Università Commerciale Luigi Bocconi – Milano
Facoltà di Economia
Dottorato di Ricerca in Diritto Internazionale dell'Economia
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ECONOMIC INTEGRATION, COMPETITION AND PRODUCTIVITY:

Theory and evidence from the Italian case

Comitato di tesi:

Chiar.mi proff. Carlo Altomonte,
Alberto Brugnoli (tutor),
Gianmarco I. P. Ottaviano

Tesi di dottorato di
Alessandro Barattieri
Matr. N. 935684

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Introduction

"Economic integration" is one of the most prominent aspects of the much more complex phenomenon known as "globalization". By "economic integration" we mean here the impressive growth of international trade and investment flows. Table 1 reports, for instance, the dynamics of the trade to GDP ratio for a sample of OECD countries.

Table 1: GDP Share of trade in goods and services

	1970	1980	1990	2000	2004
Belgium	50.5	59.3	69.9	84.0	82.3
Ireland	38.4	52.8	54.2	91.8	75.5
Netherlands	45.1	52.1	52.6	64.9	62.7
Austria	29.0	35.1	37.3	44.7	48.5
EU15 average	**30.0**	**37.0**	**38.2**	**51.2**	**48.5**
OECD average	**25.7**	**31.7**	**31.9**	**45.2**	**43.9**
Denmark	30.0	34.3	34.9	43.6	43.2
Switzerland	31.5	36.1	35.1	42.8	42.5
Sweden	23.7	29.9	29.4	43.2	42.3
Iceland	43.6	35.1	33.5	38.0	38.6
Norway	36.8	40.0	37.2	38.0	36.6
Canada	21.2	27.4	26.0	43.2	36.5
Germany	16.9	22.5	24.7	33.2	35.6
Finland	25.2	32.0	23.3	38.2	35.1
Portugal	24.1	30.1	36.2	37.2	34.5
New Zealand	23.4	30.1	26.9	35.1	29.1
Spain	12.9	15.7	17.8	30.6	27.8
United Kingdom	21.9	26.0	25.3	29.0	26.7
Italy	**16.0**	**23.0**	**19.7**	**27.8**	**26.2**
France	15.5	22.0	22.0	28.1	25.8
Greece	13.2	25.7	23.0	30.8	25.2
Australia	13.4	16.5	16.7	23.0	19.4
United States	5.6	10.4	10.3	13.2	12.7
Japan	10.1	14.1	9.9	10.1	12.2

Source: OECD Factbook 2006

As it is evident, the importance of trade over GDP has been constantly increasing since the '70s, reaching an average of 43.9% for the OECD countries and of 48.5% for the EU-15. Also in Italy, the importance of trade grew considerably, going from 16% of GDP in 1970 to 26.3% in 2004.

On the other hand, FDI flows have grown even more. In the OECD countries, the stock of inward FDI has risen from the 1.2 trillion dollars registered in 1990 to the almost 6 trillion dollars of 2003. The outward stock, instead, rose from 1.7 to 7.4 trillion dollars in the same period. In Italy, from 1990 to 2004 FDI inward stock grew from 60 billion dollars to 180 billion dollars, while FDI outward stock went up from 60 to 238 billion dollars (OECD factbook 2006). Summing up, as recently stated by Helpman, "international trade and foreign direct investments have been among the fastest growing economic activities around the world" (Helpman, 2006).

The present work aims at understanding which has been the impact of economic integration on competition and productivity in the Italian case. The choice of Italy has three main reasons. The first is that there is in Italy still room for boosting economic integration both in terms of trade (as witnessed by Table 1) and in terms of FDI, as the international comparison of table 2 makes clear.

Table 2: FDI stocks as % of GDP, selected countries

	1990	**2000**	**2004**
Ireland	88.9	134.1	**126.3**
United Kingdom	20.6	30.5	**36.3**
Spain	12.8	27.6	**34.9**
Canada	19.6	29.8	**30.5**
France	7.1	19.9	**26.5**
Italy	**5.4**	**11.3**	**13.1**
Germany	6.6	14.5	**12.9**
United States	6.9	12.9	**12.6**

Source: Unctad, WIR 2005

Second, because competition has been unanimously considered a desirable target for economic policy in Italy. It is therefore very interesting to understand whether economic integration can induce greater competition.

Finally, productivity slowdown seems to be one of the biggest macroeconomic problems of Italy. Table 3 shows, in fact, as Italy has been the worst performer among the OECD countries in terms of productivity growth in the period 2001-2003. Again, understanding the possible role of economic integration is crucial in order to design policies aimed at fostering productivity and hence economic development and welfare.

Table 3: Total factor productivity growth

	1985-1990	**1991-1995**	**1996-2000**	**2001-2003**
Ireland	3.1	3.3	4.8	**3.0**
Greece	0.3	0.0	1.7	**2.4**
Australia	0.3	1.4	1.4	**1.9**
Sweden	0.2	0.8	1.3	**1.6**
United States	1.0	1.0	1.5	**1.6**
Finland	2.2	1.2	2.7	**1.5**
United Kingdom	0.5	1.4	1.2	**1.3**
France	1.7	1.0	1.6	**1.2**
New Zealand	-0.2	0.4	0.8	**0.9**
Canada	-0.4	0.4	1.3	**0.6**
Spain	0.0	0.6	-0.1	**0.6**
Germany	0.0	1.1	1.1	**0.4**
Japan	3.1	0.8	0.5	**0.4**
Belgium	1.2	1.3	0.8	**0.2**
Austria	1.6	1.5	1.0	**0.1**
Denmark	0.2	1.0	0.1	**0.0**
Netherlands	0.4	1.5	0.4	**-0.4**
Portugal	0.0	0.0	2.1	**-0.6**
Italy	**1.3**	**1.3**	**0.1**	**-1.0**

Source: OECD Factbook 2006

The present work is structured in three chapters. The first chapter presents a survey of theory and empirical evidence on the relations between economic integration, competition and productivity. In order to do so, the possible channels through which economic integration might affect productivity have been divided into three categories: the trade-related and the FDI-related channels (the "direct effects") and all the other possible channels (the "indirect effects"). The main results discovered are four. First, there is large evidence that increased trade flows improve productivity. This is due both to the pro-competitive effects of trade and to the improved access to better inputs. The main challenge here is probably to build up models able to explain also the intra-firm integration-induced productivity effects, which are ruled out by the models able to explain a positive relation between integration and productivity. Second, the results from the FDI-related channels are much less clear. While a direct entry effect seems to be confirmed by the data, the evidence of productivity spillover from MNEs to local firms is mixed and dependent on the specifications and the country studied. Third, although evidence of direct effects of competition on productivity has been shown (mainly due to its impact on innovation), competition has been found as one of the most important channels through which economic integration can foster productivity. Fourth, a lot of possible indirect effects of economic integration on productivity have been emphasized. The most important ones are those acting through innovation, human capital improvements, institution building, financial development and liberalization policies.

After the survey, two different empirical tests have been performed starting from a dataset of Italian manufacturing firms.

The second chapter proposes an empirical test regarding the effects of economic integration on competition, analysing the evolution of the price-cost margins of a significant sample of Italian firms. In particular, I investigate the effects of import penetration on the price-cost margins of roughly 30,000 firms operating in the Italian manufacturing sector. In the period considered (1998-2003), I 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, I find a surprising heterogeneity of responses: in some industries, the increased exposure to international trade leads to lower price-cost margins, while in other this result is reverted. I show preliminary evidence of the structural characteristics that might explain this challenging result. In particular, those industries in which a negative impact of import penetration on price-cost margins is found exhibit, on average, lower levels of export-ratios while industries characterised by a positive impact of import penetration on price cost margins exhibit, on average, a more significant evolution of the product mix.

The third chapter, finally, deals with the possible effects of economic integration on productivity. I test the impact of import penetration on productivity using a sample of roughly 35,000 Italian manufacturing firms operating in the period 1996-2003. In the spirit of Amiti and Konings (2005), I consider the impact on productivity of both import penetration in the same industry and of import penetration in the up-stream industries. Three main results emerge from the analysis. First, import penetration matters for productivity, and in particular the import penetration ratio in the up-stream industries. An increase of 10% of the import penetration in the same industry would result in a productivity increase by 0.5% to 0.9% while an increase of 10% of the import penetration ratios in the up-stream industries would increase productivity by 2.9% to 5%, according to the Tfp measure and the econometric specification. Second, both foreign firms and internationalised firms are on average more productive than the other firms. Third, these two features do not explain much of the Tfp evolution, which is clearly (and not surprisingly) linked also to other relevant factors (as the R&D, for example).

Finally, some policy suggestions drawn by the main results obtained are provided in the final chapter.

Chapter 1

Economic integration, competition and productivity: a survey of theory and empirical evidence

1.1 Introduction

Productivity is at the heart of economic development. The concept of productivity has been recognized as the real engine of growth and hence of economic development and welfare. Thus, understanding the sources of productivity improvements is crucial in order to design policies aimed at fostering economic growth and welfare gains for people.

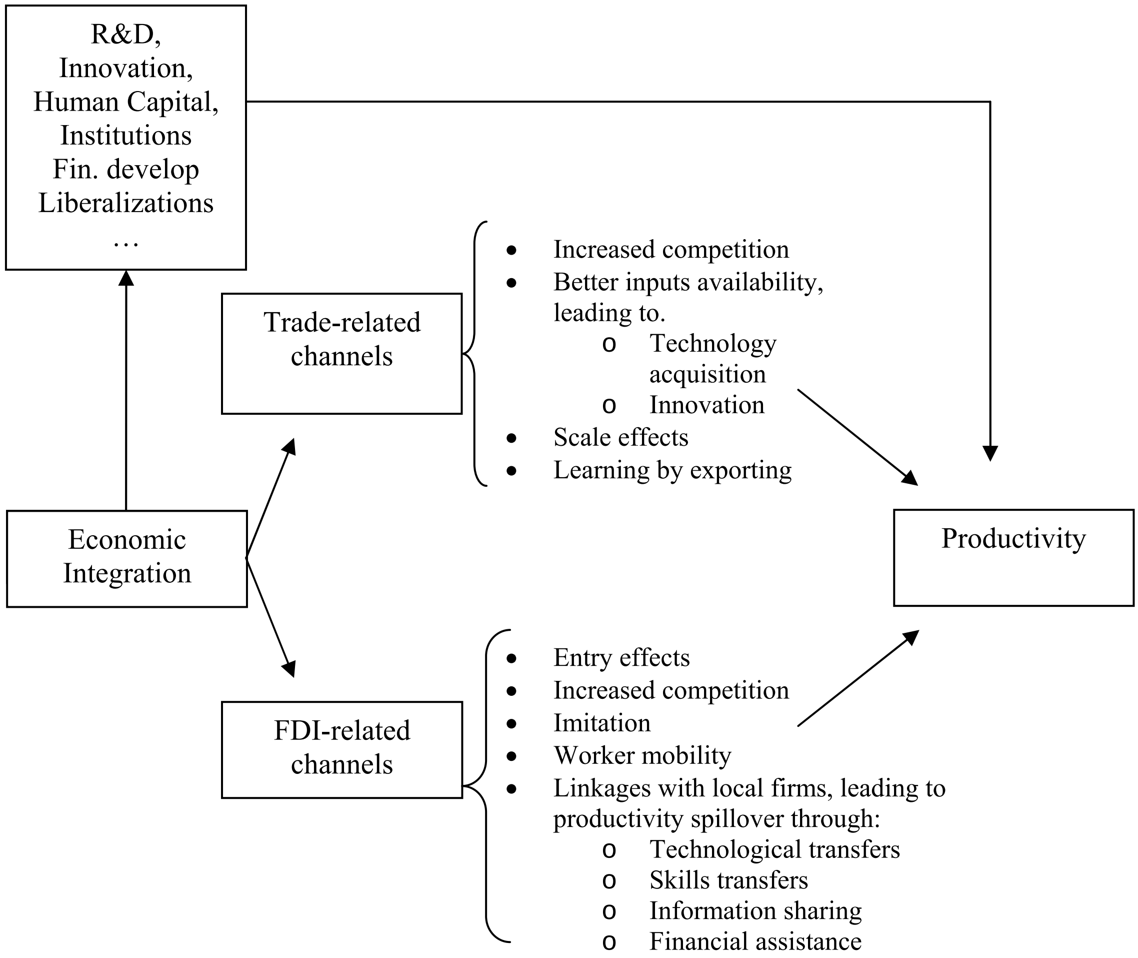
On the other hand, the last decades have been increasingly characterized by what we can call economic integration, certainly one of the prominent aspects of the much more complicate process of globalization. By economic integration, in this context, the attention is mainly focused on two phenomena: the increasing flows of trade in goods and services and the increasing flows of foreign direct investments (both inward and outward).

The aim of the present chapter is to review the literature dealing with the possible interactions between economic integration and productivity, trying to enlighten both the main theoretical achievements and the most relevant empirical evidence.

Graph 1 reports an attempt of classification of the possible channels through which economic integration might affect productivity. It is worth noting, first of all, that economic integration might have both *direct* and *indirect effects* on productivity. As for the former type of effects, it is necessary to distinguish between the effects produced by trade and those produced by FDI flows.

As shown in graph 1, the increase of trade flows can induce higher competition in the domestic market, which can in turn induce the less productive domestic firms to eliminate their inefficiencies or even to abandon the market, thus increasing productivity. Another possible effect is the increasing availability of intermediate inputs, which might be characterized by higher quality or by higher technological content. The availability of such inputs can stimulate innovation and hence productivity. Another effect of opening up to trade is represented by the possible scale effects deriving from an enlarged market, which might be source of productivity gains. Finally, also exporting can allow firms to enter into contact with more innovative environments and hence stimulate efficiency: it is the so called learning-by-exporting phenomenon.

Graph 1.1 Economic integration and productivity: the economic channels



On the other hand, the presence of multinational enterprises in a country might exert several effects on aggregate productivity. First, there might be entry effects. If MNEs are more productive than domestic firms, average aggregate productivity would increase simply by their entrance in the market. Second, FDI can increase competition and hence force the domestic firms to increase their productivity. A third channel through which productivity of the domestic firms may increase is the imitation effect, while also workers mobility can bring substantial benefits to the domestic firms. The most studied channel, however, is the formation of linkages with MNEs suppliers (backward linkages) and customers (forward linkages), which might be source of technological transfers, information sharing and financial assistance.

Besides the direct effects of economic integration on productivity, there are the some possible indirect effects. Productivity, in fact, is certainly the product of many different factors, among which it is worth remembering R&D, innovation, human capital and institutional endowments, financial development, specific policies such as liberalizations etc. Economic integration can induce changes in these factors, thus indirectly producing effects on productivity.

The structure of the chapter is as follows. The next section is devoted to the link between trade and productivity. Section three will deal with FDI and productivity while section four will tackle the indirect effects of economic integration on productivity. Section five deals with the direct link between competition and productivity and section six, finally, concludes.

1.2 Economic integration and productivity: the trade-related channels

1.2.1 Theory

Increases in productivity due to scale economies are among the first introduced by theoretical models. Krugman (1979) and Helpman and Krugman (1985) are examples of models in which opening up to trade induces an increase in market size that allows for scale effects. The link between scale effects and productivity, however, is not explicitly explored in these models.

On the other hand, the importance of inputs availability has been underlined by the theoretical models by Either (1982), Markusen (1989) and Grossman and Helpman (1991), although also these models are not explicitly focused on productivity. Either (1982), in fact, introduces differentiated intermediate inputs in a factor-proportion model of international trade. Markusen (1989), instead, is more interested in a normative description that delivers an interesting message: in his model, trade in final goods is an inferior substitute for trade in specialized inputs. Grossman and Helpman (1991) formalize a model where trade is able to expand input variety, which directly affects total factor productivity.

It is just with what has been called the "new" new trade theory, a strand of literature introducing productivity heterogeneity at firm level, that the nexus between trade and firms' productivity is explicitly explored. The channel through which higher integration results in higher productivity is the increase in competition, as we shall see in a while.

Melitz (2003) is one of the first examples of such models[1]. In the model by Melitz (2003) heterogeneity is introduced by a firm-specific variable cost of production which is drawn by the firm from a known distribution only after the entrance in the market. Once drawn the productivity level, the firm decides whether to stay in the market and produce or to leave the market. The demand side is simply a C.E.S. function as in Krugman (1979). The key parameter is what he calls the cut-off level of productivity, which is to say the level of productivity that makes a firm indifferent to produce or exit. In the open economy version of the model, this cut-off is positively affected by trade liberalization, which forces the less productive firms to leave the market and allows just the more productive firms to self select into the export market. The channel through which this "self-selection" happens is the increased competition in the labour market, which is the only factor of production. Although this model is very innovative, it has the drawback of relying on a demand system that rules out every possible pro-competitive effect of trade in the product market, as recognized by the same author (the elasticity of demand is fixed and depends only on the level of product differentiation).

This problem is overcome by a following model by Melitz and Ottaviano (2005). Let's describe it in a more detailed way. The original model is very rich and algebra-intensive. Here the choice is to present only the cornerstones of the model (leaving aside many interesting aspects) in order to achieve as quickly as possible the model conclusions. Starting from the closed economy version of the model, the economy has L consumers, each of which provides one unit of labour. The representative consumer preferences are described by a quasi-linear utility function that takes the following form:

[1] Also Bernard et al (2003) proposes a model with firm-level productivity heterogeneity.

$$U = q_o^c + \alpha \int_{i\in\Omega} q_i^c di - \frac{1}{2}\gamma \int_{i\in\Omega} (q_i^c)^2 di - \frac{1}{2}\eta \left(\int_{i\in\Omega} q_i^c di\right)^2 \quad (1.1)$$

where q_o^c is the numeraire and q_i^c is the quantity consumed of each variety i. α and η are related to the level of substitutability between the numeraire and the differentiated varieties; γ is a measure of product differentiation. Solving the consumer maximization problem and multiplying by the number of consumers we get the linear market demand for each variety i:

$$q_i = Lq_i^c = \frac{\alpha L}{\eta N+\gamma} - \frac{L}{\gamma} p_i + \frac{\eta N}{\eta N+\gamma} \frac{L}{\gamma} \overline{p} \quad \forall i \in \Omega^* \quad (1.2)$$

where Ω^* is the subset of consumed varieties is, N is the number of varieties in equilibrium and $\bar{p}$ the equilibrium price. The linearity of the demand curve implies that the price elasticity of demand is not fixed and uniquely determined by the level of product differentiation γ. An increase in the number of competitors or a decrease in average price will imply an increase in the elasticity of demand (i.e. firm will face tougher competition).

