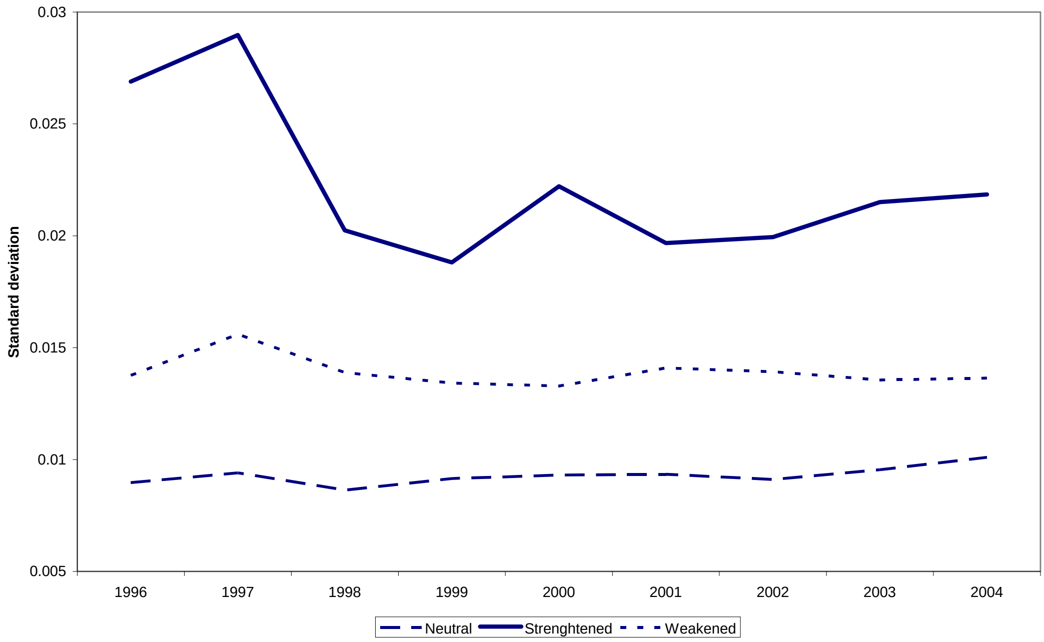
Source: authors' elaboration on the basis of sample data and Table 6, Column 1

Graph 3. Export ratios by industry groupings



Source: authors' elaboration on the basis of Eurostat and Istat databases. Sales weighted averages

Graph 4. Product mix heterogeneity, by industry groupings



Source: authors' elaboration on the basis of Eurostat production database. Sales weighted averages

Table 1: Import penetration ratios - descriptive statistics for NACE2-3 industries

	NACE_Description	mean	var	min	max
15	Manufacture of food products and beverages	17.8%	0.000043	16.9%	18.4%
17	Manufacture of textiles	26.1%	0.001060	20.3%	29.5%
18	Manufacture of wearing apparel; dressing and dyeing of fur	23.8%	0.001767	18.0%	31.6%
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	29.4%	0.003270	23.2%	37.7%
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and..	18.4%	0.000084	16.7%	19.4%
21	Manufacture of pulp, paper and paper products	28.7%	0.000336	25.9%	31.5%
22	Publishing, printing and reproduction of recorded media	3.8%	0.000004	3.4%	4.0%
24	Manufacture of chemicals and chemical products	44.3%	0.001491	37.9%	48.3%
25	Manufacture of rubber and plastic products	18.6%	0.000067	17.3%	19.6%
26	Manufacture of other non-metallic mineral products	10.1%	0.000038	8.9%	10.7%
27	Manufacture of basic metals	51.0%	0.000765	47.5%	55.7%
28	Manufacture of fabricated metal products, except machinery and equipment	10.6%	0.000047	9.6%	11.5%
29	Manufacture of machinery and equipment n.e.c.	35.0%	0.000914	32.2%	39.3%
31	Manufacture of electrical machinery and apparatus n.e.c.	25.7%	0.000564	22.1%	28.6%
32	Manufacture of radio, television and communication equipment and apparatus	55.5%	0.008638	41.2%	69.1%
33	Manufacture of medical, precision and optical instruments, watches and clocks	56.6%	0.001634	49.4%	60.7%
34	Manufacture of motor vehicles, trailers and semi-trailers	57.2%	0.002096	50.3%	62.0%
35	Manufacture of other transport equipment	43.0%	0.013110	26.4%	55.9%
36	Manufacture of furniture; manufacturing n.e.c.	18.4%	0.000343	15.5%	21.2%

Source: authors' elaboration on ISTAT and EUROSTAT data at the NACE3-digit level of disaggregation.

