Multinational enterprises and productivity of European firms [*]

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Abstract

Using a balanced panel of firm-level data on the manufacturing industry in France, Italy and Spain over the 1993-1997 period, this paper examines the impact of foreign presence on the productivity of domestic enterprises. We find positive and significant externalities on Italian firms and non-significant effects on Spanish and French firms. A generalisation of the results obtained for individual countries is attempted by introducing productivity gaps between foreign and domestic firms, and absorptive capacity of domestic firms. It is shown that high gaps tend to favour positive effects of FDI, while absorptive capacity, measured by local firms' average productivity levels, does not leverage productivity spillovers from FDI. This would confirm the "catching up" hypothesis, which identifies a positive relation between the size of technological gaps and growth opportunities induced by foreign investments, and would contradict the "technological accumulation" hypothesis, which stresses the role of domestic absorptive capacity and of coherence between foreign and domestic technology as determinants of virtuous effects of inward investments.

JEL: F23, L23
Keywords: multinationals, productivity spillovers, panel data

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[*] This paper is a contribution to the EU project on *Assessing the Impact of Technological Innovation and Globalization: the effects on growth and employment* (AITEG). Previous versions of this paper have been presented at the Aiteg Meeting held in Madrid, Universidad Complutense, May 2001 and to the CNR Study Group on International Economics and Economic Development Workshop on "Integrazione Commerciale, Integrazione Produttiva e Competitività nel Quadro dell'allargamento ad Est dell'Unione Europea" held in Milan, 16-17/11/2001. The authors are grateful to Roberto Simonetti for supplying part of the data utilised in this work, and to Elisabetta Andreani and Elvio Ciccardini for research assistantship. We also wish to thank Paola Criscuolo, Nigel Driffield, Simona Iammarino, Rajneesh Narula, Francesco Pigliaru, Vincenzo Spiezia, Marco Vivarelli for helpful comments. Usual disclaimers apply.

1. Introduction

This paper examines the effects of multinational presence on the productivity of European firms. We concentrate our attention on a panel of manufacturing firms active in France, Italy and Spain over 1992-97. Using longitudinal firm-level data is a key asset of this study, in accordance with some of the most promising lines of research on the effects of FDIs. In fact, earlier contributions using cross-sector data were typically unable to control for time invariant differences in productivity across firms and industries, which might be correlated with, but not determined by, foreign presence. More recent works, using firm-level data, were able to control for factors influencing productivity independent of foreign investments, and to isolate the effects of foreign presence on the performances of local firms (see Gorg and Strobl 2001 for a recent survey)

Building on this literature, the paper presents at least two motives of interest. First, it utilizes a combination of firm level data-sets which allows to compare the effects of multinational presence across different countries. The characteristics and comparability of the available data permit us to overcome one of the most recurrent limits of previous studies based on micro-data, which were typically focused on single host economies, and were thus unable to highlight country specific effects of inward investments. Empirical tests show that inward investments may have a different impact across countries: observed effects are positive for Italy, and non significant for France and Spain.

Second, a generalisation of results obtained for individual countries is attempted. We shall highlight how the distance between domestic and foreign productivity, as well the absorptive capacity of the former, affect the generation of externalities by multinational enterprises. While high gaps seem to favour such externalities, absorptive capacity appears to have a non-significant effect. This result supports the "catching up" hypothesis (Findlay 1978, Wang and Blomstrom 1992), which identifies a positive relation between the size of technological gaps and growth opportunities induced by foreign investments; while it would *per se* contradict the "technological accumulation" hypothesis (Cantwell 1989), which stresses the role of domestic absorptive capacity and of coherence between foreign and indigenous technology (Kokko 1994) as determinants of virtuous effects of inward investments. While higher gaps may in principle increase the likelihood that TNCs crowd out domestic suppliers and competitors, one can also expect that greater opportunities are created for technology transfer from highly productive foreign firms. According to our evidence, the latter effect seems to largely outweigh the former, in the case of the examined recipient economies. A possible explanation is that structural and institutional conditions in advanced countries favour the creation of linkages and exchanges of knowledge between TNCs and local firms, while reducing to a minimum the risk that indigenous activities are disrupted due to competitive pressure, or to unfair practices and anti-competitive behaviour. Besides, the non significant impact of absorptive capacity might also have to do with the nature of recipient economies. In fact advanced countries, different from LDCs, are relatively close to the technological frontier and might have reached a threshold level of absorptive capacity required to benefit from foreign investments so that at the margin further increasing local firms' accumulation of technology would not augment the productivity spillovers from foreign investments.

The paper is organized as follows. Section 2 briefly summarises the theoretical and empirical literature background to this paper. Section 3 describes our data, variables and econometric specification. Section 4 discusses the main results of our econometric exercises. Section 5 concludes the paper and draws some policy implications.

2. *Background literature*

The past two decades have been characterised by a remarkable growth in flows of foreign direct investments by multinational firms, which have increased significantly faster than trade flows among the most developed countries, and became the largest source of external finance for developing countries. This process raises concerns about the role that multinationals play for host countries development and performances. Economic literature has identified both positive and negative effects of multinational presence on recipient economies. On the one hand, MNEs may positively affect local productivity by training workers and managers who may move or spin off from foreign owned firms and become available to domestic enterprises (Fosfuri et al. 2001); by demonstrating the feasibility of new technologies, providing technical assistance, transferring patented knowledge, and generating opportunities for imitation of technological, organisational and managerial practices (Mansfield and Romeo 1980, Dunning 1993); by creating demand for local inputs, increasing the specialisation and efficiency of upstream and downstream activities and generating positive externalities for local industries (Hirschman 1958; Rodiguez-Clare, 1996; Markusen and Venables, 1999); and by exerting competitive pressures to improve the static and dynamic efficiency of domestic firms (Caves 1974, Cantwell 1989). On the other hand, foreign presence may negatively affect productivity of local firms, particularly in the short run, to the extent that MNEs can monopolise markets and draw demand from domestic firms, causing them to cut production and reduce their efficiency (Aitken and Harrison 1999). Multinationals can also substitute local suppliers with foreign ones, disrupting existing linkages (Lall 1978).