Turning to the supply side of the economy, the unit-cost-CRS production function for the numeraire guarantees unit wages. The differentiated product sector requires a fixed cost of entry f_E, then the production is characterized by CRS at constant marginal cost c (from here to be intended as an [inverse] indicator of firms' productivity). Firms heterogeneity is modelled as a difference in marginal cost which is unknown to the firm before entering into the market and it is drawn by a known distribution $G(c)$ with support on $[0, c_M]$. Since f_E is sunk, those firms that can cover their marginal cost survive, while all the other will immediately exit the market. Surviving firms solve their maximization problem given average price $\bar{p}$ and N. Solving the firm's maximization problem we get the profit maximization condition (PM) for a firm with marginal cost c:

$$q(c)=\tfrac{L}{\gamma}[p(c)-c] \qquad (1.3)$$

The key point of the model, as in Melitz (2003), is the introduction of the parameter c_D, the cost of the firm who is indifferent about producing or exit (let's call again this particular value the cut-off cost). This firm earns zero profit, since its price equals its marginal cost, and its demand level is equal to zero (hence $p(c) = c_D$ and (6) hold as equality). Let's assume that c_M is greater than c_D. Then, those firms whose cost is below c_D will make positive profits and stay in the market, whereas all other firms will exit. The cut-off cost summarizes the effects of both the average prices and number of firms on the performance measures of all firms. The simple algebra required by the equilibrium condition (Demand=Supply) allows to express prices $p(c)$, marks-ups $\mu(c)$, sales $q(c)$, revenues $r(c)$ and profits $\pi(c)$ as functions of c and c_D only:

$$p(c)=\tfrac{1}{2}(c_D+c) \qquad (1.4)$$

$$\mu(c)=\tfrac{1}{2}(c_D-c) \qquad (1.5)$$

$$q(c)=\tfrac{L}{2\gamma}(c_D-c) \qquad (1.6)$$

$$r(c)=\tfrac{L}{4\gamma}[(c_D)^2-(c)^2] \qquad (1.7)$$

$$\pi(c)=\tfrac{L}{4\gamma}[c_D-c]^2 \qquad (1.8)$$

Very intuitively, more productive firms (lower c) set lower prices but have higher mark-ups, sell more and earn higher revenues and profits than less productive firms.

The value of c_D is then pinned down from the free entry condition (that equals to zero the expected profits):

$$\int_0^{c_D}\pi(c)dG(c)-f_E=\tfrac{L}{4\gamma}\int_0^{c_D}[c_D-c]^2dG(c)-f_E=0 \qquad (1.9)$$

The authors assume a Pareto distribution of productivity draws, for which $G(c) = (\frac{c}{c_M})^k$. From (1.9) it is possible to solve for the cut-off cost:

$$c_D = \left[\frac{2(k+1)(k+2) f_E \gamma (c_M)^k}{L}\right]^{\frac{1}{k+2}} \tag{1.10}$$

It is evident from (1.10) how the cut-off level of productivity (and hence average productivity, which is just a monotonic transformation of c_D) is higher (lower c_D) in bigger markets (higher L), when the substitutability level among varieties (γ) is low and when entry costs (f_E) are low.

In order to verify the impact of economic integration on productivity, though, it is necessary to move to the open economy version of the model. In the open economy version, Melitz and Ottaviano consider two countries (H,F) endowed with L^H and L^F consumers. The preferences, the demand system and the assumptions on production technologies are exactly as before, however now the firms face two markets (the domestic and the foreign). Trade cost (τ) are assumed to be per-unit, which means that the delivered cost of a unit with cost c to country l ($l = H,F$) is $\tau^l c$, with $\tau^l > 1$. Since the markets are supposed to be segmented and the production exhibits CRS, firms independently maximize the profits made in the two markets. Analogously to the closed economy case, there will be two cut-off costs, one for the domestic market $\left(c_D^l\right)$ and the other for the export market $\left(c_X^l\right)$. The zero profit condition in this case has to take into account of the two possible source of profits and is as follows:

$$\int_0^{c_D^l} \pi_D^l(c)dG(c) + \int_0^{c_X^l} \pi_X^l(c)dG(c) - f_E = 0 \tag{1.11}$$

where $\pi_D^l(c)$ are the profit in the domestic market and $\pi_X^l(c)$ those in the export market. If we assume again the same Pareto distribution of productivity and tecnology for the two countries (i.e. same c_M and f_E), after introducing the specific expressions for the profits and some algebra, (1.11) can be expressed as:

$$L^l\left(c_D^l\right)^{k+2}+L^h\rho^h\left(c_D^h\right)^{k+2}=\gamma\xi \text{ , with } h=H,F \text{ and } h\neq l \tag{1.12}$$

In (1.12), $\rho^h = \tau^{-1}$ and represent the "freeness" of trade (a process of integration, for example, would increase ρ) and $\xi = 2(k+1)(k+1)f_E\,(c_M)^k$ is a "technology index" that combines the support for the distribution of productivity and the entry costs (a lower ξ indicate a better technology). Equation (12) represents a system of two equations in two unknowns that can be easily solved to give the level of the domestic cut-off in both countries:

$$c_D^l = \left[\frac{\gamma\xi}{L^l}\frac{1-\rho^h}{1-\rho^l\rho^h}\right]^{\frac{1}{k+2}} \tag{1.13}$$

Comparing (1.13) to (1.10) makes clear how opening up to trade implies an increase in the productivity cut-off (a lower c_D^l), since $\frac{1-\rho^h}{1-\rho^l\rho^h}\leq 1$. The channel through which this happens is an increase of competition in the product market that drives down average mark-ups and force the least productive firms to exit the market, thus increasing average productivity. Summing-up, as stated by the authors, “in this model, welfare gains from trade come from a combination of productivity gains, lower mark-ups (pro-competitive effects) and increased product variety”.

In both the Melitz (2003) and the Melitz and Ottaviano (2005) model, thus, competition raises average productivity through a selection mechanism that force the less productive firms to leave the market. In these models, however, the possibility of *intra-firm* productivity gains due to increased economic integration is ruled out. What Lawrence (2000) has called the “kick in the pants” effect might be explored in a model merging the firms heterogeneity features of the “new” new trade theory with some elements of the learning-by-doing style models[2]. However, to my knowledge no such a model has been developed yet.

[2] *à la* Young (1991)

1.2.2 Empirical evidence

As for the empirical contributions, obviously it is more difficult to isolate studies dealing with just one of the channels proposed. As for competition and input availability, we could attempt to schematise the existing studies according to two dimensions: the level of the approach adopted and the extension of the study in terms of economic channels included. The possible levels of approach are simply the country, industry or firm level, while the channels included can be either the "horizontal" channels or the "vertical" channels or a combination of the two. By "horizontal" channels we mean all those channels captured by within-industry measures of integration (such as import penetration in the same industry or output tariff reductions), which may generate what we could think of as "competition-led productivity gains". On the other hand, "vertical channels" include all those channels captured by across-industry measures of integration such as imported input, input tariffs or import penetration in the up-stream industries. This second class of channels generate what we could call “better input availability-led productivity gains".

Starting from the cross-country studies, for which it's impossible to disentangle "horizontal" vs. "vertical" channels, many studies are indeed more focalized on the effects of trade on growth. Ades and Glaeser (1999), for example, find a positive and significant relationship between trade and growth for a sample of developing countries in the last part of twentieth century. Frankel and Romer (1999), on the other hand, try to disentangle the effects of trade on the different component of growth, thus tackling explicitly the impact of trade on productivity. Their results, albeit only weakly statistically significant, are in favour of a positive effect of trade on productivity. Alesina, Spolaore, and Wacziarg (2000) are interested in a different question, but the model they propose has some testable implications relative to the link between trade and growth, which is found to be positive and statistically significant.

A criticism about these kinds of studies has been raised by Rodriguez and Rodrik (2001), who claim that once institutional quality and geographic variables are taken into account the positive effect of trade on productivity disappears. In a recent study, however, Alcalà and Ciccone (2004) find a positive impact of real openness on productivity for 138 countries, even after controlling for institutional quality and geographic variables, when real openness is employed. In particular, an increase in real openness from the 30th percentile to the median value would result in an increase of productivity by 80%, an increase from the 20th percentile to the median value would increase productivity by 160% and an increase of real openness from the 20th to the 80th percentile would multiply productivity by a factor of six. Alcalà and Ciccone control the robustness of their results through the use of instrumental variables both for trade and for institution quality

Besides the country level analysis, it is possible to find in the literature several industry-level studies, which try to capture all the possible heterogeneity hidden by the country level analysis. Kim (2000) analyses the case of 36 Korean industries showing how trade liberalization promotes efficiency and competition. Trefler (2004) performs instead a comprehensive study on the short run employment effects and long-run productivity effects of the Canada-US free trade agreement. He finds an increase by 14% in labour productivity in those Canadian and US industries with highest output tariff cuts.

Finally, as regarding the firm-level analysis, we find examples of studies dealing with "horizontal" channels in Tybout and Westbrook (1995), Krishna & Mitra (1998), Pavcnik (2002), Fernandes (2003) and Topalova (2004), all finding positive effects of trade or trade integration on firm-level productivity. In particular, Tybout and Westbrook (1995) analyses a panel of Mexican manufacturing firms and find a positive correlation between productivity growth and initial level of import penetration. Krishna & Mitra (1998), on the other hand, study the effects on competition and productivity growth of the trade liberalization occurred in India in 1991. They find both a significant drop in the firm-level mark-ups (thus an increase in competition) and a somewhat weak evidence of a positive effect of tariff cuts on productivity growth. Pavcnik (2002), who investigate the effect of trade liberalization on productivity for a panel of 4379 Chilean manufacturing plants, is the first study that introduces some methodological refinements to productivity estimates. In fact, by adopting the semi-parametric econometric technique developed by Olley and Pakes (1996), she's able to overcome the known "simultaneity bias" that affects the OLS estimates of the coefficients of the production function. With consistent estimates of plant level total factor productivity, she shows a positive impact on productivity growth, since the productivity of firms producing import-competing goods raised on average from 3% to 10% more than the productivity of firms producing non-tradable-goods. Fernandes (2003) follows Pavcnik (2002) by using semi-parametric econometric techniques correcting for simultaneity. In her case, she chooses the method developed by Levisohn and Petrin (2003) in order to assess the impact on productivity of trade protection for a panel of around 6,000 Colombian plants. The results display a strong positive impact of trade liberalization on plants' productivity. Interestingly, she's able to control for different economic channels, clarifying that plant exit is not an important source of productivity gains, while within-plant productivity increase are mainly related to increased skilled labour intensity of production, imports of intermediate and machinery investments. Finally, Topalova (2004) deals with the case of India, showing a strong positive impact of trade liberalization on productivity, which is not influenced by other factors such as labour regulations, investment climate or financial development.

More recently, some firm-level studies that trying to take into account also of "vertical" channels emerged. In particular, Shor (2004) tries to take into account not only of output tariff but also of input tariffs for a sample of 4844 Brazilian manufacturing firms belonging to 27 different industries, showing as input tariffs have a negative marginal effect on productivity. Moreover, she shows as including them in the analysis reduces the magnitude of the impact of output tariffs on productivity. A huge heterogeneity in the responses to trade liberalization is found: the effect of tariff reduction, in fact, depends on firm size, goods produced, degree of concentration. Another interesting study is the one by Muedler (2004). He tries to take into account both horizontal and vertical channels through which trade might affect productivity. He finds for a panel of 9,500 Brazilian manufacturers that the productivity gains due to increased competition have been more important than the import of foreign inputs[3]. On the other hand, Kasahara and Rodrigue (2004) analyse a panel of 2066 Chilean firms concluding that importing inputs matters for productivity[4]. In particular, switching from being non importer to be importer might enhance productivity by 3.5% to 21%. Amiti and Konings (2005), consider both the impact of output tariff and of input tariff on productivity for a sample of around 10,000 Indonesian manufacturers, for which they have detailed data on import of input. They adopt a two-stage empirical strategy. First they obtain reliable tfp estimates using a modification of Olley and Pakes methodology

3 Which is however just included in one of the stages for the tfp estimates and not used as a regressor in a tfp equation.

4 The same conclusion had been achieved also by Hasan (2002) in a study on a panel of Indian firms.

that takes explicitly into account the import decision of a firm. Second, they assess the impact of output and input tariff on productivity in a regression framework, concluding that a 10% of reduction in output tariff would increase productivity by 1% while a 10% reduction in input tariffs would increase tfp by 3% on average and by 11% in input-importing firms. Finally, also Bernard, Jensen and Schott (2006) find a positive effect of decreasing trade cost on productivity for a sample of US firms at three levels: across industry within manufacturing, across plants within industries and within plants.

A totally different strand of literature is the empirical literature examining the relation between export and productivity. From the seminal work by Bernard and Jensen (1995), the first that used longitudinal data to explore this issue, a lot of empirical work has been done. Wagner (2005) provides a comprehensive survey of 45 empirical studies published between 1995 and 2004 covering 33 countries. The main conclusions are three. First, almost in every study analysed the exporting firms have been found to be more productive than the domestic firms. Second, the selection hypothesis assumed by the theoretical models previously introduced has a lot of support from the data. The productivity levels of the firms entering into the export market are higher than those of the firms that decide to sell only at home. Finally, the evidence about the learning-by-exporting is much more mixed, although in general the studies that found significant learning-from-exporting effects were focused on developing countries[5], suggesting a possible relation between level of development and learning-by-exporting effects.

1.3 Economic integration and productivity: the FDI-related channels

According to the IMF and OECD definitions, direct investments reflect the aim of obtaining a lasting interest by a resident entity of one economy (direct investor) in an enterprise that is resident in another economy (the direct investment enterprise). The "lasting interest" implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the latter (Duce, 2003). Both outward and inward FDI can have potential productivity-effects, or put in other words, FDI may influence productivity

[5] See for example Blalock and Gertler (2004), Van Biesebroeck (2005) or De Loecker (2005)

both in the host country and in the home country, even if the literature has predominantly studied the former type of effects, on which the present section is focused[6].

While the entrance of MNEs[7] *per se* can have a *direct entry effect* on average productivity just because they are characterised by higher productivity than domestic firms[8], a lot of theoretical and empirical work has been focalized on the so called externalities that can rise from the presence of MNEs. Usually, although it is often difficult to disentangle them, we refer to pecuniary externalities (which can be positive or negative) when the benefit/cost are transmitted through market mechanisms while technological externalities are transmitted without market mechanisms.

The channels through which these externalities take place are those reported in graph 1[9]. The present section first presents in turn each of these channels and then reports the empirical evidence deriving from econometric studies. Barba Navaretti and Venables (2004) and Castellani and Zanfei (2006) are the most recent and complete works on these topics. The following exposition draws heavily from them.

1.3.1 Increased competition

The increase in competition due to the entrance of MNEs can have several effects on local firms. First, MNEs entrance can have several negative crowding-out effects on domestic competitors, with reduction in profit for domestic firms, as suggested for example by the model by Markusen and Venables (1999). However, as pointed out by the same authors, lower prices derived by increased competition can induce a second effect, namely a positive pecuniary externality in the downstream industries that can act as a catalyst for the entry of local firms.

A third possible effect of competition is a labour hoarding effect. Given the evidence that MNEs pay higher wages for the same level of skills (Lipsey and Sjholm, 2001), they force local firms to rise their wages or hire the less productive workers.

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[6] See Barba Navaretti and Falzoni (2004) for a recent survey on the home-country productivity effects of FDIs

[7] Both in the sense of entrance of foreign MNEs and in the sense of internationalization of a domestic firm

[8] as proved by Barba Navaretti and Falzoni (2004) for Italy, by Arnold and Hussiger (2005) for Germany and by Criscuolo and Martin (2003) for the UK in the case of home-based MNEs and by Griffith (1999) for the UK and by Benfratello and Sambenelli (2002) for Italy in the case of affiliates of foreign MNEs

[9] this classification is adapted from Blomstrom and Kokko (1998) and UNCTAD (2001)

Finally, increased competition may foster innovation and efficiency improvements in the local firms, with positive effects for productivity. As pointed out by Dunning (1993), the overall impact of MNEs on their competitors depends on three main factors: the characteristics of the sector considered the relevance of the multinationals' advantages and the mode of entry.

1.3.2 Imitation and demonstration

Imitation and demonstration effects are usually referred to as the opportunity for the domestic firms to increase their productivity imitating through reverse engineering or informal contact the technologies that are "demonstrated" by the entrant MNEs. Riedel (1975) proved as this channel has been crucial in the '60s for the development of Honk-Hong export-oriented manufacturing sectors. This effect, however, is often very close to the competition effect previously introduced, as witnessed by the studies regarding the soap sector in Kenia (Jenkins, 1990) or the Brazilian textile (Evans, 1979). More recent anecdotic evidence of imitation is provided for the case of Honduras (Alfaro and Rodriguez-Claire, 2004). An MNE used to serve breakfast to its employees before working hours. This innovation quickly spread among other firms helped improving productivity in the area.

1.3.3 Workers mobility

A third important channel of creation of externalities is the mobility of workers. It has been proved how MNEs usually provide more and better training to their workers than domestic firms do (Gershenberg, 1987). If the better-trained workers decide to move to a domestic firm or to open their own-business, they will create a positive externality for the receiving firm (Fosfuri, Motta and Ronde, 2001).

1.3.4 Linkages

The creation of backward and forward linkages and the productivity spillovers that might derive from them is certainly the most important and studied topic within this literature. Before turning to explore the productivity effects of such linkages it is worth to sketch their main determinants.

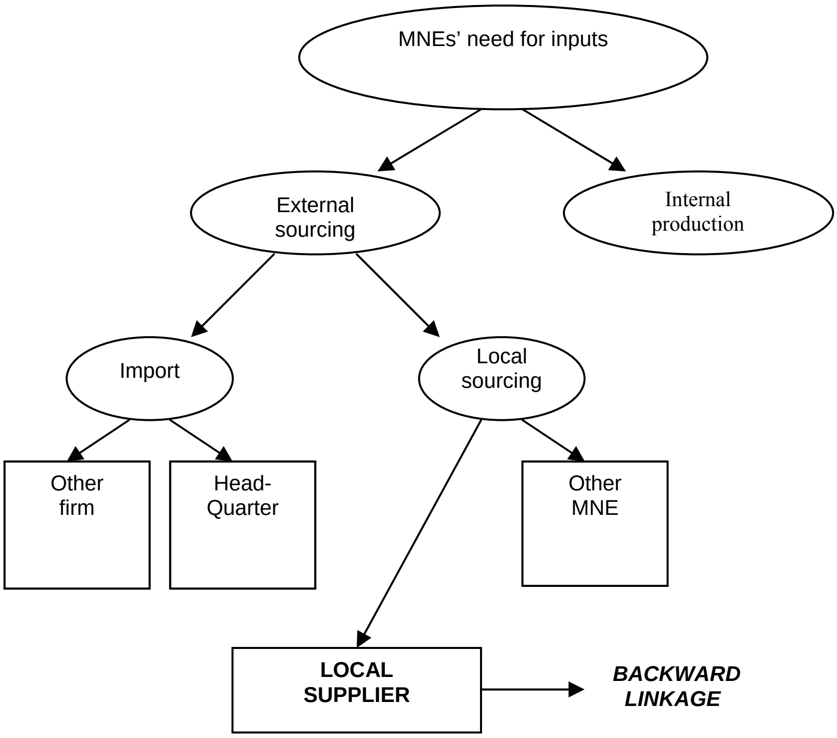
UNCTAD has devoted to this topic its 2001 World Investment Report, which is the most comprehensive source of information to date. The backward linkages (those with the MNEs' suppliers) are those reviewed in grater details. Graph 2 shows a typical MNE's input procurement decision process. The two alternatives faced by the MNEs are whether to make or buy its inputs and whether to source locally or import them. The final outcome depends on several variables.