Table 2: Spatial distribution of the sample

Region	Firms	Frequency (%)
Abruzzo	546	1.94
Basilicata	100	0.36
Calabria	145	0.52
Campania	1,088	3.88
Emilia-Romagna	3,464	12.34
Friuli	815	2.9
Lazio	988	3.52
Liguria	344	1.23
Lombardia	8,128	28.95
Marche	1,227	4.37
Molise	71	0.25
Piemonte	2,391	8.52
Puglia	749	2.67
Sardegna	190	0.68
Sicilia	508	1.81
Toscana	2,338	8.33
Trentino-Alto Adige	403	1.44
Umbria	392	1.4
Valle d'Aosta	33	0.12
Veneto	4,156	14.8
TOTAL	**28,076**	**100**

Table 3: Sample distribution by industrial activity

	Nace_Description	Firms	Freq. (%)
15	Manufacture of food products and beverages	2,804	9.99
17	Manufacture of textiles	1,557	5.55
18	Manufacture of wearing apparel; dressing and dyeing of fur	1,151	4.1
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1,162	4.14
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and…	960	3.42
21	Manufacture of pulp, paper and paper products	683	2.43
22	Publishing, printing and reproduction of recorded media	1,213	4.32
24	Manufacture of chemicals and chemical products	1,264	4.5
25	Manufacture of rubber and plastic products	1,816	6.47
26	Manufacture of other non-metallic mineral products	1,938	6.9
27	Manufacture of basic metals	820	2.92
28	Manufacture of fabricated metal products, except machinery and equipment	2,951	10.51
29	Manufacture of machinery and equipment n.e.c.	4,259	15.17
31	Manufacture of electrical machinery and apparatus n.e.c.	1,305	4.65
32	Manufacture of radio, television and communication equipment and apparatus	396	1.41
33	Manufacture of medical, precision and optical instruments, watches and clocks	637	2.27
34	Manufacture of motor vehicles, trailers and semi-trailers	456	1.62
35	Manufacture of other transport equipment	379	1.35
36	Manufacture of furniture; manufacturing n.e.c.	2,325	8.28
	Total	**28,076**	**100**

Table 4: Size distribution of the sample

	Sample 2001		Census 2001		Firm coverage
size	Firms (A)	Freq. (%) (B)	Firms (C)	Freq. (%) (D)	(A)/(C)
1-9	3,196	11.4%	447,859	82.5%	0.7%
10-19	3,926	14.0%	55,553	10.2%	7.1%
20-49	5,145	18.3%	27,075	5.0%	19.0%
50-249	3,653	13.0%	10,872	2.0%	33.6%
249-	644	2.3%	1,517	0.3%	42.5%
N/A	11,512	41.0%			
Total	**28,076**	**100.0%**	**542,876**	**100.0%**	**5.2%**

Table 5: Descriptive statistics

Variable	**Mean**	**Std dev.**	**1st perc.**	**99th perc.**
	(euro '000)			
Turnover	13700	4.86E+15	769	158000
Material costs	7020	1.72E+15	50	82800
Cost of employees	2023	1.03E+14	42	23000
Tangibile Fixed Assets	2995	5.13E+14	13	37500
Employment	63	151144.6	2	622
Growth rates:	(% change)			
Turnover	6.4%	0.04	-35.7%	74.4%
Material costs	7.5%	0.08	-51.6%	108.8%
Cost of employees	7.2%	0.03	-31.3%	78.5%
Tangibile Fixed Assets	8.0%	0.20	-67.6%	166.2%
Employment	7.4%	0.08	-50.0%	122.6%