Whether the overall impact is negative or positive for host economies depends, by and large, on which of these tensions prevails. Rodriguez-Clare (1996) suggests that net linkage creation effects will be (positively) affected by the variety of intermediate inputs multinational firms can gain access to in local markets, as compared to their home market. It has also been argued that local capabilities and technical competencies spur multinational firms to interact with local partners, while they increase indigenous firms' availability and ability to enter collaborations with foreign firms (Dunning 1958, Cantwell 1989). Besides, anti-competitive and market stealing effects may be particularly high when inward investments take the form of acquisitions (UNCTAD 2000).

Empirical evidence concerning the overall effects of multinational growth on recipient countries is mixed. Using cross-country regressions Borensztein et al. (1995) show that FDI from developed countries stimulated domestic investment in LDCs, while UNCTAD (1999) reports that crowding in and crowding out effects of foreign investments tend to cancel out. Using cross-sector data, a number of studies have reported a positive impact of sectoral FDI on productivity (Caves, 1974, Globerman, 1979, Blomstrom, 1989, Imbriani and Reganati, 1997, 1999). More recently, using firm-level longitudinal data with specific reference to a few developing countries, one rather robust result is that domestic firms with some foreign ownership exhibit better performances, such as higher productivity and wages, than purely domestic firms (Aitken and Harrison, 1999; Aitken, Harrison and Lipsey, 1995; Blomstrom and Sjoholm, 1999). The hypothesis that multinational firms can act as export catalysts has also received some support (Aitken, Hanson and Harrison, 1997), while the effects of FDIs on domestic firms' productivity often turn out to be not significant, or even negative, when controlling for industry dummies (Aitken and Harrison, 1999; Aitken, Harrison and Lipsey, 1995; Haddad and Harrison, 1993)[1]. One exception is Blomstrom and Sjoholm (1999) who find evidence of significant economic benefits to domestic firms from sector FDI, but the degree of foreign ownership does not affect the extent of these benefits.

With respect to the analysis of mechanisms underlying the positive or negative effects of multinational firms, the evidence is even less conclusive, and this is mainly due to lack of appropriate data. Using country level time series and panel data for a sample of OECD and non-OECD countries, De Mello (1999) finds that the extent to which FDIs are growth enhancing depends on the complementarity and substitution between FDI and domestic investment. A few studies based on firm level data have produced some evidence on the creation of linkages as a result of multinational presence (Dunning 1993, Blomstrom and Kokko 1998, Castellani and Zanfei 2002a). However, the actual transmission from linkage creation to productivity and growth of domestic firms is not clearly documented. With reference to Venezuela, Aitken and Harrison (1999) show that the negative overall effect of foreign presence on the productivity of domestic firms is associated with a contraction of domestic output, which they interpret in terms of a market stealing effect.

One oft-cited condition favouring a positive impact of inward investments on domestic firms' productivity has to do with the role of technological gaps between foreign and domestic firms. On the one hand, some works suggest that the larger the *productivity gap* between host country firms and foreign-owned firms, the larger the potential for technology transfer and for productivity spillovers to the former. This assumption, which we label as the "catching up hypothesis", can be derived from the original idea put forward by Findlay (1978), who formalised technological progress in relatively "backward" regions as an increasing function of the distance between their own level of technology and that of the "advanced regions", and of the degree to which they are open to direct foreign investment. Consistently with this hypothesis, Blomstrom and Wolff (1994) find evidence that the growth of gross output per employee of locally owned firms in Mexico in 1970-75, is positively related to a measure of FDIs and of initial labour productivity gap between locals and multinationals. In a similar vein, Driffield (2001) shows that changes in productivity in the foreign sector, over 1986-89, positively affect growth in productivity of domestic firms in the UK, and interprets this as evidence of catching up of local manufacturers stimulated by higher level competitors. Driffiled and Love (2001) also obtain some results which are largely consistent with the catching up hypothesis. In fact they highlight that technology exploiting FDIs (proxied by investments originating from a country with a higher sectoral R&D intensity than the host country) raise productivity in the UK industry, while technology sourcing FDIs (proxied by foreign investments originating from a country with a lower sectoral R&D intensity than the host country) do not have any productitvity effect. Although their analytical purpose is different, they implicitly confirm that spillovers do appear when technology gaps are high and positive, while they do not show up when technology gaps are small or negative .

On the other hand, scholars have argued that the lower the technological gap between domestic and foreign firms, the higher the *absorptive capacity* of the former, and thus the higher the expected benefits in terms of technology transfer to domestic firms. We label this as the "technological accumulation hypothesis" (Cantwell, 1989). It is worth noting that the role of absorptive capacity is implicitly recognised also in the catching up tradition, when it is acknowledged that a sort of lower bound of local technological capabilities exists, below which foreign investment cannot be expected to have any positive effects on host economies[2].

[1] See Gorg and Strobl (2001) for a rich review of recent empirical studies on productivity spillovers from foreign presence.

[2] As Findlay (1978 p.2-3) notes: "Stone age communities suddenly confronted with modern industrial civilisation can only disintegrate or produce irrational responses … Where the difference is less than some critical minimum, admittedly difficult to define operationally, the hypothesis does seem attractive and worth