The empirical literature (mainly through case studies) underlines as important factors for the establishment of such linkages (UNCTAD, 2001):

- the aim of the investment[10]. Market-seeking FDI are more prone to establish linkages than export-oriented efficiency seeking FDI. On the other hand, linkages created by efficiency-seeking foreign firms have been proved to be more stable than others (Altenburg, 2000);
- the technology used in the production process and the position on the market. The more standardized the product, more likely is the establishment of linkages;
- the role assigned to the affiliates by the parent-firms. The greater is the level of autonomy given to the affiliates, greater is the probability of linkages formation (Zanfei, 2000).
- the age of foreign affiliates. The number of linkages established grow-up along the time (McAleese and McDonald, 1978);
- the mode of entry. M&As are more likely to generate linkages with local context than greenfields investments (Scott-Kennel and Enderwich, 2001);
- the affiliates' size. Larger affiliates tend to have fewer linkages with local suppliers due to the difficulty of finding suitable suppliers and to the incentive to source from the parent-firm exploiting economies of scale (Barkley and McNamara, 1994);
- eventual public policies aimed at fostering the interactions between MNEs and local firms (Lall, 1980 and Halbach, 1989).

[10] For a description of the different possible aims of FDI see Dunning (1993)

Graph 2: MNEs' input procurement decision process



Souce: UNCTAD (2001)

Beside this evidence-based conceptual classification, the topic of linkages has been explored also in formal economic models. Markusen and Venables (1999), for instance, design a model where the linkage effects contrast the negative competition effects explained previously. Rodriguez-Claire (1996), on the other hand, delivers a model where the presence of MNEs is more beneficial to the host country the higher is what he calls "linkage coefficient", namely the amount of inputs locally purchased *per employee.*

1.3.5 Productivity spillover induced by linkages

Once established, these linkages are likely to produce productivity spillover mainly through four channels: technology transfers, skills transfers, information sharing and financial assistance. As for the technology transfer, a rich variety of theoretical models as well as evidence-based classifications are available. Starting from the technology transfers, it is necessary to distinguish between transfers of product technology, process technology and managerial know-how. As regarding the product technology transfers, we can find:

- direct technology transfers to MNEs supplier through licences, although this is quite rare (Yoon, 1994);
- product design and technical specifications transfers, which is probably the most important source of product technology transfers, as proved for Thailand, China, Indonesia, Korea e Taiwan (UNCTAD, 1995);
- technical cooperation aimed at increasing the supplier technological absorptive capacity, as interestingly found in the Irish case (Crone and Roper, 2001);
- R&D cooperation on product development eventually carried out with the help of local institutions (such as Universities) as happened in the case of India, Singapore e Malaysia (Reddy, 2000).

As for process technology transfers, we can instead find:

- provision of particular equipments aimed at improving production processes;
- technical support in the design of production processes, in some cases proved to be very high, as for instance in Singapore (Tan, 1990);
- visit to supplier production facilities by the MNEs technician aimed at advising about layout, operations and quality (Ernst, 1997);
- incentives to MNEs employees to start their own business, as in the case of Motorola in Korea (Kim, 1999).

The last type of technology transfer regards the managerial know-how. In particular, it is possible to find:

- assistance in inventory management and in the introduction of techniques such as the just-in-time, that might help to increase suppliers' productivity, as happened in Mexican automotive sector (Perez-Nunez, 1990);

- assistance in the adoption of quality certifications such as the ISO 9000;
- assistance in the introduction of new marketing techniques (Crone and Roper, 2001).

As for the formal economic model regarding technological transfers, a first example of such a model is Findlay (1978), who designs a two-country model where the technical efficiency growth rate is dependent on the foreign presence. Das (1987) builds instead a general equilibrium model where profit-maximizing local firms are characterized by cost functions that depend negatively on the spillovers produced by the MNEs operations. Finally, also Blomström and Wang (1992) present a very interesting model where technological transfer from the parent-firm depends negatively on perceived operational risk.

The second channel through which linkages can generate productivity spillovers is the transfer of skills. Among the most diffused manners in which such transfers take place there are:

- training courses specifically tailored for the suppliers' employees, as for example happened in the case of FIAT in Brazil (Borges Lemos, 2000);
- access to internal MNEs training courses for the suppliers employees, as in the case of INTEL in Costarica (Larrain, 2001);
- visits of experts to suppliers facilities in order to deliver training courses, as in the case of the MNEs operating in the Malaysian electronic sector (Giroud, 2001).

A third possible linkages-led productivity improvement has to do with information sharing. Possible concrete examples of this are the following:

- informal flows of information regarding future MNEs business development, as witnessed by the Indian case (Lall, 1980);
- deliver to the suppliers of annual (or in general long-term) orders, useful in order to achieve a better organization and plan investments due to more stable profit perspectives (Sison, 2000);

- sharing of international markets information not accessible to the smaller suppliers
- incentive for networking.

Finally, the last possible channel for productivity improvements of local suppliers has to do with financing. Here the main area where MNEs can help their suppliers are:

- pricing;
- cash flow, through prompt payments or payments in foreign currencies;
- medium term financing.

These last set of possible spillovers are however rarely been supported by the empirical evidence.

1.3.6 Empirical evidence of productivity spillovers from FDI

It is not easy to find econometric studies that specifically target one of the channels previously described. The vast majority of studies, instead, simply try to identify a net effect of the presence of MNEs on the productivity of local firms. A measure of productivity such as labour productivity or tfp is regressed on a set of explanatory variables, among which the foreign presence. The usual way of measuring foreign presence is either the employment or the sales shares of MNEs in the industry considered or other measures of FDI penetration such as FDI flows over Gross fixed capital formation or GDP. A possible distinction can be made between those studies that just consider *intra-industry* (horizontal) spillovers (those arising from the foreign presence in the same industry) and those considering also *inter-industry* (vertical) spillovers (arising from the foreign presence in the up-stream and down-stream industries). The former type of spillover is more likely to be generated through the competition channels, while the latter are mainly generated by the backward and forward linkages. All the other channels reviewed can in theory to both types of spillovers (workers can move across or within industry as well as imitation can occur within industry or across industries).

An excellent survey of the empirical results obtained until now is provided by Gorg and Greenaway (2001) further extended by Gorg and Greenaway (2004) and by Barba Navaretti and Venables (2004). Table 1.1 here reports their summary of the intra-industry spillovers studies. As it is clear from the table, there is no consensus about the impact of foreign presence on the productivity of local firms. Within this literature, started from the earlier works by Caves (1974), Globerman (1979) and Blomström & Persson (1983) on Australia, Canada and Mexico, respectively, 19 studies report positive and significant spillovers. Among them, however, the majority of study is based on cross sectional datasets, which have been criticized since they are unable to control for fixed industry characteristics that may bias the results. Among the studies using panel data, evidence of positive spillovers effects comes from UK (Liu et al., 2000; Haskel et al., 2002), Italy (Castellani and Zanfei , 2002), US (Keller and Yeaple, 2003), Ireland (Ruane and Ugur, 2002; Görg and Strobl, 2003) and Romania (Damijan et al, 2001).

On the other hand, evidence of negative spillover is found in the case of Venezuela (Aitken & Harrison , 1999), Spain (Castellani and Zanfei, 2002), Czech Republic (Djankov & Hoekman, 2000), Poland (Zukowska-Gagelmann, 2002) Bulgaria, Romania, and seven CEE countries (Konings, 2001; Damijan et al, 2001) .

In a third group of studies is characterized by non significant results, as in he case of Morocco (Haddad & Harrison, 1993), Uruguay (Kokko et al., 1996 and Kokko et al, 2001), India (Kathuria, 2000), Colombia (Kugler, 2001), Lithuania (Smarzynska, 2004).

Some studied tries to explicitly tackle the apparent contradictions of the results presented. Kokko (1994), for instance, underlines as spillovers are less likely in situations where MNEs operate in so-called enclaves (high presence of MNEs and large technological gap between MNEs and local firms), thus pointing at the absorptive capacity as one possible explanation for the heterogeneity of results found in the literature. This view is supported also by Kokko, Tansini and Zejan (1996). In their study on Uruguay, they find positive spillovers only in those industries characterized by moderate technology gap between foreign and domestic firms. These same conclusions are reached by a series of studies on UK firms by Girma et al. (2001), Girma (2002) and Girma and Görg (2002). In a similar spirit, Kinoshita (2001), studying a panel of Czech firms, finds positive spillover to the firms that are R&D intensive. Absorptive capacity thus seems to be an important piece of the answer to this productivity spillover paradox. On the other hand, competition certainly plays a role in this context. The negative effects from the presence of MNEs might be caused by competition effects, as argued by Aitken and Harrison (1999) and Konings (2001). Kokko (1996), in an interesting paper argues that in the Mexican case positive productivity spillovers are found in those industries where more fierce is the competition between foreign and domestic firms. Again, the ability to compete against foreign firms might be view as another aspect of absorptive capacity, which is thus considered as what really matters in order to allow domestic firms to get out the most from the entrance of MNEs in the market.

Table 1.1: Empirical evidence relative to intra-industry (horizontal) spillovers

Authors	Country	Period	Data	Aggregation	Result
Developing countries					
1 Blomström & Persson (1983)	Mexico	1970	cs	industry	+
2 Blomström (1986)	Mexico	1970/1975	cs	industry	+
3 Blomström & Wolff (1994)	Mexico	1970/1975	cs	industry	+
4 Kokko (1994)	Mexico	1970	cs	industry	+
5 Kokko (1996)	Mexico	1970	cs	industry	+
6 Haddad & Harrison (1993)	Morocco	1985-1989	panel	micro & ind.	?
7 Kokko et al. (1996)	Uruguay	1990	cs	micro	?
8 Blomström & Sjöholm (1999)	Indonesia	1991	cs	micro	+
9 Sjöholm (1999a)	Indonesia	1980-1991	cs	micro	+
10 Sjöholm (1999b)	Indonesia	1980-1991	cs	micro	+
11 Chuang & Lin (1999)	Taiwan	1991	cs	micro	+
12 Aitken & Harrison (1999)	Venezuela	1976-1989	panel	micro	-
13 Kathuria (2000)	India	1976-1989	panel	micro	?
14 Kokko et al (2001)	Uruguay	1988	cs	micro	?
15 Kugler (2001)	Colombia	1974-1998	panel	industry	?
16 López-Córdova (2002)	Mexico	1993-1999	Panel	micro	?
17 Görg and Strobl (2002c)	Ghana	1991-1997	panel	micro	+
Developed countries					
18 Caves (1974)	Australia	1966	cs	industry	+
19 Globerman (1979)	Canada	1972	cs	industry	+
20 Liu et al. (2000)	UK	1991-1995	panel	industry	+
21 Driffield (2001)	UK	1989-1992	cs	industry	+
22 Girma et al. (2001)	UK	1991-1996	panel	micro	?
23 Girma and Wakelin (2001)	UK	1980-1992	panel	micro	?
24 Harris and Robinson (2001)	UK	1974-1995	panel	micro	?
25 Girma and Wakelin (2002)	UK	1988-1996	Panel	Micro	?
26 Haskel et al. (2002)	UK	1973-1992	panel	micro	+/?
27 Girma (2002)	UK	1989-1999	panel	micro	?
28 Girma and Görg (2002)	UK	1980-1992	panel	micro	?

29 Ruane and Ugur (2002)	Ireland	1991-1998	panel	micro	+
28 Barrios and Strobl (2002)	Spain	1990-1994	panel	micro	?
29 Dimelis and Louri (2002)	Greece	1997	cs	micro	+
30 Castellani and Zanfei (2002)	Fra, Ita. Spa	1992-1997	panel	micro	Ita +, Spa -, Fra ?
31 Keller and Yeaple (2003)	US	1987-1996	panel	Micro	+
32 Görg and Strobl (2003)	Ireland	1973-1996	panel	micro	+
Transition Countries					
33 Djankov & Hoekman (2000)	Czech Republic	1993-1996	panel	micro	-
34 Kinoshita (2001)	Czech Republic	1995-1998	Panel	micro	?
35 Bosco (2001)	Hungary	1993-1997	Panel	micro	?
36 Konings (2001)	Bulgaria	1993-1997	panel	micro	-
	Poland	1994-1997	panel	micro	?
	Romania	1993-1997	panel	micro	-
37 Damijan et al (2001)	Bulgaria, Czech Rep.	1994-1998	Panel	Micro	
	Estonia, Hungary,	1994-1999	Panel	Micro	
	Poland, Romania	1994-2000	Panel	Micro	
	Slovakia, Slov.	1994-2001	Panel	Micro	- or ? + for ROM
38 Li et al. (2001)	China	1995	cs	industry	+
39 Zukowska-Gagelmann (2002)	Poland	1993-1997	panel	micro	-
40 Smarzynska (2004)	Lithuania	1996-2000	panel	Micro	?

(i) Data: *CS* denotes cross-sectional data, while *panel* denotes use of combined cross-sectional time-series data in the respective analysis
(ii) Aggregation: Use of either *industry* or *micro* (i.e., firm, plant, or establishment) level data in the analysis
(iii) Result: Regression analysis finds a + positive and statistically significant, - negative and statistically significant, *?* mixed results or statistically insignificant sign on the foreign presence variable for the aggregate sample

Source: Gorg and Greenaway (2004)

A more recent and promising strand of research is the literature concerned with the possible inter-industry (vertical) productivity spillovers. The importance of backward and forward linkages as possible source of spillovers has been stressed before. As for the empirical evidence, however, to date there are only few papers that explicitly tackles this topic. Table 1.2, taken from Gorg and Greenaway (2003) summarises the available evidence[11].

[11] All this literature is characterized by the use of panel data.

Table 1.2: Empirical evidence relative to inter-industry (vertical) spillovers

Authors	Country	Period	Aggregation	Horiz	Back	Forw
1 Kugler (2001)	Colombia	1974-1998	Industry	?	many +	n.a.
2 Driffield et al(2002)	UK	1984-1992	industry	?	?	+
3 Harris and Robinson (2002)	UK	1974-1995	micro	?	?	?
4 Blalock and Gertler (2003)	Indonesia	1988-1996	Micro	?	+	n.a.
5 Smarzynska (2004)	Lithuania	1996-2000	micro	?	+	n.a.

Notes: see table 1, Kugler (2001) and Harris and Robinson (2002) do not distinguish backward and forward spillovers

Source: Gorg and Greenaway (2004)

Kluger (2001) presents evidence from 10 Colombian industries for the period 1974-1998. Although aggregate horizontal spillovers are not found, he finds in several cases significant and positive inter-industry spillovers (even if he is not able to distinguish between backward or forward). In a couple of studies on UK, Driffield et al(2002) find no evidence of positive vertical spillovers while Harris and Robinson (2002), who deal with firm-level data, do provide evidence of positive vertical spillovers. Positive vertical spillovers are found for developing countries. Blalock and Gertler (2003) detect positive spillovers from backward linkages for a panel of Indonesian firms in the period 1988-1996 while Smarzynska (2004) finds evidence for a sample of Lithuanian firms operating in the period 1996-2000. Given the relevance of the theme, the extent of this strand of literature will certainly grow in the future.

1.4. Economic integration and productivity: the indirect effects

The first possible indirect effect of economic integration that is worth remembering is the role that it can play in the so-called R&D spillover effects. The empirical evidence on the positive impact of R&D on productivity is convincing[12]. In particular, it has been proved how productivity depends positively on the stock of domestic R&D. However, in an integrated world economy productivity might be affected also by the foreign stock of R&D, reaching the country trough FDI (as seen before) or trade in goods and services. Coe and Helpman (1995) were the first to explore this possibility. In their

[12] And beyond the aim of the present survey

study of 21 OECD economies plus Israel for the period 1971-1990 they found that both domestic and foreign R&D capital stock[13] had significant effects on productivity. In particular, these effects are found to be greater the highest the import share over GDP. This study has been criticised due to several methodological problems. Lee (2005) tackles much of these critics showing that the qualitative results by Coe and Helpman are robust to the use of modern and up-graded econometric techniques. Further evidence that trade might have indirect effects on productivity come from Cameron, Proudman and Redding (2005), who find that trade enhanced the speed of technology transfer in a panel of 14 UK industries since 1970.

A second possible indirect effect through which economic integration might affect productivity is related to the human capital flows, which might be fostered by integration processes. Park (2004) performs a study on the role of international student flows as possible driver of productivity increase. Using a Panel of 22 developed countries for the period 1971-1990 he finds a positive and significant impact of student flows on productivity.

A third possible indirect channel regards financial development. Both theoretical and empirical works pointed out a positive relation between financial development and productivity. Two example of this literature are Benhabib and Spiegel (2000) and Jeanneney, Hua and Liang (2006). Benhabib and Spiegel (2000) find that the ratio of the financial assets hold by the private sector to the GDP has a significant and positive effect on growth while Guillaumont Jeanneney, Hua and Liang (2006) find that financial development (measured in terms of private credit, bank competition and public credit) significantly contributed to tfp growth in a panel of 29 Chinese provinces in the period 1993-2001.

A fourth possible factor that can be influenced by economic integration and affect productivity has to do with the infrastructural endowment. Here the reference is both to the physical infrastructures and to the institutional infrastructures. As for the former, evidence that public infrastructure can enhance productivity is provided by Salinas-Jimenez (2004) in a study on the Spanish regions. As for the latter, instead, evidence of positive effects of institutional quality on productivity have been detected, among

[13] Computer as a trade-weighted average of the R&D domestic capital stock of the trade partners.

others, by Fulginiti, Perring and Yu (2004) in their study on the agricultural productivity in 41 Sub-Saharan countries from 1960 to 1999.

Lastly, economic integration can induce governments to adopt policies that foster productivity. One of the best example are the liberalization policies (take for instance the European integration process and all the European directives pursuing liberalization). The effects of regulation on productivity have been extensively studied in the literature. Nicoletti and Scarpetta (2005), for example, provide evidence from the OECD, for which better regulatory data are available. In a regression framework, they establish that an alignment of the overall regulatory stance to the standard of the best[14] performer of the OECD would imply an increase on the rate of growth of tfp by 0.4% to 1.1% over a period of ten years. In particular, according to the authors, "the effect of entry regulation is likely to be particularly important for productivity performance in industries in which technology is rapidly evolving". On the other hand, also service liberalizations can result in enhanced productivity, as recently pointed out by Arnold, Javorcik and Mattoo (2006).

1.5. Competition and productivity

As we have seen until now, competition is frequently considered as one of the main economic channels through which economic integration induces productivity improvements. It is worth remembering, however, that there is a huge literature that link directly competition to firms' performance.

As for the theoretical literature, the contract theory delivers a range of prediction about the relation between competition and productivity using models of moral hazard with multiple agents[15]. On the other hand, also the endogenous growth theory[16] delivers predictions relative to the relation between competition and innovation (and hence productivity).

As for the empirical evidence, Nickell (1996) finds a positive effect of competition (measured in a variety of ways) on the productivity growth of a sample of 700 UK manufacturing firms for the period 1972-1986. These results have been confirmed also

[14] In terms of deregulation in the product markets
[15] See for example Hart (1983)
[16] See for example Aghion *et al* (2002)

by Nickell et al (1997) for another panel of English firms and more recently by Okada (2005) for a large sample of Japanese manufacturing firms.