Table 6: Mark-up estimation and import penetration

Dep. Var: DY	(1)	(2)	(3)	(4)	(5)
DX	0.349*** (0.0050)	0.351*** (0.0064)	0.343*** (0.0054)	0.358*** (0.0051)	0.345*** (0.0049)
DX99	0.006 (0.0059)	0.014** (0.0068)	0.003 (0.0065)	0.005 (0.0059)	0.007 (0.0059)
DX00	0.007 (0.0053)	0.006 (0.0066)	0.002 (0.0058)	0.007 (0.0053)	0.009* (0.0053)
DX01	0.019*** (0.0058)	0.018** (0.0071)	0.017*** (0.0063)	0.019*** (0.0057)	0.019*** (0.0057)
DX02	0.023*** (0.0055)	0.013** (0.0070)	0.019*** (0.0060)	0.023*** (0.0055)	0.024*** (0.0054
DX03	0.028*** (0.0056)	0.024*** (0.0068)	0.025*** (0.0061)	0.027*** (0.0056)	0.032*** (0.0055)
DX04					0.020*** (0.0057)
DX_IMP	-0.052*** (0.0103)	-0.054*** (0.0147)	-0.028*** (0.0096)	-0.132*** (0.0157)	-0.043*** (0.0098)
cons	-0.002*** (0.0009)	-0.003*** (0.0010)	-0.02*** (0.0010)	-0.02** (0.0009)	-0.012*** (0.0001)
Firms fixed effects Time fixed effects	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
R-squared	0.73	0.75	0.73	0.74	0.73
Obs.	68,327	35,504	57,128	68,327	85,801

Standard errors clustered at the firm level are reported in parentheses

***, ** or * significant at the 1, 5 or 10 per cent level

(2) balanced panel; (3) Import penetration calculated at NACE4 level;

(4) Import penetration calculated excluding exports; (5) Lagged import penetration

Table 7: Industry-specific results

	Nace Description	DX [1]	DX_IMP [1]	DX [2]	DX_IMP [2]	DX [3]	DX_IMP [3]	Label
15	Food products and beverages	0.29***	-0.47***	0.29***	-0.48***	0.31***	-0.48***	W
17	Textiles	0.31***	0.37***	0.32***	0.33***	0.31***	0.35***	S
18	Wearing apparel	0.35***	-0.05	0.35***	-0.39	0.33***	0.18	N
19	Leather	0.48***	-0.57***	0.48***	-0.57***	0.44***	-0.44***	W
20	Wood and of products	0.27***	-0.18***	0.26***	-0.17***	0.26***	-0.2***	W
21	Pulp, paper and paper products	0.28***	0.09*	0.28***	0.09*	N/A	N/A	S
22	Publishing & printing	0.37***	4.06***	0.37***	4.06***	0.37***	4.47***	S
24	Chemicals and chemical products	0.36***	-0.08**	0.36***	-0.085**	0.38***	-0.10*	W
25	Rubber and plastic products	0.31***	-0.06	0.31***	-0.07	0.30***	-0.04	N
26	Other non-metallic products	0.37***	-0.04	0.37***	-0.04	0.35***	-0.11	N
27	Basic metals	0.26***	-0.009	0.25***	0.01	0.27***	-0.05	N
28	Fabricated metal products	0.36***	0.05	0.36***	0.05	0.35***	0.09	N
29	Machinery and equipment n.e.c.	0.34***	0.03	0.35***	0.013	0.35***	0.02	N
31	Electrical machinery	0.30***	0.01	0.30***	-0.08	0.30***	0.05	N
32	Communication equipment	0.26***	-0.02	0.26***	-0.02	0.23***	0.09	N
33	Precision and optical instruments	0.37***	-0.01	0.37***	-0.02	0.37***	-0.01	N
34	Motor vehicles	0.21***	0.08	0.21***	0.08**	0.20***	0.1	N/S
35	Other transport equipment	0.49***	-0.05	0.49***	-0.09	0.32***	0.19	N
36	Furniture; manufacturing n.e.c.	0.36***	-0.08***	0.36***	-0.077***	0.36***	-0.08**	W

1: firm FE estimator with time dummies and standard errors clustered at firm level
2: FE or RE estimators (according to the Hausman test) corrected for heteroskedasticity and/or autocorrelation by either robust or clustered standard errors after testing with xttest3 and xttest0 Stata routines.
3: firm FE estimator with time dummies and standard errors clustered at firm level, balanced sample only

W= “Weakened”; N= “Neutral”; S= “ Strengthened”