The "technological accumulation hypothesis" goes beyond this simplistic view of absorptive capacity and places a new emphasis on the ability to absorb and utilise foreign technology as a necessary condition for spillovers to take place. The analysis of the responses of local firms to the entry and presence of US multinationals in European markets over 1955-75 seems to suggest that the most positive impact occurs in industries where the technological gap is small (Cantwell, 1989). This is consistent with the view that relatively low technological differentials between domestic and foreign firms would grant higher ability of local economies to capture technological opportunities and to respond to the stimuli created by MNEs. Kokko (1994) focuses on 156 industries that hosted MNEs in Mexico in 1970 and finds evidence that in industries characterised by both large technological gaps and large foreign market shares, which he identifies as "enclave sectors", local productivity growth is significantly inhibited. His idea is that in such circumstances, MNEs are able to crowd out local competitors from the most important market segments, thus reducing the likelihood that positive benefits accrue to, and are captured by, local firms. In a more recent work on Uruguayan manufacturing plants Kokko, Tansini and Zejan (1996) find positive and statistically significant spillover effect only in the sub-sample of locally-owned plants with moderate technology gaps vis-à-vis foreign firms. They argue that small or moderate gap, in the case of Uruguayan plants, identify cases where foreign technologies are *useful* to local firms and where local firms possess the skills needed to apply or learn foreign technologies. On the contrary, large gaps may signal that foreign technologies are so different from local ones that local firms have nothing to learn, or that local firms are so weak that they are not able to learn. Imbriani and Reganati (1997), analysing the Italian manufacturing industry, find that value added of domestic firms in sectors where the productivity gap between local and foreign firms is high is negatively related to foreign presence, while the opposite occurs where productivity gaps are low. Preliminary evidence from Portuguese sectoral data supports the idea that positive effects from foreign presence might be associated with intermediate productivity gaps (Flores et al., 2001). Girma (2002), using data on a large sample of UK firms, finds evidence supporting an inverted-U shaped relationship between absorptive capacity and FDI spillovers. Finally, Sjoholm (1997), using detailed micro data from the Indonesian manufacturing sector in 1980 and 1991, finds that the effects of labour productivity differences (after controlling for capital intensities and scale of production) vary according to the specification he adopts, so that no clear conclusion can be drawn on this issue.

Several scholars have identified high (low) gaps with low (high) absorptive capacity of domestic firms. Here we argue that the two concepts are related but plainly different. In fact, if one takes into account the technology gap between the *average* foreign and domestic firms in a country, high gaps necessarily imply low absorptive capacity. On the contrary, when heterogeneity is allowed, the picture may change substantially. For example, looking at sectoral patterns within a country the same gap might be associated with different levels of absorptive capacity. In some sectors both domestic and foreign firms will be above the country's average absorptive capacity, and in other sectors they may be below this average. In other words, high (low) gaps can be associated with both high and low absorptive capacity[3]. In section 5 we illustrate some of these occurrences in the case of Italy, France and Spain.

3. Data, variables and methodology

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consideration". Findlay also observes that the educational level of the domestic labour force, which is a good proxy for what is currently named country's "absorptive capacity", might also affect, *inter alia,* the rate at which the backward region improves its technological efficiency. (Findlay 1978 pp.5-6).

[3] It follows that when firms' heterogeneity is allowed, as we do in our econometric exercise, one can expect an even more varied picture.

The review of the literature has highlighted some issues regarding data and methodological approaches used to detect externalities from inward FDI. First, it is apparent that the results of the examined studies cannot be easily compared due to the heterogeneity of data sources available, let alone the different methodologies adopted. Data heterogeneity is even more binding when the analysis is conducted at the firm-level, a problem which has often discouraged scholars from using micro-data for cross-country studies. Therefore, *using a uniform set of firm-level data* to examine these phenomena across different countries will *per se* imply a considerable advancement.

Second, obtaining sound evidence on the impact of FDIs on local firms requires the adoption of a *key methodological choice*, that is to control for fixed, time invariant factors which might affect productivity itself. As it is now widely acknowledged in recent literature, controlling for fixed effects is particularly important because FDIs typically follow a pattern of sectoral concentration towards more productive industries, implying that a positive association between foreign presence and the productivity of domestic firms could show up even if no spillover takes place. Failure to control for sector characteristics could then lead to mis-interpretations.

The empirical analysis performed here tries to address those two methodological issues directly. In fact, it is based on a sample of manufacturing firms active in France, Italy and Spain. The sample is drawn from Elios (European Linkages and International Ownership Structure), a data-set constructed by a team of researchers at ISE-University of Urbino, Italy, from the intersection of two commercially available databases, Amadeus and Who Owns Whom[4]. From the former source we obtained most economic and financial data used for our analysis, while from the latter we gathered information on the ownership structure (domestic vs. foreign) of each firm. The overall sample contains 3,932 firms, out of which 1,950 are located in France, are 980 are located in Italy and 1,002 are located in Spain. Foreign firms represent slightly less than one quarter of total firms in Italy, and between 35 and 40% in the other two countries (see Tables 1 and 2 for other descriptive statistics on sample firms and their distribution across countries and sectors). A chi-squared test rejects the hypothesis that the sectoral distribution of firms in each country which we extracted from our database is significantly different from the distribution of the population of firms with more than 50 employees, as registered by Eurostat[5]. For every firm located in the 3 countries we were able to identify the ultimate parent company, and with this information we have distinguished foreign-owned firms (when the ultimate parent company is different from the country of registration) from domestic firms. Economic and financial data were available for a 6-year time span, from 1992 to 1997. Firms for which the complete series of data was not available were preliminarily dropped, thus the sample available for estimation is a balanced panel of 23,592 observations (of which 15,606 refer to domestic firms) for the three countries altogether. All data used for regressions and descriptive statistics are drawn from this combined data-set.

4. Econometric specification

Following most of the recent literature in this field (see for example Aitken and Harrison, 1999), we specify a Cobb-Douglas production function (in logs) with externalities of the following form:

[4] Amadeus and Who Owns Whom (D&B Linkages) are products of Bureau Van Dijck and Dun & Bradstreet respectively.
[5] We are grateful to L. Nascia for supplying background data for these comparisons.

$$\log Y_{it} = c + \alpha \ \log(L)_{it} + \beta \ \log(K)_{it} + \gamma \ \log(M)_{it} \qquad (1)$$
$$+ \delta_1 \log(F)_{jt} + \delta_2 \log(F)_{j,t-1} + \varphi_1 \log(D)_{jt} + \varphi_2 \log(D)_{j,t-1} + \phi \ X_{ijt} + \eta_i + \lambda_t + \varepsilon_{it}$$

$i = 1, \ldots N^d$ (domestic firms)
$j = 201, \ldots 399$ (3-digit SIC)
$t = 1992, \ldots 1997$

where Y is real output, L is the number of employees, K is the stock of capital and M is the use of raw materials and energy[6]. As noted by Aitken and Harrison (1999), once controlled for inputs, the parameters of all other explanatory and control variables can be interpreted as TFP elasticities.