1.6. Conclusions

The present chapter's aim was to survey the main theoretical achievements and the empirical evidence available regarding the relation between economic integration, competition and productivity. The main results discovered are four.

First, there is large evidence that increased trade flows improve productivity. This is due both to the pro-competitive effects of trade and to the improved access to better inputs. The main challenge here is probably to build up models able to explain also the intra-firm integration-induced productivity effects, which are ruled out by the models able to explain a positive relation between integration and productivity.

Second, the results from the FDI-related channels are much less clear. While a direct entry effect seems to be confirmed by the data, the evidence of productivity spillover from MNEs to local firms is mixed and dependent on the specifications and the country studied.

Third, although evidence of direct effects of competition on productivity has been shown (mainly due to its impact on innovation), competition has been found as one of the most important channels through which economic integration can foster productivity.

Fourth, a lot of possible indirect effects of economic integration on productivity have been emphasized. The most important ones are those acting through innovation, human capital improvements, institution building, financial development and liberalization policies.

Chapter 2

Economic integration and competition: evidence form Italian firms

2.1. 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 Economist, February 26th 2006, p. 65-66]

The latter quotation is just one of the many examples describing how changes in competition determined 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 and productivity thoroughly explored across industries.

More recently, however, the increasing availability of firm-level datasets and the subsequent development of models accounting for firm heterogeneity have allowed to a broadening of the scope of the previous analysis: 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 (Helpman, 2006). A further dimension of firm heterogeneity has been recently added by Bernard et al. (2005 and 2006). As for the Benetton's case previously quoted, they show that some firms, when exposed to increasing international trade pressures, might endogenously self-select into the production of a different product mix composed of asymmetric products, each one produced according to a different technology.

These developments deliver new empirical implications which may contrast with the previously established results, and thus need to be tested. In particular, a number of recent contributions in the literature have made the relationship between trade liberalization and firms' price-cost margins particularly worth revisiting.

From a theoretical point of view, Melitz and Ottaviano (2005) have in fact 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, in order to overcome the undesirable feature of constant mark-ups in standard imperfect competition models of trade. In their framework, monopolistically competitive firms produce one variety of a single product with heterogeneous productivity levels; mark-ups, however, 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.

Combining the feature of endogenous mark-ups with the previously mentioned finding of product heterogeneity within the same firm might thus yield a richer set of predictions on the relationship between trade liberalization and price-cost margins.

Moreover, from an empirical point of view, this type of analyses can now capitalize on two recent empirical papers by Konings et al. (2005a and 2005b), which 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 mark-ups, i.e. a potential simultaneity bias between output growth and the growth in the input factors[17]. It also avoids relying on imperfect measures of firms' marginal costs in order to observe firms' mark-ups, since price-cost margins can be estimated consistently starting from nominal balance sheets data on sales and input factors[18]. As a result, the potential downward bias in the estimated mark-ups due to the omitted price variable bias (Tybout, 2003; De Loecker, 2006) is circumvented, since no price deflators are needed to implement the algorithm.

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[17] 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.

[18] 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. Tybout (2003) provides an overview of mark-up estimation with firm-level data.

Following the latter procedure, I have thus 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, I find broad evidence of pro-competitive gains from trade at the aggregate level, i.e. firms' mark-ups tend to be negatively associated with an increase of import penetration indexes. However, when performing the same analysis at a more disaggregated level, I have found a huge variation in the response across industries: in some industries, the increased exposure to international trade leads to lower price-cost margins, while in others this result is reverted. For a third group of industries, the effect does not seem to be significant.

I have then tried to relate this evidence to some structural characteristics of firms, on the basis of the most recent theoretical developments. While no significant differences have emerged across industries in firm's size, or the entry and exit dynamics, the industries in which I find a positive impact of import penetration on price-cost margins exhibit, on average, an high export-ratio and a larger variation in the composition of their product-mix.

The structure of the chapter 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 the 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, while section 6 concludes.

2.2. Econometric Model

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

$$Q_{it} = A_{it} \cdot F\left(N_{it}, M_{it}, K_{it}\right) \tag{2.1}$$

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:

$$\frac{\Delta Q_{it}}{Q_{it}} = \alpha_{Nit}\frac{\Delta N_{it}}{N_{it}} + \alpha_{Kit}\frac{\Delta K_{it}}{K_{it}} + \alpha_{Mit}\frac{\Delta M_{it}}{M_{it}} + g_{it} \qquad (2.2)$$

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 exceed marginal costs, equation (2.2), as suggested by Hall (1988), becomes:

$$\frac{\Delta Q_{it}}{Q_{it}} = \mu_{it}\left(\alpha_{Nit}\frac{\Delta N_{it}}{N_{it}} + \alpha_{Kit}\frac{\Delta K_{it}}{K_{it}} + \alpha_{Mit}\frac{\Delta M_{it}}{M_{it}}\right) + g_{it} \qquad (2.3)$$

where $\mu_{it} = \frac{P_{it}}{c_{it}}$ is the mark-up of output price over marginal cost. After some simple algebra, that still requires the assumption of constant returns to scale, equation (2.3) may be written as follows:

$$\frac{\Delta Q_{it}}{Q_{it}} - \alpha_{Nit}\frac{\Delta N_{it}}{N_{it}} - \alpha_{Mit}\frac{\Delta M_{it}}{M_{it}} - (1-\alpha_{Mit}-\alpha_{Nit})\frac{\Delta K_{it}}{K_{it}} = \beta_{it}\left(\frac{\Delta Y_{it}}{Y_{it}} - \frac{\Delta K_{it}}{K_{it}}\right) + (1-\beta_{it})g_{it} \qquad (2.4)$$

The term β_{it} is then 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 mark-up factor. The problem in estimating equations (2.3) or (2.4) as in Levinsohn (1993) and Harrison (1994) is that unobserved productivity shock g_{it} may be correlated with the input factors.

The latter is the traditional critique to the Hall's (1998) approach for estimating mark-ups, 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 (2.4):

$$\alpha_{Nit}\frac{\Delta P_{Nit}}{P_{Nit}}+\alpha_{Mit}\frac{\Delta P_{Mit}}{P_{Mit}}+\left(1-\alpha_{Mit}-\alpha_{Nit}\right)\frac{\Delta P_{Kit}}{P_{Kit}}-\frac{\Delta P_{it}}{P_{it}}=-\beta_{it}\left(\frac{\Delta P_{it}}{P_{it}}-\frac{\Delta P_{Kit}}{P_{Kit}}\right)+\left(1-\beta_{it}\right)g_{it} \tag{2.5}$$

where $\frac{\Delta P_{Jit}}{P_{Jit}}$ (with J=N,M,K) is the unit cost of input factor J. By subtracting eq. (2.5) from eq. (2.4), one ends up with:

$$\left(\frac{\Delta Q_{it}}{Q_{it}}+\frac{\Delta P_{it}}{P_{it}}\right)-\alpha_{Nit}\left(\frac{\Delta N_{it}}{N_{it}}+\frac{\Delta P_{Nit}}{P_{Nit}}\right)-\alpha_{Mit}\left(\frac{\Delta M_{it}}{M_{it}}+\frac{\Delta P_{Mit}}{P_{Mit}}\right)-\left(1-\alpha_{Mit}-\alpha_{Nit}\right)\left(\frac{\Delta K_{it}}{K_{it}}+\frac{\Delta P_{Kit}}{P_{Kit}}\right)=\beta_{it}\left[\left(\frac{\Delta Y_{it}}{Y_{it}}+\frac{\Delta P_{it}}{P_{it}}\right)-\left(\frac{\Delta K_{it}}{K_{it}}+\frac{\Delta P_{Kit}}{P_{Kit}}\right)\right] \tag{2.6}$$

In equation (2.6) the unobserved productivity shock g_{it} is cancelled out and therefore the simultaneity bias previously discussed disappears. The Lerner index can therefore be consistently estimated. Moreover, equation (2.6) implies that estimating the price-cost margin requires just information about the growth rates of production value, wage bill, material cost and value of capital. Since no deflation is required, also the omitted price variable bias is not a source of trouble[19].

As for the rental price of capital, by 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-

[19] 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 mark-ups. Klette and Griliches (1996) have been the first to discuss a similar omitted price variable bias in production functions estimations.

level depreciation rate computed as depreciation over net tangible fixed asset in the previous year and r_{it} is a firm-level real interest rate, an information retrieved from the dataset[20]. If we label the LHS of eq. (2.6) as DY and the RHS as DX, we obtain a very simple testable equation for estimating the price-cost margins:

$$dY_{it} = \beta_{it} \cdot dX_{it} + \varepsilon_{it} \qquad (2.7)$$

In order to estimate eq. (2.7), however, we have to assume constant mark-ups 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[21].

Since I'm interested in assessing the evolution over time of the price cost margins, in order to gauge the impact of trade openness, I have modified eq. (2.7) as follows:

$$dY_{ijt} = \beta_1 dX_{ijt} + \delta_t dX_{ijt} \cdot T_t + \beta_2 dX_{ijt} \cdot IMP_{jt} + \gamma_i + \varepsilon_{it} \qquad (2.8)$$

In equation (2.8) the dimension *j* represents the industry to which the firm *i* belongs at time *t*, while T_t is a set of time dummies, which allow us to control for cyclical demand effects[22]. Hence, the evolution of the estimated price-cost margin is captured by the sequence of the coefficients ($\beta_1+\delta_t$), where β_1 is the estimated PCM in the first period for the group of firms considered and IMP_{jt} is the import penetration index in industry *j* at time *t*. As usual, the index is calculated as:

$$IMP_{jt} = \frac{IMPORTS_{jt}}{IMPORTS_{jt} + PRODUCTION_{jt} - EXPORTS_{jt}} \qquad (2.9)$$

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

21 I 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.

[22] 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.

where $IMPORTS_{jt}$, $EXPORTS_{jt}$ and $PRODUCTION_{jt}$ are respectively the total imports, exports and production value of industry *j* at time *t*. Finally, γ stands for an unobservable firm-specific fixed effect.

The coefficient β_2 in equation (2.8) therefore captures the marginal impact of import penetration on the PCM's estimates, with the latter retrievable through the sequence of the coefficients (β_1+δ_t), where β_1 is the estimated PCM in the first period for the group of firms considered and δ_ts are the coefficient of the time dummies[23].

Before turning to the description of the dataset and the exposition of 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. (2.7), in which, in principle, the error term should not appear. However, as explained by Roeger (1995), a variety of reasons justify the presence of ε_{it}. In particular, possible measurement errors in the variables employed call for the inclusion of such error term, which in any case should not affect the consistency of our estimates.

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 mark-up levels, depending on whether returns to scale are respectively decreasing or increasing. However, the latter bias, even if present, should not affect the validity of our results, since I are only interested in discussing the marginal impact of the import penetration on the mark-up.

Finally, market-power might be product-specific, while I only have firm-level data. Taking into account of this means interpreting our results as the impact of import penetration on the average PCM of the group of firms considered.

[23] The PCM in each year t is thus retrieved as $\beta_1+\delta_t+\beta_2$AV_IMP, the average of the import penetration index across the considered industries.

2.3. Data description

2.3.1 Import penetration indexes for Italian manufacturing industries

In order to compute import penetration indexes according to eq. (2.10), 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, who's detailed industrial statistics database reports several variables (such as value of production, value added, employment) for the same industries, with a year coverage ranging from 1996 to 2003, which therefore constitutes the sample period.

Table 2.1 reports some descriptive statistics on the calculated import penetration ratios at the NACE2-digit level of aggregation[24]. As it is possible to see, there are structural differences in the exposure to international trade flows, ranging from the 57.2% of average import penetration ratio registered by sector 34 ("Manufacture of motor vehicles, trailers and semi-trailers"), the 56.6% registered by sector 33 ("Manufacture of medical, precision and optical instruments, watches and clocks") or the 55.5% registered by the sector 32 ("Manufacture of radio, television and communication equipment and apparatus") to the 10% of the sector 26 ("Manufacture of other non-metallic mineral products") or the 3% of sector 22 ("Publishing, printing and reproduction of recorded media").

As for the evolution over time of the import penetration ratios, graph 1 reports the dynamics in the different industries. Also in this case there is a lot of heterogeneity. In some cases the trend is clearly upward as in the case of sectors 17, "Manufacture of textiles"; 18, "Manufacture of wearing apparel; dressing and dyeing of fur"; 24 "Manufacture of chemicals and chemical products" and 34. In other cases the path is almost flat (sectors 15 "Manufacture of food products and beverages", 20 "Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials", 22, 25 "Manufacture of rubber and plastic products", 26 "Manufacture of other non-metallic mineral products", 28 "Manufacture of fabricated

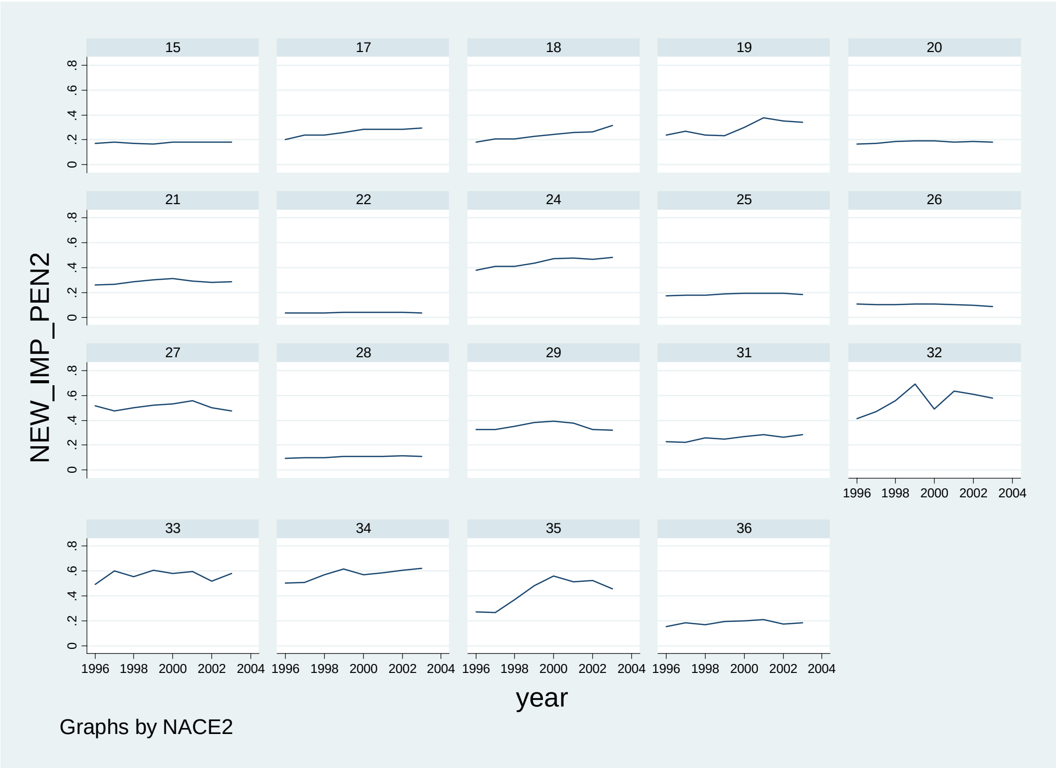
[24] From here on I will present the results at this level of aggregation, although the methodology implies the use of the more disaggregated NACE3 level data.

metal products, except machinery and equipment", 33 "Manufacture of medical, precision and optical instruments, watches and clocks"). Finally, there are cases in which an increase in import penetration ratio is followed by a flatter path (sector 19 "Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear") or even by a decrease (sectors 21 "Manufacture of pulp, paper and paper products", 27 "Manufacture of basic metals", 32 "Manufacture of radio, television and communication equipment and apparatus", 35 "Manufacture of other transport equipment"). Obviously, the heterogeneity in the patterns further increase if one looks at the 3-digits industries, which are not reported here. Once assessed the industries for which import penetration indexes could be built, I turn to retrieve firm-level data in order to estimates eq. (2.8) and (2.9).

Table 2.1: import penetration ratios - descriptive statistics

	Nace_Description	**mean**	**var**	**min**	**max**
34	Manufacture of motor vehicles, trailers and semi-trailers	57.2%	.002096	5.3%	62.0%
33	Manufacture of medical, precision and optical instruments, watches and clocks	56.6%	.001634	49.4%	6.7%
32	Manufacture of radio, television and communication equipment and apparatus	55.5%	.008638	41.2%	69.1%
27	Manufacture of basic metals	51.0%	.000765	47.5%	55.7%
24	Manufacture of chemicals and chemical products	44.3%	.001491	37.9%	48.3%
35	Manufacture of other transport equipment	43.0%	.013110	26.4%	55.9%
29	Manufacture of machinery and equipment n.e.c.	35.0%	.000914	32.2%	39.3%
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	29.4%	.003270	23.2%	37.7%
21	Manufacture of pulp, paper and paper products	28.7%	.000336	25.9%	31.5%
17	Manufacture of textiles	26.1%	.001060	2.3%	29.5%
31	Manufacture of electrical machinery and apparatus n.e.c.	25.7%	.000564	22.1%	28.6%
18	Manufacture of wearing apparel; dressing and dyeing of fur	23.8%	.001767	18.0%	31.6%
25	Manufacture of rubber and plastic products	18.6%	.000067	17.3%	19.6%
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and..	18.4%	.000084	16.7%	19.4%
36	Manufacture of furniture; manufacturing n.e.c.	18.4%	.000343	15.5%	21.2%
15	Manufacture of food products and beverages	17.8%	.000043	16.9%	18.4%
28	Manufacture of fabricated metal products, except machinery and equipment	10.6%	.000047	9.6%	11.5%
26	Manufacture of other non-metallic mineral products	10.1%	.000038	8.9%	10.7%
22	Publishing, printing and reproduction of recorded media	3.8%	.000004	3.4%	4.0%

Graph 2.1: Import penetration ratio (by 2-digits industries) 1997-2003



2.3.2 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. Taking 2001 as reference year and comparing the sample data with the official industrial census of that year, 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. At the first stage, after having computed the relevant input shares, I dropped all those firms for which these shares were bigger than one or less than zero in at least one year. Secondly, I took the distribution of these shares and I dropped all those firms with shares belonging to the 1° or to the 99° percentile of the distributions. Lastly, after having calculated the growth rate of each variable, I controlled for possible outliers by dropping all those firms for which any percentage variation was bigger than 200%. After these steps, the resulting sample was more than halved to an unbalanced panel of 28,076 firms, which are those employed in the analysis. As for the validation of the cleaned sample, these firms account for the 34.6% of total Italian manufacturing value added and for the 25.8% of total manufacturing employment. Since it is fair, but not much, I checked the representativeness of the sample along three dimensions: geographical location, industrial activity and firms' size. Table 2.2 reports the distribution across Regions of the firms included in the sample.

Table 2.2: 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**

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 Census the correlation obtained is .96[25].