Table 8a: Industry characteristics

	Net Entry rate [a]			Observed PCM [b]			Herfindahl Index [b]		
	W	N	S	W	N	S	W	N	S
1996	-0.95	-0.78	-1.81	0.30	0.34	0.31	0.010	0.029	0.078
1997	-1.41	-1.17	-2.54	0.30	0.34	0.30	0.010	0.028	0.077
1998	-0.36	0.15	-1.62	0.31	0.34	0.31	0.010	0.031	0.074
1999	-0.03	-0.23	-1.16	0.33	0.35	0.31	0.010	0.029	0.068
2000	-0.48	-0.48	-1.57	0.32	0.34	0.32	0.010	0.030	0.059
2001	-0.34	-0.34	-1.65	0.33	0.35	0.33	0.009	0.028	0.062
2002	-0.87	-1.13	-2.77	0.34	0.36	0.34	0.009	0.023	0.057
2003	-0.99	-1.07	-2.65	0.33	0.36	0.36	0.009	0.020	0.064
2004	-1.60	-1.56	-3.32	0.33	0.34	0.37	0.008	0.020	0.062

W= “Weakened”; N= “Neutral”; S= “ Strengthened” NACE2 Industries as of Table 7.
[a] NACE2 industry weighted average, using number of active firms as weights, and based on official Chamber of Commerce data.
[b] Sales-weighted NACE2 industry average of (Production value – Variable costs) / Production Value, based on observations in our sample.

Table 8b: Changes in PCM components, 1997-2004

	Growth rate of Variable Costs			Growth rate of Production Value		
	W	N	S	W	N	S
1996	1.1%	2.4%	5.2%	0.8%	2.6%	4.8%
1997	0.5%	1.5%	2.8%	0.6%	1.7%	3.4%
1998	0.4%	0.7%	1.4%	0.5%	1.8%	1.1%
1999	1.7%	4.2%	3.7%	1.3%	4.0%	3.6%
2000	0.7%	0.3%	0.1%	0.6%	0.7%	0.6%
2001	0.5%	0.4%	-2.1%	0.4%	0.4%	-0.1%
2002	0.3%	0.3%	0.4%	0.2%	0.3%	0.3%
2003	0.5%	1.6%	1.3%	0.3%	1.4%	1.5%
2004	1.1%	2.4%	5.2%	0.8%	2.6%	4.8%

W= “Weakened”; N= “Neutral”; S= “ Strengthened” NACE2 Industries as of Table 7;
Sales-weighted NACE2 industry averages

Table 9: Markups, import penetration and the product mix

Dep. Var: DY	(1)	(2)	(3)
DX	0.341***	0.335***	0.341***
	(0.0055)	(0.0054)	(0.0054)
DX99	0.007	0.007	0.007
	(0.0059)	(0.0058)	(0.0059)
DX00	0.010*	0.010*	0.009*
	(0.0053)	(0.0052)	(0.0053)
DX01	0.019***	0.020***	0.020***
	(0.0053)	(0.0057)	(0.0057)
DX02	0.024***	0.025***	0.025***
	(0.0055)	(0.0053)	(0.0054)
DX03	0.030***	0.030***	0.030***
	(0.0056)	(0.0055)	(0.0056)
DX_IMP	-0.052***	-0.021***	-0.039***
	(0.010)	(0.0104)	(0.0103)
DX_PROD_MIX	0.519***	-0.369*	-0.32
	(0.213)	(0.205)	(0.212)
DX_PROD_MIX_S		4.44***	
		(0.380)	
DX_PROD_MIX_S_34			2.86***
			(0.3385)
Firm fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
R-squared	0.74	0.74	0.74
Obs.	68,327	68,327	68,327

Standard errors clustered at the firm level are reported in parentheses
***, ** or * significant at the 1, 5 or 10 per cent level

Table 10: Selected performance indicators of industry groupings

	1998	1999	2000	2001	2002	2003
Nominal Value-added [a]						
Neutral	1.00	1.02	1.05	1.00	0.82	0.80
Strenghtened	**1.00**	**0.95**	**0.98**	**0.96**	**0.79**	**0.79**
Weakened	1.00	1.10	1.11	1.08	0.96	0.93
TFP (Olley-Pakes semiparam. estimation) [b]						
Neutral	1.00	1.05	1.07	1.01	1.09	0.94
Strenghtened	**1.00**	**1.00**	**0.99**	**0.84**	**0.82**	**0.75**
Weakened	1.00	1.05	1.04	0.96	0.96	0.93

[a] unweighted NACE2 industry mean
[b] sales weighted NACE2 industry mean