Log(F_{jt}) and log(D_{jt}) identify the externality terms. We allow for different within sector externalities from foreign (F_{jt}) and from domestic (D_{jt}) activity, and we accommodate either contemporaneous and lagged effects. F is measured by the sum of workers employed at time *t* by all foreign-owned firms whose core business is in sector *j*, while D is measured as the sum of employment in domestic firms in sector *j*. In this way we are specifying effects from foreign investments as a specific source of external (within sector) economies. The main parameter of interest are δ_1 and δ_2, whose sign and magnitude will measure the direction and intensity of spillovers from foreign activity on domestic firms' productivity. The size of activity in the domestic sector (D_{jt} and D_{jt-1}), is introduced to avoid that δ_1 and δ_2 pick up effects related to the overall size and dynamics of the industry, not directly related to FDI externalities. Unlike other works modelling the effects of inward investments in terms of the ratio of foreign owned activities to total activity, this specification avoids a substantial bias in FDI spillover estimates. In the Appendix to this paper we derive a simple analytical explanation for this bias and we show how this bias is removed with our specification. Suffice here to notice that relative measures of foreign presence, such as foreign to total activity ratio, imply the assumption that changes in the same proportion of both foreign and domestic activities have no effect on local firms (i.e. elasticities are assumed to be equal with inverted signs for D and F). To the extent that changes in foreign activity have (or can be expected to have) differential, and non symmetric, effects on productivity, using such relative measures leads to either under or over-estimate the actual spillovers of FDIs (see Castellani and Zanfei 2002b for a more detailed explanation and an application to the case of Italy).

X is a vector of controls, varying across time and firms (such as firm's age and productivity gap) and sectors (such as the concentration index). They are introduced to capture firm/sector-time variations of TFP. See below for a more detailed description of those variables.

Finally, η_i and λ_t are respectively unobserved firm-specific effect and time-specific effects, while ε_{it} is the disturbance term. As noted earlier correlation between the fixed effect and measures of FDI would cause a biased estimation of the FDI effect. In fact, FDIs might be attracted by the productivity levels of sectors; thus failing to control for the average productivity of the firm (and the sector) will show up in a magnified coefficient on the FDI variable. In particular, it is often claimed that FDIs are attracted towards more productive sectors, and OLS estimates are likely to find higher impact of FDIs on TFP[7]. Indeed, our data show a significant correlation between the fixed effects and FDI variables in the case of

[6] Real values of Y, K and M are obtained by deflating respectively nominal turnover, book value of fixed assets net of depreciation, and costs of materials. The deflator used is the OECD-STAN implied sectoral value added deflator.

[7] In a preliminary work on sectoral panel data from Portugal, Flores et al. (2001) obtain exactly this result. OLS regressions, without controlling for fixed effects, yield positive (although still mixed) effects of foreign presence on domestic productivity. Once controlled for sector dummies, the coefficient on foreign presence turns out negative.

French and Italian firms. Such correlation is positive in France (.04) and negative in Italy (-.03). In the case of Spain we cannot reject the null of no correlation between the fixed effect and log(F).

Taking first differences wipes out the fixed effects and yields the estimated equation, where the time varying component is captured by year dummies YR_k

$$\Delta \log Y_{it} = \alpha\, \Delta \log(L)_{it} + \beta\, \Delta \log(K)_{it} + \gamma\, \Delta \log(M)_{it} \tag{2}$$
$$+ \delta_1 \Delta \log(F)_{it} + \delta_1 \Delta \log(F)_{i,t-1} + \varphi_1 \Delta \log(D)_{it} + \varphi_1 \Delta \log(D)_{i,t-1} +$$
$$+ \phi\, \Delta X_{ijt} + \sum_{k=1}^{T} \lambda_k YR_k + \Delta \varepsilon_{it}$$

In other words the growth rate of output is regressed on the growth rate of inputs, on the growth rate of two variables capturing foreign and domestic activity at the 3-digits and a vector of controls X, including the concentration in the industry, measured by the Herfindal index at the 3-digits (HERF), the age of the firm (AGE) and the gap in productivity of each firm from the average foreign firm in a sector (GAP). GAP for firm *i*, belonging to sector *j* and to country *c*, is obtained as the ratio of the average productivity of foreign firms in sector *j* to productivity of firm *i,* where each firm's productivity is the estimated fixed effect from a deterministic country-specific production frontier.

$$GAP_{ij}^{c} = \frac{Foreign\_TFP_j^c}{TFP_i^c} = \frac{\frac{1}{N_j^f} \sum_{f=1}^{N_j^f} \hat{\eta}_{jf}^{c}}{\hat{\eta}_i^c} \tag{3}$$

We allowed Herfindal index and age to affect both the level and the growth rate of domestic firms' productivity, therefore we introduced the two variables (HERF and AGE) both in levels and in first differences, while GAP is introduced in levels, since we expect that the higher the gap the higher the rate of growth in domestic firms' productivity due to a catching up effect.

5. Discussion of results

Regressions were run using OLS regression with standard errors robust to heteroschedasticity.

Table 5 shows the results we have obtained with reference to the three EU countries, France, Italy and Spain, which we have considered separately to highlight the specific impact of inward investments on domestic firms productivity. The first two columns for each country report estimates of equation (2) without controlling for time dummies. In the first column the vector X is not estimated, while the second column introduces the vector of controls. The remaining two columns report estimates controlling for time dummies, and in particular the third column focuses only on contemporaneous effects, while in the fourth column externalities are allowed to affect firms' productivity with one year of lag. Results suggest that contemporaneous externalities from foreign and domestic employment occur in France and Italy when time dummies are not estimated, but when year dummies are introduced these effects disappear, suggesting that the positive coefficient was simply capturing year specific increases in productivity associated with increases in sectoral activity, possibly due to aggregate positive shocks. Interestingly, when externalities are allowed to affect TFP with some lag, the picture changes. In particular, $\Delta\log(F)_{i,t-1}$ is positive and significant in the case of Spain and Italy, but in the former case contemporaneous externalities are negative (although non significant) and the hypothesis that $\delta_1+\delta_2=0$ cannot be rejected. Therefore, in the case of Spain and France the net effect on domestic firms' productivity due to present and lagged increase in foreign employment is null, while in the case of Italy is soundly positive.