The second dimension I controlled for is firms' activity. Table 2.3 shows the distribution across 2-digits industries. Tobacco industry (16) was as usually dropped, while I have to

[25] Significant at 1% level of confidence.

drop also "Manufacture of coke, refined petroleum products and nuclear fuel" (23) and "Manufacture of office machinery and computers" (30) due to lack of sufficient observations.

Table 2.3: activity distribution of sample

	Nace_Description	**Freq.**	**Percent**
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**

As table 2.3 shows, the number of firms in the sample ranges from 379 in the sector 35 ("Manufacture of other transport equipment") to 4,259 in sector 29 ("Manufacture of machinery and equipment"). Again, I calculated this correlation with the one of the Census (for accurateness, I compared the distributions at the more detailed 3-digits level industries), finding a value of .71[26]. Finally, regarding the firms' size, table 2.4 shows the distribution across the size classes adopted by the Italian National Institute of Statistics. Firm size is measured with employment. Looking at the firms for which

[26] Significant at 1% level of confidence.

employment data in 2001 is available, there is a fair representation of micro firms (11.4%). Clearly, the third column shows as this sample under-represent the micro-firms, which in Italy account for more that 80% of total firms.

Table 2.4: size distribution of sample

	Sample 2001		**Census 2001**		**Firm coverage**
size	Freq. (A)	Percent (B)	Freq. (C)	Percent (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%	542,876	100.0%	
Total	**28,076**	**100.0%**	**542,876**	**100.0%**	**5.2%**

This (relative) over-representation of large firms is clearly a drawback that must be taken in mind along all the analysis. However, the overall representation of the sample appears fairly good and above all it is almost impossible to obtain data on the myriads of micro firms that build up the Italian manufacturing sector. The alternative is clear-cut: either we accept this (moderate) "size bias" in the sample or we have to abandon the study of this country.

Before turning to present the results of the econometric analysis, let's just show some descriptive statistics regarding the main variable used. Table 2.5 shows the mean, the standard deviation, the 1° and the 99° percentile for the variables used in eq. (2.7).

From panel A we can see that the average production value of the firms in the sample is 13.7 million of euros and the average employment is 63. The heterogeneity among firms is huge, as witnessed by the high standard deviations. Panel B reports instead the percentage variations over time of these variables.

Table 2.5: main descriptive statistics

variable	mean (euros '000 and %)	sd	p1	p99
A				
PROD	13700	4.86E+15	769	158000
M	7020	1.72E+15	50	82800
N	2023	1.03E+14	42	23000
K	2995	5.13E+14	13	37500
L	63	151144.6	2	622
B				
DPROD	6.4%	0.04	-35.7%	74.4%
DM	7.5%	0.08	-51.6%	108.8%
DN	7.2%	0.03	-31.3%	78.5%
DK	8.0%	0.20	-67.6%	166.2%
DL	7.4%	0.08	-50.0%	122.6%

2.4 Results

2.4.1 Aggregate results

Let's start presenting the results obtained at the aggregate level. Table 2.6 reports the results for the baseline model expressed by eq. (2.8). The first column reports the POLS estimates. The Lerner index estimate is reasonable (34% for 1998[27]) and statistically significant, as well as all the time dummies considered. The IMP_PEN interaction term displays a negative and statistically significant coefficient. However, the Breush-Pagan test clearly rejects the Null hypothesis of correctness of the POLS estimator, and thus we have to turn to estimators suitable to panel data contexts, such as the random (RE) of fixed (FE) effects. The second column, therefore, reports the results obtained with firms' FE, as specified in eq. (2.9). Again, all the coefficients are significant and correctly signed. We then performed standard tests for serial autocorrelation and heteroskedasticity. Since both problems are present, they call for appropriate corrections. The third column reports the regression with fixed effects estimator corrected by clustering standard errors at firm level: as expected, the coefficients do not change, while the corrected standard errors maintain the statistical significance. The

[27] Since the methodology involves growth rate, information about year 1996 is just used to build the 1997 variables.

fourth column reports the estimation with RE, where standard errors are corrected in a similar way as in column (3). The Hausman test is clearly in favour of the RE estimation, which becomes our baseline model. The fifth column shows the results obtained using a two-way RE estimator, namely including also time fixed effects in the regressions, while the sixth column a two-way fixed effects estimator is used. The results obtained are consistent across all these specifications and provide broad evidence of pro-competitive gains from trade at the aggregate level.

Table 2.6: main results

Dep. Var: DY	POLS	FE	FE_corr	RE_corr	RE_corr	FE_corr
	(1)	(2)	(3)	(4)	(5)	(6)
DX	0.346*** (0.0025)	0.347*** (0.0029)	0.347*** (0.0050)	0.346*** (0.0048)	0.348*** (0.0048)	0.349*** (0.0050)
DX99	0.009*** (0.0033)	0.006* (0.0039)	0.006 (0.0059)	0.009 (0.0057)	0.008 (0.0058)	0.006 (0.0059)
DX00	0.009*** (0.0030)	0.01*** (0.0034)	0.01* (0.0053)	0.009* (0.0051)	0.006 (0.0051)	0.007 (0.0053)
DX01	0.017*** (0.0030)	0.019*** (0.0035)	0.019*** (0.0058)	0.018*** (0.0054)	0.017*** (0.0054)	0.019*** (0.0058)
DX02	0.025*** (0.0029)	0.024*** (0.0034)	0.024*** (0.0055)	0.025*** (0.0051	0.054** (0.0051	0.023*** (0.0055)
DX03	0.029*** (0.0029)	0.030*** (0.0036)	0.030*** (0.0056)	0.029*** (0.0053)	0.027*** (0.0053)	0.028*** (0.0056)
DX_IMP_PEN3	-0.046*** (0.0044)	-0.052*** (0.0050)	-0.052*** (0.010)	-0.046*** (0.0096)	-0.047*** (0.0096)	-0.052*** (0.103)
cons	-0.01*** (0.0003)	-0.01*** (0.0003)	-0.01*** (0.0003)	-0.01*** (0.0002)	-0.004*** (0.0008)	-0.002*** (0.0009)
Firms fixed effects	No	Yes	Yes	No	No	Yes
Time fixed effects	No	No	No	No	Yes	Yes
R-squared	0.73	0.73	0.73	0.73	0.73	0.73
Obs.	68,327	68,327	68,327	68,327	68,327	68,327
***,**,* Statistically significant at 1%, 5%, 10% respectively						

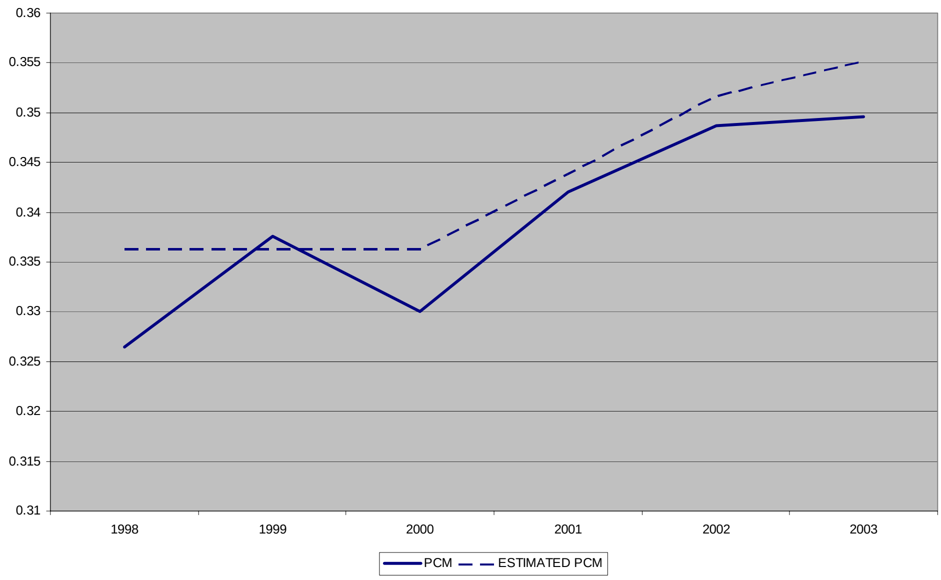
A short methodological note is due here. I chose to employ the 3-digits industries data on import penetration ratios. The trade-off I had to face was between getting as much variation as possible in the variable IMP_PEN and including as much firms (and hence observation) as possible in the regressions[28]. The 3-digits level of detail (which usual in literature) seemed the best solution for this trade-off.

These results can be compared with natural benchmark, which is the approximation of the price-cost margin that can be inferred directly from the data. In fact, we can compute the PCM as the difference between production value and total variable costs (employment plus material costs) divided by production value:

$$PCM_{it} = \frac{P_{it} - c_{it}}{P_{it}} \cong \frac{P_{it}Q_{it} - c_{it}Q_{it}}{P_{it}Q_{it}} \qquad (2.10)$$

In order to get a sensible average of (2.10) at the aggregate level, I calculated weighted averages at industry level using as weights the firms' sales shares. We are so able to plot the evolution over time of the observed price-cost margin and the estimates of it. Graph 2 reports precisely this plot.

Graph 2.2: Inferred PCM vs. Lerner index estimates, 1998-2003



The solid line is the sales-weighted average of the observed price cost margins for total manufacturing sector between 1998 and 2003, which is slightly increasing (from 32.6% in 1998 to 34.9% in 2003). The dotted line reports the evolution of the estimated Lerner

[28] Slight difference between the industry classifications for firms and import penetration at 4-digits would have implied to drop some observations.

index over the same period. As the graph shows these patterns are highly correlated (0.92).

The model considered, therefore, is able to trace fairly well the evolution of the PCM, while at the same time it shows how the import penetration acted as an effective source of competition in Italy. However, given the heterogeneity present across industries and firm, it is interesting to perform the same analysis at a more detailed industry level, as it will be shown after some due robustness checks.

2.4.2 Robustness

In order to check the results of the previous section, I performed three different robustness checks, whose results are displayed in table 2.7. First of all, I performed a similar analysis on the balanced panel resulting from dropping all those firms that did not have data for every time period. As the first column of table 2.7 proves, the negative impact of import penetration on the average price-cost margins is still there (even if the point estimate is slightly lower than in the unbalanced case). Thus, we can exclude that the results are driven by entry and exit dynamics. Secondly, I test whether the results are sensible to the proxy for import penetration employed. In column 2 of table 2.7 are reported the results obtained using as proxy for import penetration the same index employed in previous section at 4-digits level of details. Again, the point estimate is lower but the negative and significant relation between price-cost margin and import penetration persists. The third column interact the Lerner index term DX with a different indicator, obtained as the ratio of total import over the sum of import and production. Here the point estimate of the impact of import penetration on price-cost margins is larger than before. Sign and significance, however, stand exactly as before. Finally, the third robustness checks for endogeneity and employs an import penetration index lagged of one period. Here the results are more similar to the previous section, even if they change somewhere in the interaction terms of DX with the period dummies. Overall, we can say that the evidence of a negative impact of import penetration on price cost margins is a fairly robust result in our sample. Let's turn to see what happens when an industry-level analysis approach is undertaken.

Table 2.7: robustness checks

Dep. Var: DY	Balanced	Alternative specifications		Lag_import
	(1)	(2)	(3)	(4)
DX	0.351*** (0.0064)	0.343*** (0.0054)	0.358*** (0.0051)	0.345*** (0.0049)
DX99	0.014** (0.0068)	0.003 (0.0065)	0.005 (0.0059)	0.007 (0.0059)
DX00	0.006 (0.0066)	0.002 (0.0058)	0.007 (0.0053)	0.009* (0.0053)
DX01	0.018** (0.0071)	0.017*** (0.0063)	0.019*** (0.0057)	0.019*** (0.0057)
DX02	0.013** (0.0070)	0.019*** (0.0060)	0.023*** (0.0055)	0.024*** (0.0054)
DX03	0.024*** (0.0068)	0.025*** (0.0061)	0.027*** (0.0056)	0.032*** (0.0055)
DX_IMP_PEN3	-0.054*** (0.0147)			
DX_IMP_PEN4		-0.028*** (0.0096)		
DX_IMP3			-0.132*** (0.0157)	
DX_IMP_PEN3_L1				-0.043*** (0.0098)
cons	-0.003*** (0.0010)	-0.02*** (0.0010)	-0.02** (0.0009)	-0.012*** (0.0001)
Firms fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
R-squared	0.74	0.73	0.73	0.73
Obs.	35,504	57,128	68,327	85,801

2.4.3 Industry level results

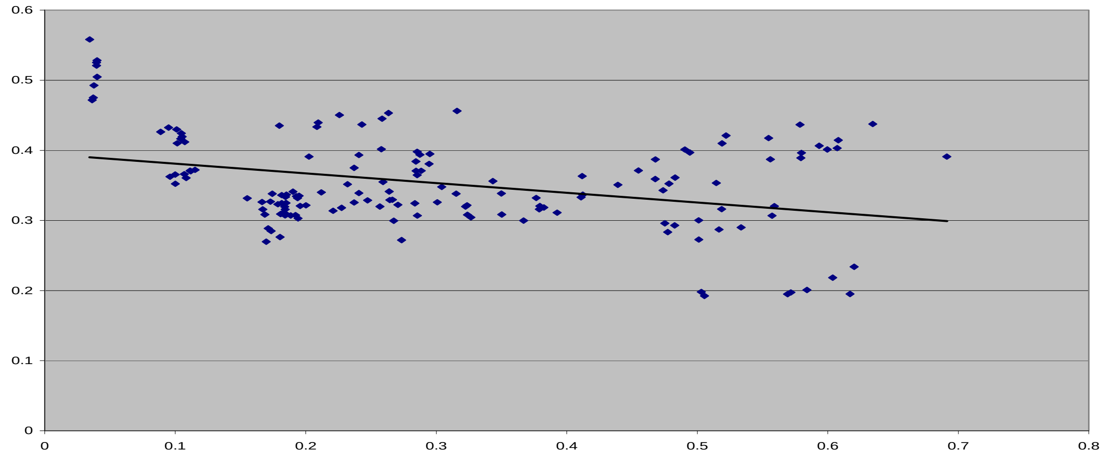
The very first (and simple) analysis performed at industry level is graphical in nature. I calculated 2-digits industry specific weighted averages of data-inferred PCM eq. (2.11) and I plotted them against import penetration ratios. As graph 2.3 shows, a certain negative relation between openness and price-cost margin is found.

Second, I performed a simple econometric analysis, by estimating for each industry and for each year the equation (2.7)[29]. The estimated Lerner indexes are highly statistically correlated with the "observed" ones (.72). Moreover, when plotting these estimates

[29] Without constant terms but with clustered standard errors

against import penetration indexes, again we find a negative relationship. Thus, across industries there is still evidence of this pro-competitive effect of import penetration.

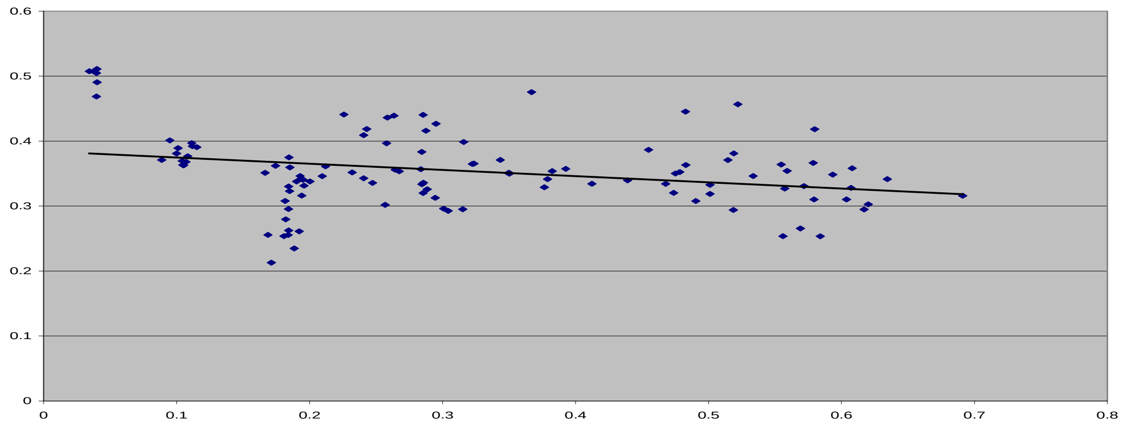
Graph 2.3: sales-weighted average of PCM (Y) vs. import penetration (X)



The last exercise I made was to move to the estimation of eq. (2.8) for each NACE2 industry, always using firm-fixed effects and time dummies to control for a possible time trend, and clustering the standard errors at firm level to avoid a possible downward bias. Table 2.8 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 2.8. Moreover, Table 2.8 also reports the results obtained running each industry-specific estimation only on the balanced sample of firms, again in order to exclude that the results are driven by entry and exit dynamics of firms.

Graph 2.4: OLS estimates of Lerner indexes (Y) vs. import penetration (X)



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 (labelled "Weakened" in the last column, in order to indicate the impact of import penetration on firms' mark-ups) 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. 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, that we have called "Strengthened"[30], a higher import penetration is always significantly associated to a higher price cost margin.

Since the latter result is quite controversial, the next section explores whether any structural characteristic of these industries might explain it.

[30] These names must be interpreted as indicating the impact of import penetration on firms performance

Table 2.8: 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

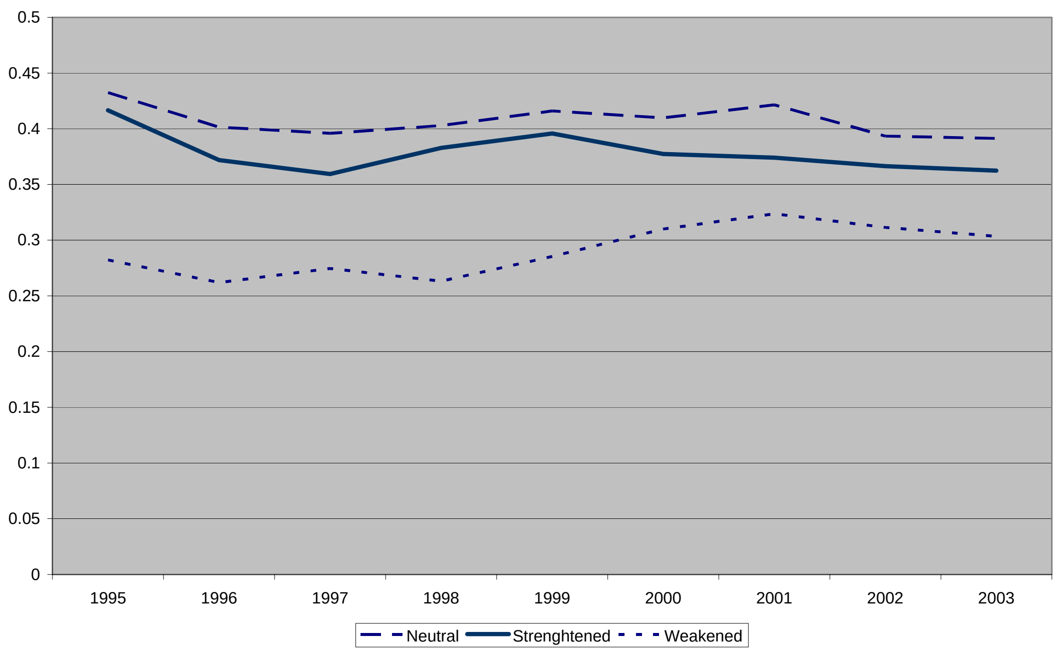
W= “Weakened”; N= “Neutral”; S= “ Strengthened”

2.5. Industry mark-ups and the product mix

Pooling industries together into the three identified groupings, I have explored whether some structural characteristics at the industry level might explain the results obtained in the previous section. I did not notice significant differences across the three industry groupings in the level or variation of firms' sizes (calculated as the median employment of the industry), nor in the dynamics of total employment. Moreover, I have already shown that our results hold for both the unbalanced and the balanced sample of firms, i.e. they do not seem to be driven by different entry and exit dynamics.

The three groups of industries display however some differences in terms of export ratios, as shown by Graph 2.5[31]. In particular, the industries were the import penetration has a marginally negative effect on the mark-ups (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 mark-ups. Although the latter evidence is not conclusive, since I'm discussing average values computed from industry level data, this finding that firms operating in industries which are relatively more export-intensive face less competition from trade is however entirely 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 mark-up, they show in fact that, on average, exporters have higher mark-ups than non-exporters, with the result holding in particular for some specific industries, i.e. those where differentiated goods are produced.

Graph 2.5: Sample sales weighted average of Export ratios, by group



[31] I have calculated sales weighted averages of the export ratios. The weights are computed at industry level with reference to the relevant industry group. Therefore, the weight attached to, say, the export ratio of industry 15 is the share of industry 15 (Manufacture of food products and beverages) in the total sales of the "Weakened" industries group.

I have then tried to link the positive correlation between import penetration and average industry mark-ups with the recent evidence, provided by Bernard et al. (2006), that firms adjust their product mix in response to trade pressures. In particular, the 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, I have used the Eurostat PROCDCOM database, which collects data in time series on production at the 8-digits level of detail of the Combined Nomenclature, for every EU country[32]. We have thus calculated for each of our NACE2 industries the share of each 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 2.6 reports the evolution over time of this indicator for each of the three industry groupings previously identified[33]. Consistently with the hypothesis, the "Strengthened" industries, i.e. those where I find a positive correlation between import penetration and average industry mark-ups, display a much higher level of product heterogeneity with respect to the other control groups.
I have then tried to assess the significance of this finding within the econometric model, modifying eq. (2.8) as follows:

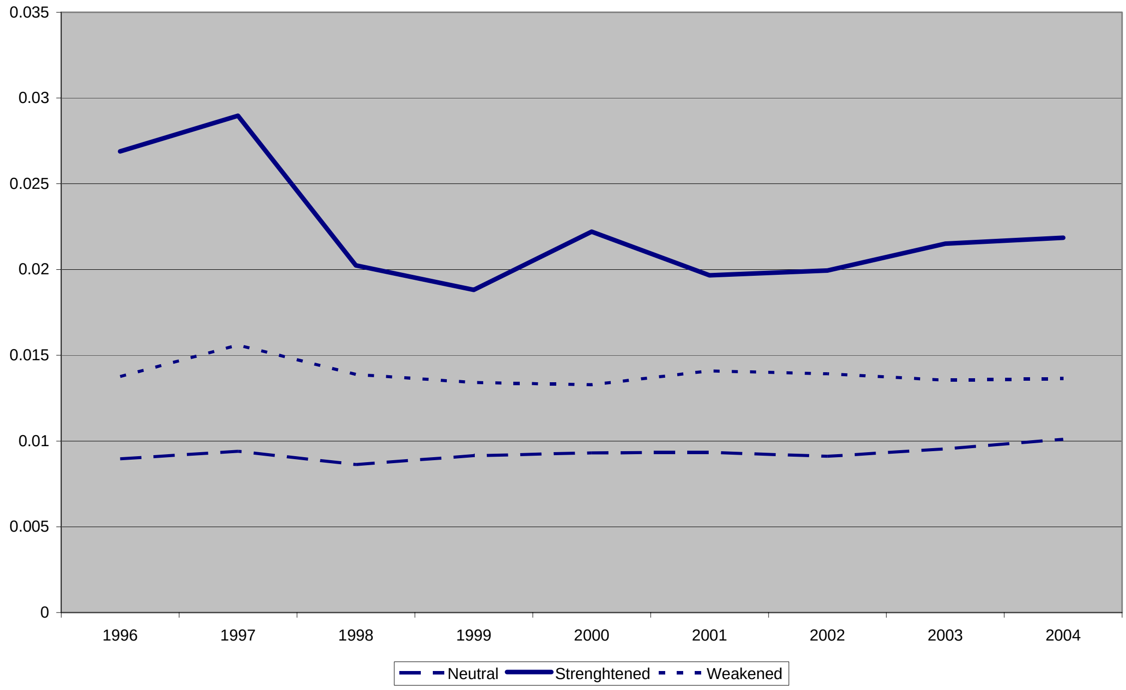
$$dY_{ijt} = \beta_1 dX_{ijt} + \delta_t dX_{ijt} \cdot T_t + \beta_2 dX_{ijt} \cdot IMP_{jt} + \beta_3 dX_{ijt} \cdot PROD_{jt} + \gamma_i + \varepsilon_{it} \qquad (2.11)$$

As for the previous estimating equation, in Eq. (2.11) 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 β_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 mark-up.

32 The first 4 digits of the Combined Nomenclature correspond to the NACE4 REV1.1 industrial classification.
33 As for the export ratios, we have calculated sales weighted averages of each industry measure in order to retrieve the group value.

Table 2.9 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 at firm level. The overall impact of the product heterogeneity on the mark-up 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 I originally found a positive correlation between the import penetration and the mark-ups.

Graph 2.6: sample sales weighted average of product mix evolution proxy, by group



As it can be seen in Column 2 of Table 2.9, where I have introduced in the product-mix interaction term a dummy equal to 1 if the industry j belongs to the "Strengthened" group, 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 2.9 was not robust across all the different specifications. The qualitative results are unchanged.

Table 2.9: Mark-ups, import penetration and the product mix

Dep. Var: DY	(1)	(2)	(3)
DX	0.341*** (0.0055)	0.335*** (0.0054)	0.341*** (0.0054)
DX99	0.007 (0.0059)	0.007 (0.0058)	0.007 (0.0059)
DX00	0.010* (0.0053)	0.010* (0.0052)	0.009* (0.0053)
DX01	0.019*** (0.0053)	0.020*** (0.0057)	0.020*** (0.0057)
DX02	0.024*** (0.0055)	0.025*** (0.0053)	0.025*** (0.0054)
DX03	0.030*** (0.0056)	0.030*** (0.0055)	0.030*** (0.0056)
DX_IMP	-0.052*** (0.010)	-0.021*** (0.0104)	-0.039*** (0.0103)
DX_PROD_MIX	0.519*** (0.213)	-0.369* (0.205)	-0.32 (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

2.6. Conclusions

The present empirical test applied a methodology able to deliver consistent estimates of the Lerner index in order to investigate the impact of import penetration on price cost margins.

A large sample of Italian manufacturing firms has been used for this aim. At the aggregate level, broad evidence of pro-competitive gains from trade has been found. On

the other hand, industry-level analysis provides 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.
Asking whether some structural characteristics might explain this puzzle, it is possible to provide weak and indirect evidence that this is indeed the case. Firstly, at least on average, those industries that are “Weakened” by import penetration are those with lower export ratios. This sounds reasonable. At the increase of the international pressure, industries with lower access to foreign markets cannot react by selling more there with even higher margins. Obviously the problem of causality is huge here and we are unable to solve it due to the nature of the information. Secondly, always on average, the industries that are “Strengthened” by import competition are those that display a more pronounced variation in the product mix, if we accept as proxy for that the evolution of the variance of the product shares in the different industries. Evidence that significant evolution in product mix have a positive impact on mark-ups is also provided in a regression framework.

Chapter 3

Economic integration and productivity: evidence from Italian firms

3.1 Introduction

"In the long run, only productivity leads to economic development"
[Mario Draghi, Italy's Central Bank Governor]

The importance of productivity for economic development and welfare is well known. In a recent and careful study on the Italian case, Daveri and Lasinio (2006) prove how the present so-called "Italian decline" is mainly due to the dynamics of labour productivity. In particular, this labour productivity slowdown has been mostly driven by a decline in total factor productivity (Tfp), especially in manufacturing sectors. Understanding which are the sources of productivity is therefore essential in order to design policies aimed at fostering economic growth and, hence, people's welfare.
This chapter reports the test of the impact of import penetration on productivity using a sample of roughly 35,000 Italian manufacturing firms operating in the period 1996-2003. In the spirit of Amiti and Konings (2005), the impact on productivity of both import penetration in the same industry and of import penetration in the up-stream industries is considered.
Three main results emerged from this analysis. First, import penetration matters for productivity, and in particular the import penetration ratio in the up-stream industries. An increase of 10% of the import penetration in the same industry would result in a productivity increase that ranges from 0.5% to 0.9% according to the Tfp measure and the econometric specification. An increase of 10% of the import penetration ratios in the up-stream industries would increase productivity by 2.9% to 5%, according to the Tfp measure and the econometric specification. Second, both foreign firms and internationalised firms are on average more productive than the other firms. Foreign

firms' productivity premium ranges from 14% to 48% while internationalised firms' productivity premium ranges from 10.1% to 41% according to the Tfp measure and the econometric specification. Third, these two features do not explain much of the Tfp evolution, which is clearly (and not surprisingly) linked also to other relevant factors (as the R&D, for example).

The structure of the chapter is as follows. In the next paragraph a brief review the huge literature related to the topic is presented. Section two is then devoted to introduce the econometric model while section three explores the data used in the analysis. Section four contains the main results and the relative robustness checks. Finally, section five concludes.

3.2 Related literature

The effects of trade and trade policy on productivity have been widely studied in the literature.

As for the theoretical contributions, several the channels might explain a positive effect of trade and trade liberalization on productivity. An increased product market competition, for instance, may stimutale firms to reduce their x-inefficiences or even lead the less productive firms to leave the market (Melitz, 2003 and Melitz and Ottaviano, 2005). Other important channels might be the increased availability of foreign (possibly better) intermediate inputs that can also stimulate technological innovation (see for example Grossman and Helpman, 1991) and possible scale effects due to the greater market size (Krugman and Helpman, 1985).

As for the empirical contributions, we could attempt to schematise the existing studies according to two dimensions: the level of the approach adopted and the extension of the study in terms of economic channels included. The possible levels of approach are simply the country, industry or firm level, while the channels included can be either the "horizontal" channels or the "vertical" channels or a combination of the two. By "horizontal" channels we mean all those channels captured by within-industry measures of integration (such as import penetration in the same industry or output tariff reductions), which may generate what we label "competition-led productivity gains". On the other hand, "vertical channels" include all those channels captured by across-industry measures of integration such as imported input, input tariffs or import penetration in the up-stream industries. This second class of channels generate what we could call better "input availability-led productivity gains".

Starting from the cross-country studies, for which it's impossible to disentangle "horizontal" vs. "vertical" channels, Ades and Glaeser (1999), Frankel and Romer (1999) and Alesina, Spolaore, and Wacziarg (2000) found significant effects of trade or trade liberalization on growth and productivity. These studies have been criticised by Rodrik (2000) and Rodriguez and Rodrik (2001), who claim that once institutional quality and geographic variables are taken into account the positive effect of trade on productivity disappears. In a recent study, however, Alcalà and Ciccone (2004) find a positive impact of real openness on productivity for 138 countries, even after controlling for institutional quality and geographic variables, when real openness is employed.

As for the industry studies, which try to capture all the possible heterogeneity hidden by the country level analysis, Trefler (2004) finds an increase by 14% in labour productivity in those Canadian and US industries with highest output tariff cuts. Shor (2004) tries to take into account of input tariffs for a sample of Brazilian industries, showing as input tariffs have a negative effect on productivity and including them in the analysis reduces the impact of output tariffs.

Finally, as regarding the firm-level analysis, we find examples of studies dealing with "horizontal" channels in Tybout and Westbrook (1995), Krishna & Mitra (1998), Pavcnick (2002), Fernandes (2003) and Topalova (2004), all finding positive effects of trade or trade integration on firm-level productivity. More recently, some firm-level studies that trying to take into account also of "vertical" channels emerged. In particular, Muedler (2004) finds that for the Brazilian manufacturer the productivity gains due to increased competition have been more important than the import of input[34]. Amiti and Konings (2005), on the other hand, consider both the impact of output tariff and of input tariff on productivity for a sample of Indonesian manufacturers. They conclude that a 10% of reduction in output tariff would increase productivity by 1% while a 10%

[34] which is however just included in one of the stages for the tfp estimates and not used as a regressor in a tfp equation.

reduction in input tariffs would increase Tfp by 3% on average and by 11% in input-importing firms.
Altghough it follows the spirit of this last study, the present econometric exercise mainly asks a slightly different question, namely whether import penetration in the up-stream industries matters for productivity.

3.3 Econometric model

Let's start from a standard production function

$$Y_{it} = AK_{it}^{\beta_k} L_{it}^{\beta_l} \quad (3.1)$$

where Y_{it} is a measure of production (in our case value added), K and L are the capital and labour inputs and β_k and β_l the inputs coefficients. A is total factor productivity (Tfp). Since our aim is to verify in which way Tfp is affected by import penetration, the first step of the analysis is to obtain unbiased estimates of Tfp, in order to use them in a second stage and achieve our aim.

3.3.1 Productivity estimates

The usual technique that has been adopted in order to estimate the production coefficients and hence compute Tfp starting from a production function similar to eq(3.1) is ordinary least squares. However, this technique is affected by several problems, among which the most serious is the simultaneity problem. In order to explain the problem let's first take eq. 1 in logs:

$$y_{it} = \beta_k k_{it} + \beta_l l_{it} + a_{it} \quad (3.2)$$

OLS estimate needs, in order to deliver consistent a estimator, that a_{it} (the residual) is uncorrelated neither to k_{it} or to l_{it} (the regressors). In practice, however, productivity is frequently realised by the firm in a point in time such that it can modify its input choices. If this is the case, OLS estimates are biased and must be corrected in some way. In order to do so, consistent semi-parametric estimators have been developed by Olley and Pakes (1996) (OP) and Levinsohn and Petrin (2003) (LP). Both techniques suppose that the productivity term a can be decomposed into two terms, so that eq. (3.2) becomes:

$$y_{it} = \beta_k k + \beta_l l + \omega_{it} + \varepsilon_{it} \tag{3.3}$$

Where ω_{it} is a productivity shock observed by the firm (but not by the econometrician) that is able to change the input choices while ε_{it} is a white noise uncorrelated to inputs. The key point in both the OP and the LP estimators is to "turn unobservable into observables", namely to find an observable proxy for the productivity term ω_{it}. In particular, OP methodology uses investment as proxy while LP methodology uses material costs. Since OP estimation will be the baseline model, let's go into the detail of this methodology[35]. In the OP case, investment is the proxy employed. In particular, investment is supposed to be an increasing monotonic function of capital and productivity:

$$i_{it} = i_t(\omega_{it}, k_{it}) \tag{3.4}$$

where i_{it} is the investment of firm *i* at time *t*. By inverting this function, it is possible to define ω_{it} as:

$$\omega_{it} = h_t(i_{it}, k_{it}) \tag{3.5}$$

where $h_t = i_t^{-1}$. Using eq. (3.5), eq. (3.3) can now be written as

$$y_{it} = \beta_k k_{it} + \beta_l l_{it} + h_t(i_{it}, k_{it}) + \varepsilon_{it} \tag{3.6}$$

[35] LP and OLS estimates will be presented as robustness checks.

If we define a new (unknown) function

$$\phi(i_{it}, k_{it}) = \beta_k k_{it} + h_t(i_{it}, k_{it}) \qquad (3.7)$$

that can be proxied by a 3rd or 4th order polynomial in capital and investment, it is now possible to estimate consistently β_l and φ through OLS from the following equation:

$$y_{it} = \beta_l l_{it} + \phi(i_{it}, k_{it}) + \varepsilon_{it} \qquad (3.8)$$

Then, in order to recover an estimate for β_k, it is first of all convenient to define a function V_{it}

$$V_{it} = y_{it} - \hat{\beta}_l l_{it} \qquad (3.9)$$

by using eq.(3.8) eq. (3.7) and eq.(3.5), it is simple to see as:

$$V_{it} = \beta_k k_{it} + h_t(i_{it}, k_{it}) + \varepsilon_{it} = \beta_k k_{it} + \omega_{it} + \varepsilon_{it} \qquad (3.10)$$

Moreover, if we assume that $\omega_{it} = g(\omega_{it-1}) + \xi_{it}$, eq.(3.10) becomes:

$$V_{it} = \beta_k k_{it} + g(\omega_{it-1}) + \varepsilon_{it} + \xi_{it} \qquad (3.11)$$

which using again eq.(3.5) and eq.(3.7) can be written as

$$V_{it} = \beta_k k_{it} + g(\phi_{t-1} - \beta_k k_{it-1}) + \mu_{it} \qquad (3.12)$$

Eq.(3.12), where g is an unknown function that can be proxied by a 3rd or 4th order polynomial and $\mu_{it} = \varepsilon_{it} + \xi_{it}$, allows estimating a consistent β_k through a non linear least square procedure. Having obtained consistent estimates for β_l and β_k , it is possible to calculate the firm level Tfp as

$$tfp_{it} = y_{it} - \beta_k k_{it} - \beta_l l_{it} \tag{3.13}$$

3.3.2 Import penetration, intermediate inputs and productivity

Once obtained reliable Tfp estimates, we test the impact of import penetration on productivity according to the following econometric models:

$$tfp_{ijt} = \alpha_0 + \alpha_1 Horiz\_imp\_pen_{jt} + \alpha_2 Vert\_imp\_pen_{jt} + \gamma_i + \delta_t + \varepsilon_{ijt} \tag{3.14}$$

and

$$tfp_{ijt} = \alpha_0 + \alpha_1 Horiz\_imp\_pen_{jt} + \alpha_2 Vert\_imp\_pen_{jt} + \alpha_3 FOR + \alpha_4 FDI + \lambda_j + \delta_t + \varepsilon_{ijt} \tag{3.15}$$

where tfp_{ijt} is the productivity of firm i operating in industry j at time t while $\gamma_{i,} \lambda_j , \delta_t$ are respectively firm, industry and time fixed effects. $Horiz\_imp\_pen_{jt}$ is a measure of import penetration ratio in industry j at time t. As usual, it is computed as:

$$Horiz\_imp\_pen_{jt} = \frac{IMP_{jt}}{(IMP_{jt} + PROD_{jt} - EXP_{jt})} \tag{3.16}$$

$Vert\_imp\_pen_{jt}$ is somewhat more complicated and reflects the import penetration ratio in the up-stream industries. Following Smarzynska (2004), it is computed as the weighted average of the up-stream industries horizontal import penetration ratios using as weights time-varying input-output coefficients:

$$Vert\_imp\_pen_{jt} = \sum_{k,k \neq j} \sigma_{kjt} \cdot Horiz\_imp\_pen_{kt} \quad (3.17)$$

where σ_{kjt} is the weight of industry k as input of industry j at time t. FOR is a dummy variable capturing foreign firms while FDI is a dummy variable for those firms with participation abroad. The reason why we need two different specifications in order to include in the regressions the variables FOR and FDI is that they would been captured by the firm fixed effects in eq.(3.14)

3.4 Data description

3.4.1 The sample of Italian manufacturing firms

A commercial dataset called AIDA, collected by the Bureau van Dijk, was used in order to retrieve balance sheet data relative to sales, value added, net tangible fixed assets, number of employees and ownership structure. The total sample was made up by 61,335 firms. Taking 2001 as reference year and comparing the sample data with the official industrial census of that year, 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. A two-stage data cleaning procedure was adopted. First, I dropped all those firms reporting negative values of any variable. Second, in order to get rid of the many outliers present, I computed the growth rates of each variable and I dropped all firms reporting growth rate values lesser than the 1° or greater than the 99° percentile of the relevant distribution. The resulting sample was almost halved to 34,385 firms, representing the 40.7% of total manufacturing value added and the 31.7% of manufacturing employment in 2001. Since it is fair, but not too much, I compared the sample and the official data along three dimensions: geographical location, industrial activity and firms' size.