Control variables introduced in the vector X do not change the picture much, but it might be of some interest to comment briefly on some results. Concentration (proxied by HERF) does not seem to affect firms' TFP level and growth significantly, except in the case of France, where it causes higher growth rates of TFP. Firm's age does not determine significant effects on TFP of Italian firms, while it affects substantially both TFP level and growth in Spain. The idea that a higher productivity gap between foreign and domestic firms causes higher TFP growth is supported in Italy and France but not Spain.

In sum, our results suggest that, after controlling for time-invariant individual effects and time-specific effects, productivity spillovers from multinational to domestic firms are significant in the case of Italy and non-significant in the case of Spain. There thus appears to exist a significant heterogeneity across countries as far as the impact of inward investment is concerned.

Why are we observing such differences in the actual impact of inward investments on TFP in the examined countries? There certainly are diversities in the institutional and structural features of the three economies which ought to be examined in details. Amongst other factors, important insights can be drawn from the analysis of how the three countries differ in terms of the characteristics of foreign and domestic firms. In particular, from Table 3 we notice three important features.

First, in our sample foreign firms are not always more productive than their domestic counterparts. This is particularly the case of France, where, on average, domestic firms are more productive. Details by broad sectors (resulting from the aggregation of the 2-digit SIC) highlight that in a number of industries in the three countries, domestic firms do represent the technological frontier, with foreign firms lagging behind[8]. This outcome could have to do with the fact we are considering developed countries, where inward investments can often be motivated by the desire to access knowledge localised in the host country, more than to exploit their own technological advantage[9].

Second, TFP levels vary considerably across countries. Spanish firms exhibit the lowest average TFP (1.02), while French firms are characterised by the highest TFP (1.11), and Italian firms constitute an intermediate case (1.04). Foreign firms are very productive on average in Italy (1.12), although with a rather high variability, while in Spain foreign TFP is the lowest (1.04).

Third, if one takes productivity as a measure of absorptive capacity, one can confirm the argument put forward in Section 2: productivity gaps and absorptive capacity are different, although related, concepts. In particular, they are negatively correlated but only a relatively small fraction of the variance in the former is explained by sectoral variation in the latter (approximately 35%, as from the R-squared reported in Figure 1). In fact, Table 3 and Figure 1 show a number of interesting cases where high (low) technology gaps do not correspond to low (high) absorptive capacity. Roughly the same (null or very low) GAP characterises sectors where absorptive capacity is markedly different. In France, such cases are, for example *Furniture and fixtures manufacturing* (SIC 25), T*extile mill products manufacturing* (SIC 22), *Printing, publishing and allied industries* (SIC 27), where the average TFP of domestic firms (a proxy for absorptive capacity) ranges from .75 to 1.56. Similarly, in Italy TFP gap is negligible in *Primary metal industries manufacturing* (SIC 33), *Transportation equipment manufacturing* (SIC 37), *Printing, publishing and allied industries* (SIC 27), but

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8 See for example the case of Furniture and fixtures manufacturing (SIC 25), Paper and allied products manufacturing (SIC 26) in Italy and Spain, Apparel and other finished products made from fabrics (SIC 23) in Italy, Transportation equipment manufacturing (SIC 37), Electronic and other electrical equipment and components (SIC 36), Measuring, analyzing and controlling instruments (SIC 38) and Fabricated metal products (SIC 34) in France.

9 A rich literature has addressed the issue of technology sourcing versus technology exploiting foreign investments (see Castellani (2002) for a review).

absorptive capacity varies between 1.08 and 1.50. Finally, in Spain both *Rubber and miscellaneous plastics products manufacturing* (SIC 30) and *Stone, clay, glass and concrete products manufacturing* (SIC 32) foreign firms are 4% more productive than domestic firms, but the latter exhibit TFP equal to .89 and 1.21, respectively. Quite symmetrically, one can observe a remarkably different TFP gap for a given level of absorptive capacity. This is the case of *Petroleum refining and related industries* (SIC 29), *Stone, clay, glass and concrete products manufacturing* (SIC 32), *Furniture and fixtures manufacturing* (SIC 25) in Spain, where the average TFP of domestic firms is approximately equal to 1.2, but TFP gaps range from 40% to -25%. In Italy a similar pattern characterises *Food and kindred products* (SIC 20) and *Apparel and other finished products made from fabrics* (SIC 23) where TFP gap is respectively 20% and -27%.

The above description of stylised facts concerning the three countries induces us to attempt a generalisation of our results, which takes TFP levels and gaps into account and integrates the approaches which we labelled as the "catching-up" and the "technological accumulation" hypotheses. Table 6 illustrates this attempt. The average productivity of firm *i* (TFP_i) is our proxy of *absorptive capacity* (AC_i), while within-sectors *technological gap* (GAP_i) is defined as the ratio between the average productivity of foreign firm in a given sector *j* in country *c* ($Foreign\_TFP_j$) and each firm average productivity (as specified in equation (3) at the end of section 4 above).

GAP takes values higher than 1 if the average foreign TFP in the sector is higher than firm *i*'s TFP (i.e. if a sample firm is relatively less productive than the mean TFP of foreign firms in the sector), value one if the (domestic) firm and the average foreign TFP are exactly equal, while it takes values less than 1 if the domestic firm is more productive than the average foreign ones. In the extreme case of sectors where no foreign firms are active, TFP Gap takes value equal to zero. Both GAPs and AC are taken into account in our econometric exercise, as discussed in section 2. It is worth noting that *GAP* is calculated for each firm relative to a sectoral benchmark, represented by the average TFP of foreign firms in that sector. Therefore, for a given AC, domestic firms in sectors where foreign firms are more productive, will exhibit a rather high variety of GAP size. Symmetrically, for a given GAP size, a large heterogeneity of domestic firm productivity can be observed in the recipient countries. Consistently with the descriptive above, AC and GAP are only moderately correlated (-.29 in Spain, -.38 in France, –.31 in Italy) .

The test of our conjecture that GAP and AC may play a role in enabling FDI externalities to occur is based on a modified version of (2).

$$\begin{aligned}\Delta \log Y_{it} &= \alpha\ \Delta \log(L)_{it} + \beta\ \Delta \log(K)_{it} + \gamma\ \Delta \log(M)_{it} \\ &\quad + \delta_1 \Delta \log(F_{jt}) + \delta_1^{GAP} \Delta \log(F_{jt}) * GAP_{ij} + \delta_1^{AC} \Delta \log(F_{jt}) * AC_i \\ &\quad + \varphi\ \Delta \log(D_{jt}) + \phi\ \Delta X_{ijt} + \lambda_k \sum_{k=1}^{T} YR_k + \Delta \varepsilon_{it}\end{aligned} \tag{4}$$

Now, the FDI externality, i.e. the partial derivative of Δlog(Y) with respect to Δlog(F) (holding inputs constant), depends on GAP and AC.

$$\frac{\partial \Delta \log Y}{\partial \Delta \log F} = \delta_1 + \delta_1^{GAP} * GAP_{ij} + \delta_1^{AC} * AC_i \tag{5}$$

Table 6 reports estimates of (2) and (4) on the pooled sample obtained by stacking firm/time observations from the three countries, as well as regressions of (4) on single countries. Positive estimated coefficients for the interaction of FDIs with GAP (δ_1^{GAP}) would support Findlay's hypothesis that the higher the technological differentials, the higher the spillovers from foreign presence. Positive estimated coefficients for the interaction of FDIs with AC (δ_1^{AC}) would support the technological accumulation hypothesis, according to which the higher the local ability to capture and utilise technology, the higher the benefits from foreign presence. Overall, in the pooled sample foreign externalities do not seem to occur, while the introduction of productivity gap as a variable enabling spillovers yields significantly different results. In particular, the hypothesis that domestic firms benefit more from foreign presence the higher the distance from foreign-owned counterparts (column 5 and 7) is supported, and this result is confirmed within countries in the case of Italy and Spain. Surprisingly, we find that AC does not favour the exploitation of FDI externalities (column 6 and 7). These results would support the catching-up hypothesis *versus* the technology accumulation hypothesis. As suggested earlier in this paper, this overall result may have to do with the structural and institutional features of recipient countries. When host countries are underdeveloped, there may well be a lower bound of local technological capabilities below which activities carried out in the host economies can be displaced by foreign competition or disrupted by anti-competitive practices. This is not likely to be the case when foreign investments are localised in industrialised countries, which are characterised by a general technological and institutional environment favouring market transactions, linkage creation and knowledge transfers between TNCs and local firms. By the same token, absorptive capacity of domestic enterprises may also play a different role in industrialised nations. Different from LDCs, advanced countries are relatively close to the technological frontier and might have reached a threshold level of absorptive capacity required to benefit from foreign investments, so that at the margin further increasing local firms' accumulation of technology would not augment the productivity spillovers of foreign investments.

Setting the derivative in (4) equal to zero one can easily obtain the threshold value of GAP.

$$GAP_{ij}^{*} = -\frac{\delta_1}{\delta_1^{GAP}} - \frac{\delta_1^{AC}}{\delta_1^{GAP}} AC_i \tag{6}$$

which, given that in our data δ_1^{AC} is not significantly different from zero reduces to $-\frac{\delta_1}{\delta_1^{GAP}}$. Above (below) this threshold which positive (negative) externalities occur. Direct calculations from parameter estimates in column (5) and (7) of Table 6 suggest that in the pooled sample the threshold is approximately equal to 1, that is when foreign firms are more productive than domestic counterparts in the same sector [10]. Domestic firms which have a TFP below the average foreign firm in their sector (i.e. those who would benefit from an increase in foreign employment are 1,774 out of 2,601 (of which 546 are from Italy, 776 from France and 452 from Spain).

[10] From column (8) and (9) one notices that this threshold is slightly lower in Italy (.81) and higher in Spain (1.25). Being the threshold lower in the case of Italy, there will be a relatively higher number of domestic firms benefiting from foreign presence in this country. This is consistent with the results we illustrate in Table 5, showing that spillover effects are positive and significant in Italy. The relatively low threshold, and positive externalities, observed for Italy might have to do with the specific combination of domestic and foreign technological profiles characterising this country. In fact, in those sectors where foreign presence is high, one can notice that there are relatively large technology gaps (ensuring high technological opportunities for local enterprises), but domestic firms' productivity are still often above average in these sectors (as in the case of food and kindred products, SIC 20, and of chemical and allied products, SIC 28).

In interpreting our results, we should however introduce a few words of caution. First, we have some evidence that in science based industries AC play positive role in enabling positive externalities. Results are not reported because they are not robust to different specifications but indeed they suggest a future line of investigation. Second, we need to admit that our measure of absorptive capacity is very rough and might not fully capture the essence of this concept. Third, there certainly are further factors which may affect the creation of spillovers, either independently and interacting with AC and GAP. Some of these factors are considered as key parameters in Findlay's original model, as is the case of local taxation on foreign capital and saving rates, while other variables are only mentioned as disregarded albeit important factors, like market structure and property right protection (Findlay 1978 p.5-6). We do not take into account these and other structural and institutional conditions in this paper, thus limiting the possibility to interpret differences in technology spillovers across countries.

6. Conclusion

This paper provides a contribution to the debate on the impact of inward investments, a phenomenon that has been accelerating in Europe since the early 1990's. We provided a wide-spectrum analysis of this aspect of globalisation in three EU countries, Italy, France and Spain, using comparable data. We found that foreign presence has a positive impact on productivity of Italian firms, while the effect is not significant on French and Spanish firms. Despite the fact that these three countries share a number of common features, such as the fact that all of them are industrialised counties localised at the heart of the EU market, they show rather different patterns of inward FDI, both in terms of the weight of foreign firms in the economy and in terms of their characteristics relative to domestic ones. We attempted a generalisation of the results obtained for individual countries by introducing TFP gaps between foreign and domestic firms, and absorptive capacity of domestic firms as variables explaining the direction and magnitude of the impact of multinational presence on domestic performances. We showed that foreign presence has a positive effect on domestic firms when it is associated with high TFP gaps, while absorptive capacity does not seem to have a significant effect. These results are most probably conditioned by structural and institutional characteristics of industrialised countries in general, and of the examined economies in particular.