Table 3.1 reports the geographical distribution of the firms in our sample. The number for each region ranges from 55 (Aosta Valley) to more than 10,000 (Lombardy). The correlation between the distribution of our sample and the distribution of the 2001 Census is 0.96[36].

---

[36] statistically significant at 1% level

Table 3.1: Geographical distribution

Regione	Freq.	Percent
Abruzzo	602	1.75
Basilicata	121	0.35
Calabria	177	0.51
Campania	1,350	3.93
Emilia-Romagna	4,299	12.5
Friuli	1,048	3.05
Lazio	1,255	3.65
Liguria	409	1.19
Lombardia	10,415	30.29
Marche	1,258	3.66
Molise	65	0.19
Piemonte	2,956	8.6
Puglia	881	2.56
Sardegna	208	0.6
Sicilia	590	1.72
Toscana	2,729	7.94
Trentino-Alto Adige	486	1.41
Umbria	430	1.25
Valle d'Aosta	55	0.16
Veneto	5,051	14.69
Total	**34,385**	**100**

As for the activity distribution, table 3.2 shows how the number of firms for each 2-digits sector ranges from 119 in the case of sector 23 ("Manufacture of coke, refined petroleum products and nuclear fuel") to more than 5,000 firms in sector 29 ("Machinery and equipment"). Again, the correlation with the Census data is pretty good (0.71) and highly statistically significant.

As regarding the firms' size, table 3.3 shows the distribution across the size classes adopted by the Italian National Institute of Statistics. Firm size is measured by employment. Looking at the firms for which employment data in 2001 is available, there is a fair representation of micro firms (11.2%). Clearly, the third column shows as this sample under-represent the micro-firms, which in Italy account for more that 80% of total firms. This (relative) over-representation of large firms is clearly a drawback that must be taken in mind along all the analysis. However, the overall representation of the sample appears to us fairly good and above all it is almost impossible to obtain data on the myriads of micro firms that build up the Italian manufacturing sector. The alternative is clear-cut: either to accept this (moderate) "size bias" in the sample or to abandon the study of this country.

Table 3.2: Activity distribution

CODE	NACE_DESCRIPTION	Freq.	Percent
15	Manufacture of food products and beverages	3,251	9.45
17	Manufacture of textiles	2,047	5.95
18	Manufacture of wearing apparel; dressing and dyeing of fur	1,437	4.18
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1,470	4.28
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and..	1,086	3.16
21	Manufacture of pulp, paper and paper products	845	2.46
22	Publishing, printing and reproduction of recorded media	1,533	4.46
23	Manufacture of coke, refined petroleum products and nuclear fuel	119	0.35
24	Manufacture of chemicals and chemical products	1,511	4.39
25	Manufacture of rubber and plastic products	2,219	6.45
26	Manufacture of other non-metallic mineral products	2,278	6.62
27	Manufacture of basic metals	1,030	3
28	Manufacture of fabricated metal products, except machinery and equipment	3,530	10.27
29	Manufacture of machinery and equipment n.e.c.	5,171	15.04
30	Manufacture of office machinery and computers	234	0.68
31	Manufacture of electrical machinery and apparatus n.e.c.	1,599	4.65
32	Manufacture of radio, television and communication equipment and apparatus	490	1.43
33	Manufacture of medical, precision and optical instruments, watches and clocks	749	2.18
34	Manufacture of motor vehicles, trailers and semi-trailers	558	1.62
35	Manufacture of other transport equipment	447	1.3
36	Manufacture of furniture; manufacturing n.e.c.	2,781	8.09
	Total	**34,385**	**100**

Table 3.3: Size distribution

	Sample 2001		Census 2001		
size	Freq.	Percent	Freq.	Percent	Firm coverage
1-9	3,844	11.2%	447,859	82.5%	0.9%
10-19	4,881	14.2%	55,553	10.2%	8.8%
20-49	6,646	19.3%	27,075	5.0%	24.5%
50-249	4,641	13.5%	10,872	2.0%	42.7%
249-	809	2.4%	1,517	0.3%	53.3%
N/A	13,564	39.4%			2.5%
TOTAL	**34,385**	**100.0%**	**542,876**	**100.0%**	**6.3%**

The last relevant feature retrieved is the firm ownership structure. For each firm I was able to identify its owner structure in 2004. Hence, I classified as foreign (FOR) those firms with a direct foreign participation grater than 10% and we defined internationalised (FDI) all those firms with participation abroad greater than 10% in 2004. I have got a total of 453 foreign firms and 1,365 internationalised firms.[37]

Finally, table 3.4 shows some descriptive statistics. Panel A shows the descriptive statistics for the values of the different variables whereas panel B reports the information about the growth levels.

Table 3.4: Descriptive statistics

(A)					
Variable	Obs	Mean	Std. Dev	Min	Max
PROD_DEFL	182149	1.29E+07	7.31E+07	204.2953	5.40E+09
Y_DEFL	182149	1.25E+07	7.16E+07	198.023	5.35E+09
VA_DEFL	182149	3154958	1.59E+07	10.49453	1.11E+09
M_DEFL	151898	7022836	4.95E+07	1.87991	4.98E+09
K_DEFL	182149	2669536	1.91E+07	4.735422	1.85E+09
L	178420	62.57517	357.8281	1	103761
(B)					
Variable	Obs	Mean	Std. Dev	Min	Max
DPROD	141526	0.063077	0.194417	-0.44328	1.980081
DY	141526	0.064328	0.203545	-0.47451	1.993963
DVA	141526	0.070475	0.248729	-0.62854	1.997875
DM	141526	0.0742	0.274415	-0.62274	1.999147
DK	141526	0.075576	0.341839	-0.67925	1.999518
DL	141526	0.069498	0.263197	-0.81667	1.982955

3.4.2 Tfp estimates

I estimate separately production function for each 2-digits sector. All the variables are deflated using 2-digits price deflators. Capital deflator, following Smarzynska (2004), is the simple average of five industries capital deflators[38]. Table 3.5 shows the results obtained for the coefficients using the different techniques previously described. In

[37] I'm perfectly aware that I'm dealing with the data of the last available year, which prevent me from capturing any possible change of status in the period considered (as for example due to M&A operations). This caveat should be taken in mind along the following analysis.

38 NACE sectors 29 "Manufacture of machinery and equipment n.e.c."; 30, "Manufacture of office machinery and computers"; 31,"Manufacture of electrical machinery and apparatus " ; 34, "Manufacture of motor vehicles, trailers and semi-trailers"; 35, "Manufacture of other transport equipment".

particular, it is worth noting the expected up-ward bias of the OLS labour coefficients with respect to the OP or the LP ones. As for the capital coefficients, OP coefficients are usually higher than OLS ones, while LP capital coefficients seem to be systematically lower[39].

OP was chosen as the baseline model. In graph 3.1 we report the evolution of an aggregate Tfp index[40] that shows a declining path, particularly from 2000 to 2003 (as reported by the aggregate studies previously cited). In 2004, however, a slight recovery seems to have occurred.

Table 3.5: Estimated coefficients

NACE2	B_OLS_k	B_OP_k	B_LP_k	B_OLS_l	B_OP_l	B_LP_l
15	0.199286	0.1849	0.0908	0.807484	0.7669	0.7302
17	0.156383	0.2947	0.0911	0.767666	0.7646	0.6793
18	0.14598	0.1008	0.0817	0.785492	0.7606	0.6884
19	0.156995	0.2617	0.0607	0.772181	0.7706	0.6835
20	0.151688	0.2615	0.084	0.758334	0.7279	0.6773
21	0.163492	0.0124	0.059	0.829653	0.8149	0.7079
22	0.100989	-0.1478	0.0879	0.875345	0.8492	0.791
23	0.237177	-0.2347	0.1991	0.82989	0.6974	0.6793
24	0.125747	0.039	0.0475	0.880446	0.8631	0.7011
25	0.164333	0.1867	0.0977	0.807254	0.7641	0.7019
26	0.19005	0.2926	0.0837	0.795313	0.7589	0.7078
27	0.179544	0.2456	0.0982	0.809779	0.7515	0.7328
28	0.150927	0.1866	0.0687	0.805118	0.7702	0.7393
29	0.146798	0.1816	0.1125	0.82128	0.7957	0.7085
30	0.142311	0.1768	0.1554	0.806228	0.789	0.7742
31	0.146407	0.1709	0.0987	0.79652	0.7665	0.6984
32	0.129786	0.0636	0.0968	0.858254	0.8232	0.7427
33	0.131017	0.0884	0.0619	0.815538	0.7442	0.6917
34	0.126878	0.2201	0.0592	0.875367	0.8229	0.7351
35	0.17106	0.1074	0.0929	0.813883	0.816	0.7493
36	0.127275	0.1333	0.0693	0.806038	0.8168	0.6938

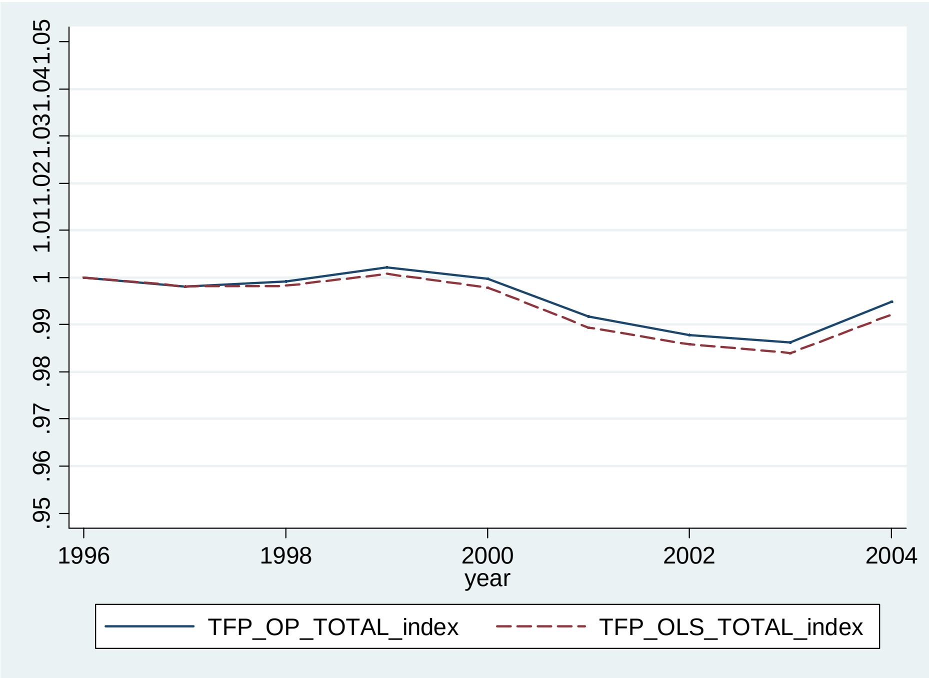
Trying to disentangle this Tfp evolution according to its geographical and industrial dimensions, graph 3.2 reports the evolution of the same index for each 2-digits industry. Although broadly speaking a similar path is common among all industries, a certain

39 The negative OP capital coefficients for industry 22 "Publishing, printing and reproduction of recorded media" and 23 "Manufacture of coke, refined petroleum products and nuclear fuel" might be due to the small number of observations.

40 computed as the ratio between the yearly unweighted average of the firm level tfp to the initial value of this same variable

level of heterogeneity emerges. More pronounced declining paths are exhibited by industry 22 ("Publishing, printing and reproduction of recorded media"), 23 ("Manufacture of coke, refined petroleum products and nuclear fuel"), 24("Manufacture of chemicals and chemical products") and 28 ("Manufacture of fabricated metal products, except machinery and equipment"). A relatively more flat path characterises instead industry 17 ("Manufacture of textiles"), 20 ("Manufacture of wood and of products of wood "), 25 ("Manufacture of rubber and plastic products") and 36("Manufacture of furniture; manufacturing n.e.c."). Other and different paths are displayed by the remaining industries.

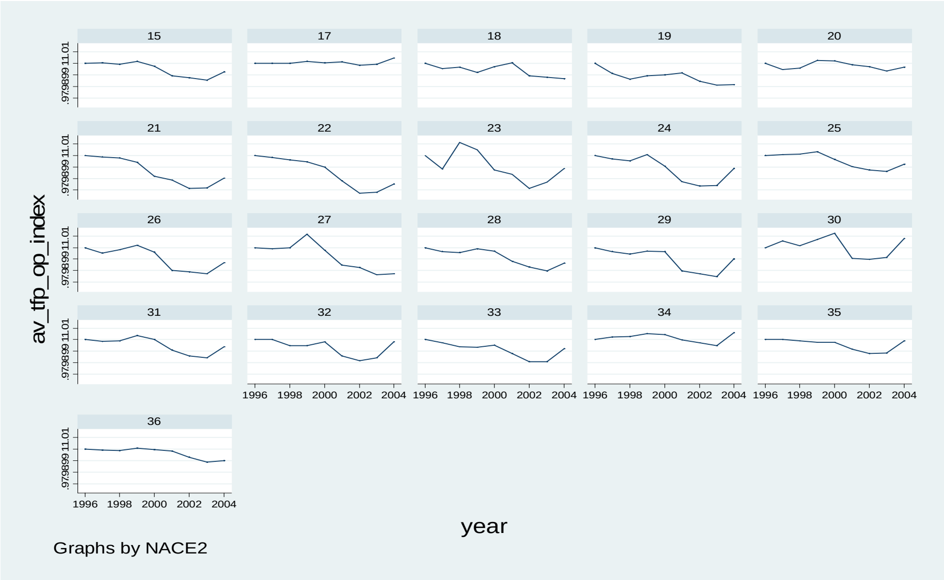
Graph 3.1: Average TFP



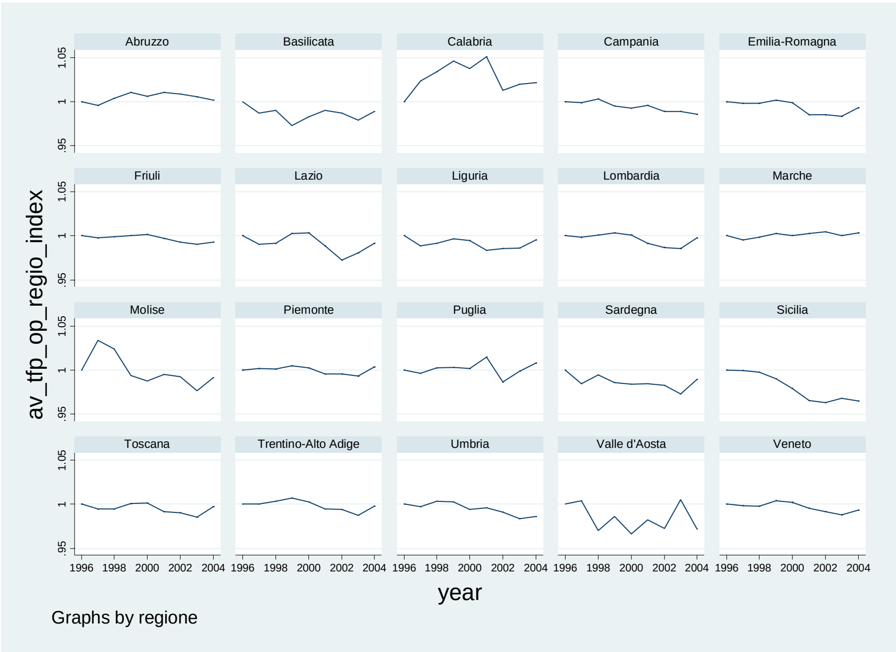
Finally, as for the geographical heterogeneity of the Tfp evolution, graph 3.3 reports the break-down for the different regions. While many of the southern regions display a declining path[41], the majority of the northern regions are characterised by an almost flat path, with a little decrease in productivity from 2000 to 2003 and some signs of recovery in 2004[42].

[41] Notably Campania and Sicilia
[42] The strange path displayed by Aosta Valley region might be due to the small number of observations

Graph 3.2: Average TFP by industry



Graph 3.3: Average TFP by region



3.4.3 Import penetration ratios

In order to compute import penetration indexes according to eq. (16) information about trade flows and production are needed. 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 NACE Rev 1.1 classification for period 1996-2003. Data on production are instead collected from EUROSTAT, whose detailed industrial statistics database reports several variables (such as value of production, value added, and employment) for the same industries. Table 3.6 reports some descriptive statistics about import penetration ratios at the 2-digit level of aggregation[43].

As it is possible to see, there are structural differences in the exposure to international trade flows, ranging from the 54% of average import penetration ratio registered by sector 34 ("Manufacture of motor vehicles, trailers and semi-trailers") to the 3% of sector 22 ("Publishing, printing and reproduction of recorded media"). As for the evolution over time of the import penetration ratios, graph 3.4 reports the dynamics in the different industries. Also in this case there is a lot of heterogeneity. In some cases the trend is clearly upward as in the case of sectors 17, "Manufacture of textiles"; 18, "Manufacture of wearing apparel; dressing and dyeing of fur"; 24 "Manufacture of chemicals and chemical products" and 34, "Manufacture of motor vehicles, trailers and semi-trailers". In other cases the path is almost flat (sectors 15 "Manufacture of food products and beverages", 20 "Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials", 22 "Publishing, printing and reproduction of recorded media", 25 "Manufacture of rubber and plastic products", 26 "Manufacture of other non-metallic mineral products", 28 "Manufacture of fabricated metal products, except machinery and equipment", 33 "Manufacture of medical, precision and optical instruments, watches and clocks").

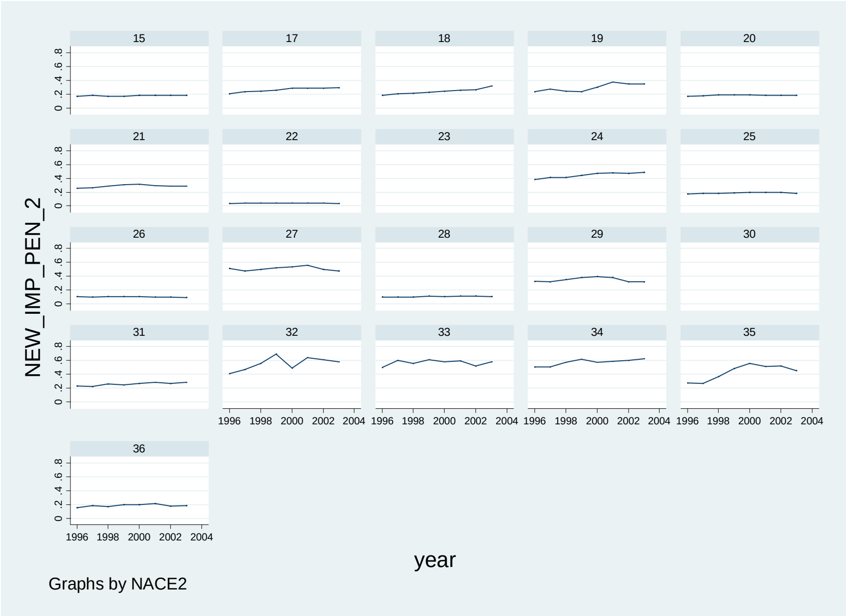
[43] Due to unreasonable value of the Import penetration values for industry 23 "Manufacture of coke, refined petroleum products and nuclear fuel" and 30 "Manufacture of office machinery and computers" we had to dropped them and hence exclude them from the analysis from here onwards.

Table 3.6: Import penetration ratios

CODE	NACE_DESCRIPTION	mean	variance	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%

Finally, there are cases in which an increase in import penetration ratio is followed by a flatter path (sector 19 "Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear") or even by a decrease (sectors 21 "Manufacture of pulp, paper and paper products", 27 "Manufacture of basic metals", 32 "Manufacture of radio, television and communication equipment and apparatus", 35 "Manufacture of other transport equipment"). Obviously, the heterogeneity in the patterns further increase if one looks at the 3-digits industries, which are not reported here.

Graph 3.4: Import penetration ratios



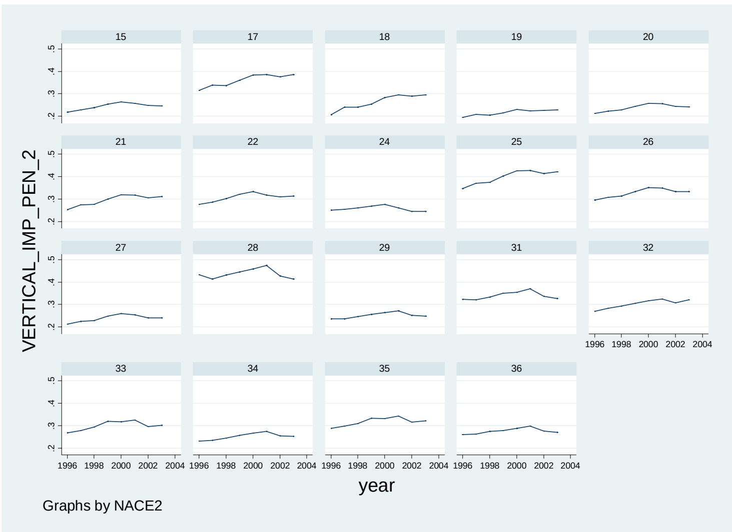
As for the import penetration indexes in the up-stream industries, I built the variable according to the methodology described before. ISTAT provides annual supply and use matrixes for the period 1996-2003. This allows obtaining time-varying σs. Although the correlation between the 1996 and the 2003 use-matrix is very high, what we might call "input mix evolution" is in some cases quite relevant, with differences in coefficients ranging from -15% (the weight of sector 23, "Manufacture of coke, refined petroleum products and nuclear fuel" as input of itself) to +12% (the weight of sector 34, "Manufacture of motor vehicles, trailers and semi-trailers" as input of itself).

Table 3.7, which reports the relevant descriptive statistics, reveals again a lot of heterogeneity. The sector with higher up-stream import penetration ratio is the 28 ("Manufacture of fabricated metal products") while the one with lowest value is sector 19 ("Tanning and dressing of leather"). If we look at the dynamics of such variable, graph 3.5 suggest as in the majority of the cases the import penetration ratios in the up-stream industries increased, with exceptions in which it appears almost flat (sector 29, "Manufacture of machinery and equipment n.e.c." ; 24, "Manufacture of chemicals and chemical products"; 36 "Manufacture of furniture; manufacturing n.e.c.").

Table 3.7: Vertical import penetration ratios

CODE	NACE_DESCRIPTION	mean	variance	min	max
15	Manufacture of food products and beverages	24.4%	0.014143	21.9%	26.4%
17	Manufacture of textiles	36.0%	0.02588	31.4%	38.6%
18	Manufacture of wearing apparel; dressing and dyeing of fur	26.3%	0.030489	20.7%	29.5%
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	21.7%	0.012417	19.4%	23.0%
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and..	23.8%	0.01474	21.3%	25.7%
21	Manufacture of pulp, paper and paper products	29.5%	0.022311	25.3%	31.9%
22	Publishing, printing and reproduction of recorded media	30.7%	0.017817	27.6%	33.4%
24	Manufacture of chemicals and chemical products	25.8%	0.010636	24.5%	27.7%
25	Manufacture of rubber and plastic products	39.8%	0.02826	34.7%	42.8%
26	Manufacture of other non-metallic mineral products	32.7%	0.018506	29.6%	35.1%
27	Manufacture of basic metals	23.8%	0.014757	21.2%	25.9%
28	Manufacture of fabricated metal products, except machinery and equipment	43.7%	0.019934	41.2%	47.4%
29	Manufacture of machinery and equipment n.e.c.	25.1%	0.011516	23.5%	27.1%
31	Manufacture of electrical machinery and apparatus n.e.c.	33.9%	0.01621	32.1%	36.9%
32	Manufacture of radio, television and communication equipment and apparatus	30.2%	0.018205	26.9%	32.5%
33	Manufacture of medical, precision and optical instruments, watches and clocks	30.0%	0.01867	26.8%	32.5%
34	Manufacture of motor vehicles, trailers and semi-trailers	25.2%	0.013863	23.1%	27.4%
35	Manufacture of other transport equipment	31.7%	0.017878	28.7%	34.4%
36	Manufacture of furniture; manufacturing n.e.c.	27.6%	0.011474	26.0%	29.7%

Graph 3.5: Vertical import penetration ratios



3.5 Results

3.5.1 Main Results

Table 3.8 contains the main results of the analysis, obtained from the estimation of eq. (14) and eq. (15). After the proper tests, in every regressions the standard errors have been clustered at firm level in order to deal with the heterogeneity and the autocorrelation problems detected.

Table 3.8: Basic results

Dependent var: Tfp_op				
	(1)	(2)	(3)	(4)
Horizontal_imp_pen	0.058*** (0.0065)	0.051*** (0.0064)	0.097*** (0.0082)	0.097*** (0.0082)
Vertical_imp_pen		0.448*** (0.0337)	0.397*** (0.04)	0.394*** (0.04)
FOR			0.239*** (0.020)	0.219*** (0.020)
FDI				0.175*** (0.010)
Firms fixed effects	yes	yes	no	no
Industry Fixed effects	no	no	yes	yes
Time fixed effects	yes	yes	yes	yes
R-sq	0.06	0.06	0.90	0.90
Observations	146455	146455	146455	146455
***,**,* Statistically significant at 1%, 5%, 10% respectively				
Standard errors clustered at firm level; each regression was run with a constant term				

While the Breush-Pagan test rejected the Pooled OLS as a possible estimator, the Hausman test identified fixed effect estimator preferable in this case to the alternative random effect estimator. In the first two columns we just add to the firm and time fixed effects the variables relative to import penetration. In both cases, the horizontal import penetration ratio displays a positive and significant coefficient, revealing however a quite small effect in absolute value. An increase in horizontal import penetration of 10% would results, ceteris paribus, in an increase of productivity of around 0.5%[44]. Also the coefficient attached to the import penetration in the up-stream industries is positive and statistically significant, but its absolute value is sensibly higher: an increase of 10% in

[44] Given that all the variables are taken in logs, the coefficients can be interpreted as elasticities.

what we call vertical import penetration would determine, ceteris paribus, an increase of productivity by 4.4%. The third and the fourth columns report the results obtained with the insertion of the dummies for foreign firms (FOR) and for those firms with participation abroad (FDI). Both these characteristics seem to induce grater productivity. In particular, foreign firms display a productivity which is on average between 21% and 23% higher than domestic firms, while firms with participations abroad seem, on average, to be (ceteris paribus) 17.5% more productive than the other firms.

The R^2 is quite low in the first two models, while is pretty high in the second two. The reason of this is that in the first two model the reported R^2 takes into account just of the fraction of the Tfp variance captured by the model excluding the fixed effects, while the 3rd and the 4th columns' R^2 include the fixed effects' explaining power[45].

Three main results, hence, emerge from this first analysis. First, import penetration matters for productivity, and in particular the import penetration ratio in the up-stream industries. Second, both foreign firms and internationalised firms are on average more productive than the other firms. Third, these two features does not explain much of the Tfp evolution, which is clearly (and not surprisingly) linked also to other relevant factors (as the R&D, for example).

3.5.2 Robustness

In order to verify the accurateness of these results, some robustness checks have been performed. First, different measures of productivity have been employed. Table 3.9 reports the results obtained when using alternatively the Tfp obtained with OLS or LP coefficients estimates and another and different measure of productivity, namely labour productivity[46]. The results are qualitatively the same, while the point estimates obviously vary. In particular, an increase of 10% in horizontal import penetration seem to lead to an increase in productivity that ranges from 0.53% to 0.78% while for the same increase in vertical import penetration index the productivity increase ranges from 2.9% to 4.5% according to the productivity measure employed. Both foreign and internationalised firms appear to be more productive.

[45] hence 0.06 is a more fair representation of the fit of the model than 0.9.
[46] measured as value added per employee.

Table 3.9: Robustness checks 1 (alternative productivity estimates)

Tfp specification:	Tfp_ols	Tfp_ols	Tfp_lp	Tfp_lp	Lab_prod	Lab_prod
	(1)	(2)	(3)	(4)	(5)	(6)
Horizontal_imp_pen	0.068*** (0.0064)	0.069*** (0.0076)	0.055*** (0.0061)	0.053*** (0.0078)	0.053*** (0.0037)	0.078*** (0.0078)
Vertical_imp_pen	0.457*** (0.0337)	0.395*** (0.0392)	0.349*** (0.0325)	0.293*** (0.040)	0.393*** (0.0338)	0.423*** (0.0403)
FOR		0.169*** (0.017)		0.483*** (0.011)		0.143*** (0.0168)
FDI		0.166*** (0.0086)		0.412*** (0.0229)		0.108*** (0.0085)
k_l					0.251*** (0.0037)	0.143*** (0.0024)
Firms fixed effects	yes	no	yes	no	yes	no
Industry Fixed effects	no	yes	no	yes	no	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
R-sq	0.07	0.42	0.04	0.36	0.23	0.23
Observations	146455	146455	146455	146455	146455	146455
***,**,* Statistically significant at 1%, 5%, 10% respectively						
Standard errors clustered at firm level; each regression was run with a constant term						

A second set of robustness checks is reported in table 3.10. In order to verify whether entry and exit dynamics might have influenced the results previously reported, I performed the same analysis on the balanced panel, which was made up by 8,824 firms. Both horizontal and vertical import penetration coefficients are still positive and statistically significant, with the usual rank in term of absolute value. Foreign firms appear to be almost 21% more productive than domestic firms while internationalised firms' productivity premium is around 14%.

Another concern was related to the time-varying nature of the coefficients used to build the vertical import penetration ratio variable[47]. Column 3 and 4, therefore, reports the results that are obtained using the coefficients of 1996 (i.e. the starting period). Again, qualitatively the results are the same with slight changes in the point estimates.

Finally, I included in the regressions the lagged values of the horizontal and vertical import penetration ratios, verifying that this does not alter the main results.

[47] The possible source of concern here is their endogeneity to the trade shocks

Table 3.10: Robustness checks 2

Robustness:	Balanced	Balanced	Fixed Coeff	Fixed coeff	Lagged_imp	Lagged_imp
	(1)	(2)	(3)	(4)	(5)	(6)
Horizontal_imp_pen	0.067*** (0.0084)	0.067*** (0.0084)	0.052*** (0.0064)	0.098*** (0.0082)		
Vertical_imp_pen	0.501*** (0.0427)	0.501*** (0.0427)	0.393*** (0.0357)	0.345*** (0.0429)		
FOR		0.209*** (0.0292)		0.219*** (0.0205)		0.223*** (0.0206)
FDI		0.143*** (0.0126)		0.175*** (0.0102)		0.181*** (0.0103)
Imp_pen_lagged					0.061*** (0.065)	0.087*** (0.0081)
Vert_imp_pen_lagged					0.424*** (0.0372)	0.423*** (0.0426)
Firms fixed effects	yes	no	yes	no	yes	no
Industry Fixed effects	no	yes	no	yes	no	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
R-sq	0.08	0.92	0.06	0.90	0.06	0.90
Observations	69476	69476	146455	146455	133427	133427
***,**,* Statistically significant at 1%, 5%, 10% respectively						
Standard errors clustered at firm level; each regression was run with a constant term						

3.6 Conclusions

I tested the impact of import penetration on productivity using a sample of roughly 35,000 Italian manufacturing firms operating in the period 1996-2003. In the spirit of Amiti and Konings (2005), I considered the impact on productivity of both import penetration in the same industry (competition-led productivity gain) and of import penetration in the up-stream industries (better input availability-led productivity gain). After having obtained unbiased productivity measures through the widespread Olley and Pakes (1996) and Levinsohn and Petrin (2003) semiparametric techniques, I regressed the Tfp, among other variables, on the import penetration ratio and on a variable expressing the import penetration ratios in the up-stream industries.

Three main results emerged from this analysis. First, import penetration matters for productivity, and in particular the import penetration ratio in the up-stream industries. An increase of 10% of the import penetration in the same industry would result in a productivity increase that ranges from 0.5% to 0.9% according to the Tfp measure and the econometric specification. An increase of 10% of the import penetration ratios in the up-stream industries would increase productivity by 2.9% to 5%, according to the Tfp measure and the econometric specification. Second, both foreign firms and internationalised firms are on average more productive than the other firms. Foreign firms' productivity premium ranges from 14% to 48% while internationalised firms' productivity premium ranges from 10.1% to 41% according to the Tfp measure and the econometric specification. Third, these two features do not explain much of the Tfp evolution, which is clearly (and not surprisingly) linked also to other relevant factors (as the R&D, for example).

Conclusions and policy suggestions

The aim of the present work was to investigate the link between economic integration, competition and productivity.

First, a survey of the literature has been presented. The main results discovered are four. First, there is large evidence that increased trade flows improve productivity. This is due both to the pro-competitive effects of trade and to the improved access to better inputs. The main challenge here is probably to build up models able to explain also the intra-firm integration-induced productivity effects, which are ruled out by the models able to explain a positive relation between integration and productivity. Second, the results from the FDI-related channels are much less clear. While a direct entry effect seems to be confirmed by the data, the evidence of productivity spillover from MNEs to local firms is mixed and dependent on the specifications and the country studied. Third, although evidence of direct effects of competition on productivity has been shown (mainly due to its impact on innovation), competition has been found as one of the most important channels through which economic integration can foster productivity. Fourth, a lot of possible indirect effects of economic integration on productivity have been emphasized. The most important ones are those acting through innovation, human capital improvements, institution building, financial development and liberalization policies.

After the survey, two different empirical tests have been performed starting from a dataset of Italian manufacturing firms.

The first test deals with the effects of economic integration on competition, measured as the firms' price cost margins. I investigated the effects of import penetration on the price-cost margins of roughly 30,000 firms operating in the Italian manufacturing sector. In the period considered (1998-2003), I found broad evidence of pro-competitive gains from trade at the aggregate level. However, when performing the same analysis at a more detailed industry level, I found a surprising heterogeneity of responses: in some industries, the increased exposure to international trade leads to lower price-cost margins, while in other this result is reverted. I show preliminary evidence of the structural characteristics that might explain this challenging result. In particular, the industries in which a negative impact of import penetration on price-cost margins is found exhibit, on average, lower levels of export-ratios while industries characterised by a positive impact of import penetration on price cost margins exhibit, on average, a more significant evolution of the product mix.

The second test had to do with the impact of economic integration on productivity. I tested the impact of import penetration on productivity using a sample of roughly 35,000 Italian manufacturing firms operating in the period 1996-2003. In the spirit of Amiti and Konings (2005), I consider the impact on productivity of both import penetration in the same industry and of import penetration in the up-stream industries. Three main results emerged from the analysis. First, import penetration matters for productivity, and in particular the import penetration ratio in the up-stream industries. An increase of 10% of the import penetration in the same industry would result in a productivity increase by 0.5% to 0.9% while an increase of 10% of the import penetration ratios in the up-stream industries would increase productivity by 2.9% to 5%, according to the Tfp measure and the econometric specification. Second, both foreign firms and internationalised firms are on average more productive than the other firms. Foreign firms' productivity premium ranges from 14% to 48% while internationalised firms' productivity premium ranges from 10.1% to 41% according to the Tfp measure and the econometric specification. Third, these two features do not explain much of the Tfp evolution, which is clearly (and not surprisingly) linked also to other relevant factors (as the R&D, for example).

Some policy suggestions can be drawn from these two analyses.

The first is that economic integration should be fostered. The greater importance of the “better input availability-led productivity gains” over the “competition-led productivity gains” suggests as openness in the up-stream industries can be complementary to the investment in R&D, which is usually the only policy invoked in order to foster productivity. As shown in the introductory tables, in this field there is a lot of room for improvement in the Italian case, and hence Italy should be active in pursuing the success of the current trade talks. On the other hand, the greater productivity that characterizes foreign and internationalized firms suggests as important actions toward the attraction of foreign investments in Italy as well as incentives for internationalization of domestic firms. As for the former policy actions, a more clear regulatory framework, fiscal incentives and infrastructural investments could certainly generate a greater international competitiveness and foster FDI flows. As for the latter, policy experiments as the Lombardy "internationalization vouchers" should be carefully assessed. As we have shown, besides the beneficial effects on productivity, being internationalized helps the firms also to better react to international competition.

Second, methodologically speaking, it has been shown as aggregate results often hide heterogeneous situations. It is crucial, therefore, to be able to take decisions based on information as accurate as possible.

Third, as shown in chapter two, change in product mix may be source of good answers to foreign competition. What enables firms to change more easily their product mix could be target of specific policies. Clearly, here it is much more difficult to indicate the precise policy tools to be moved, even if certain factors are clearly crucial with this respect. The first is availability of human capital. The capability of up-grade the firm's product mix certainly depends on the skills of the firms' employees. The second is possibly and adequate intellectual property rights (IPR) legislation. Only in a reliable IPR legislative framework, in fact, firms will be able to put in place all those efforts (for instance in terms of R&D) that are needed in order to up-grade their product mix.

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