Based on these results, a rather strong argument could be made in favour of attracting highly competitive foreign firms which might be able to stimulate productivity in industries wherein domestic firms are lagging behind. When dealing with advanced countries as recipient economies, the risk of not having enough absorptive capacity to capture the benefits generated by foreign presence does not seem to hold, although there may be significant differences in the impact of both gaps and absorptive capacity across industries.

Of course, policies favouring positive externalities from foreign presence cannot be limited to the promotion of high value added inward investments. A whole set of measures could and should be utilised, such as the modernisation of infrastructures, human capital formation, "after-care" policies and the support of local firms, including suppliers of MNEs, in order to increase linkage creation and technology transfer. It remains that investment selection and promotion, especially if combined with complementary pro-competitive and infrastructural policies, should be re-considered in the agenda of national and supra-national governments, as a key tool to enhance industrial growth.

Appendix – Identification of FDI externalities

A rather established economic tradition models a single firm production function introducing aggregate activity as an externality, which is taken as exogenous in firms' maximising decision and increases firms' total factor productivity[11]. We extend this formulation by adding to the usual externality term T, denoting aggregate activity in sector *j*, core business of firm *i*, a second source of productivity gain stemming from activities of foreign multinationals in sector *j*, F.

$$Y_{it} = B_{it} K_{it}^{\alpha} L_{it}^{\beta} M_{ti}^{\gamma} \tag{A.1}$$

$$B_{it} = e^{\eta_i + \lambda_t + \varepsilon_{it}} F_{jt}^{\delta_1} T_{jt}^{\varphi}$$

$i = 1, \ldots N^d$ (domestic firms)

$j = 1, \ldots J$ (sectors)

$t = 1, \ldots T$ (time)

Notation is as usual: Y is real output, L is the number of employees, K is the stock of capital and M is the use of raw materials and energy. Firms' TFP (B) is modelled simply as a function of the two externality parameters, a fixed effect and an error term. We maintain a very simple structure of the determinants of firms' TFP to avoid complexities in the derivation of the bias below. We admit that economic applications, such as the one in this paper, should be able to control for other important factors affecting firms' TFP, such as firms' age, R&D and innovation activities, as well as other time varying firm/sector characteristics.

Taking logs, TFP term becomes

$$\begin{aligned} \log B_{it} &= c + \delta \ \log(F)_{jt} + \varphi \log(T)_{jt} + \eta_i + \lambda_t + \varepsilon_{it} \\ &= c + \delta \ \log(F/T)_{jt} + (\delta + \varphi)\log(T)_{jt} + \eta_i + \lambda_t + \varepsilon_{it} \end{aligned} \tag{A.2}$$

As anticipated in the previous section most existing studies looking for FDI externalities estimate (A.2) using only the F/T ratio. The seemingly innocent implication would be that an increase of the same proportion of both T and F (leaving F/T unchanged) should not cause any effect on domestic firms' productivity. However, as shown in equation (A.2), this would require that we impose the important restriction that $\delta + \varphi = 0$. Here it is argued that this is not such an innocent restriction, since it imposes that an increase in F and T in the same proportion will have an impact on domestic productivity that is equal in magnitude but opposite in direction. In other words, the restriction implies that either a positive spillover generated by foreign activities is exactly counterbalanced by a negative spillover of total activities; or, symmetrically, that a positive spillover generated by total activity is exactly counterbalanced by a negative spillover of foreign activity. Neither of these circumstances needs to occur as a rule (even though it might be the case under specific conditions). Indeed, one can easily notice that imposing $\delta + \varphi = 0$ will most likely cause a downward biased estimate of *δ*. First differencing wipes out fixed effects from equation (2) and yields

[11] For analytical simplicity we chose a Cobb-Douglas specification for the production function but, as it will be shown shortly, the empirical implementation we use can be derived from a logaritmic differentiation of a generic production function (among others see Caballero and Lyons 1991; Basu and Fernald, 1996).

$$\Delta \log B_{it} = \delta\, \Delta \log(F/T)_{jt} + (\delta + \varphi)\Delta \log(T)_{jt} + \lambda\, \Delta t + \varepsilon_{it} \\ = \lambda + \delta\, x_{it} + \theta\, z_{it} + \varepsilon_{it} \tag{A.3}$$

where we simplified notation by setting $x_{it} = \Delta \log(F/T)_{jt}$ and $z_{it} = \Delta \log(T)_{jt}$, $\theta = \delta_1 + \delta_2$. To save notation the subscript *j*, indicating variables varying across sectors, have been substituted by *i*. It remains that F and T have the same values for all the *i* belonging to sector *j*.

Whenever $\delta + \varphi = 0$ is imposed, i.e. z_{it} is omitted from the regression, equation (A.3) can be re-written as:

$$\Delta \log B_{it} = \lambda + \delta\, x_{it} + u_{it} \tag{A.4}$$

Where $u_{it} = \theta\, z_{it} + \varepsilon_{it}$ is the new error term. Equation (4) is a simplified version of what is estimated in most of the literature using only the F/T ratio as a measure of foreign presence[12]. From textbook econometrics we obtain (Greene, 1997 p.401-403)[13]:

$$E(\hat{\delta}) = \delta + \frac{Cov(x,z)}{Var(x)}\theta = \delta + \frac{Cov[(\Delta \log F/T),(\Delta \log T)]}{Var[(\Delta \log F/T)]}(\delta + \varphi) \tag{A.5}$$

To the extent that the restriction imposed in the literature estimating only the F/T ratio is satisfied (i.e. $\delta + \varphi = 0$) no bias is produced. Otherwise, since $Var(x) > 0$, the direction of the bias is determined by two terms: *(i)* the sum of the unrestricted coefficients of externalities from foreign and aggregate sectoral activity and *(ii)* the covariance between $\Delta \log F/T$ and $\Delta \log T$. Therefore, if $\delta + \varphi > 0$ (which is for instance the case when a positive externality from activities of foreign affiliate occurs), the restriction imposed in the literature is likely to produce a downward biased externality coefficient, when $\Delta \log F/T$ and $\Delta \log T$ are negatively correlated. In a related paper we show that in the case of Italy these condition are met and a substantial bias is created when the F/T measure is used (Castellani and Zanfei, 2002b). Here we choose the flexible specification, but we use a measure of domestic activity $\Delta \log D$, instead of total activity, to avoid problems of multicollinearity between $\Delta \log F$ and $\Delta \log T$.

[12] As we noted above, such a simple specification is used for illustrative purposes and is required to keep tractable the analytical derivation of the bias below (Greene, 1997 p. 402).

[13] We thank Jack Lucchetti for an illuminating discussion on this point.

Table 1 – Characteristics of our sample of French, Spanish and Italian manufacturing firms, by SIC, absolute values, average 1992-1997

	Number of Firms			Foreign Employment			Average Employment x Firm			Average Employment x Foreign Firms		
2 digit SIC	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**
Food and kindred products (20)	176	247	64	26.463	23.310	16.615	389	346	498	563	555	1.278
Tobacco products manufacturing (21)	1	1			287		951	287			287	
Textile mill products manufacturing (22)	34	75	67	1.255	5.466		299	234	276	314	304	
Apparel and other finished products made from fabrics (23)	16	63	48	1.859	4.311	538	685	273	412	620	332	179
Lumber and wood products, except furniture manufacturing (24)	11	44	8		1.595		217	215	252		199	
Furniture and fixtures manufacturing (25)	13	30	18	599	1.143	367	407	212	251	300	286	367
Paper and allied products manufacturing (26)	42	77	36	6.020	18.052	2.290	315	348	368	401	410	286
Printing, publishing and allied industries (27)	47	101	20	1.967	4.625	544	232	320	509	179	243	272
Chemicals and allied products manufacturing (28)	174	226	121	37.848	37.763	20.944	315	331	396	323	350	419
Petroleum refining and related industries (29)	7	14	6	722	5.083	940	320	1.184	360	722	565	313
Rubber and miscellaneous plastics products manufacturing (30)	68	132	79	24.511	25.223	13.344	449	358	358	645	350	607
Leather and leather products manufacturing (31)	7	14	19	522	1.654		178	339	313	261	827	
Stone, clay, glass and concrete products manufacturing (32)	64	80	54	11.053	11.058	4.452	341	423	392	526	410	557
Primary metal industries manufacturing (33)	42	92	51	1.636	10.158	2.667	346	490	337	234	339	444
Fabricated metal products (34)	50	159	78	3.395	7.756	8.264	309	288	255	212	204	413
Industrial and commercial machinery and computer equipment (35)	61	231	157	17.011	57.392	19.997	389	450	336	709	527	571
Electronic and other electrical equipment and components (36)	76	155	74	28.673	33.759	18.859	577	696	620	667	519	857
Transportation equipment manufacturing (37)	80	99	43	65.979	19.344	7.094	1.341	1.506	2.826	1.347	430	507
Measuring, analyzing and controlling instruments (38)	20	84	28	3.908	15.371	1.242	348	383	332	391	415	138
Miscellaneous manufacturing industries (39)	13	26	9	1.870	2.063	492	305	301	197	623	258	164
Total	**1002**	**1950**	**980**	**235.291**	**285.412**	**118.647**	**448**	**443**	**484**	**570**	**408**	**542**

Table 2 – Characteristics of our sample of French, Spanish and Italian manufacturing firms, by SIC, percentage values, average 1992-1997

	Share of Foreign Firms			Foreign Employment (%of Total Manufacturing)			Foreign Employment / Total Employment		
2 digit SIC	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**
Food and kindred products (20)	27%	17%	20%	11%	8%	14%	39%	27%	52%
Tobacco products manufacturing (21)		100%		0%	0%	0%		100%	
Textile mill products manufacturing (22)	12%	24%		1%	2%	0%	12%	31%	
Apparel and other finished products made from fabrics (23)	19%	21%	6%	1%	2%	0%	17%	25%	3%
Lumber and wood products, except furniture manufacturing (24)		18%		0%	1%	0%		17%	
Furniture and fixtures manufacturing (25)	15%	13%	6%	0%	0%	0%	11%	18%	8%
Paper and allied products manufacturing (26)	36%	57%	22%	3%	6%	2%	46%	67%	17%
Printing, publishing and allied industries (27)	23%	19%	10%	1%	2%	0%	18%	14%	5%
Chemicals and allied products manufacturing (28)	67%	48%	41%	16%	13%	18%	69%	50%	44%
Petroleum refining and related industries (29)	14%	64%	50%	0%	2%	1%	32%	31%	43%
Rubber and miscellaneous plastics products manufacturing (30)	56%	55%	28%	10%	9%	11%	80%	53%	47%
Leather and leather products manufacturing (31)	29%	14%		0%	1%	0%	42%	35%	
Stone, clay, glass and concrete products manufacturing (32)	33%	34%	15%	5%	4%	4%	51%	33%	21%
Primary metal industries manufacturing (33)	17%	33%	12%	1%	4%	2%	11%	23%	16%
Fabricated metal products (34)	32%	24%	26%	1%	3%	7%	22%	17%	41%
Industrial and commercial machinery and computer equipment (35)	39%	47%	22%	7%	20%	17%	72%	55%	38%
Electronic and other electrical equipment and components (36)	57%	42%	30%	12%	12%	16%	65%	31%	41%
Transportation equipment manufacturing (37)	61%	45%	33%	28%	7%	6%	61%	13%	6%
Measuring, analyzing and controlling instruments (38)	50%	44%	32%	2%	5%	1%	56%	48%	13%
Miscellaneous manufacturing industries (39)	23%	31%	33%	1%	1%	0%	47%	26%	28%
Total	**41%**	**36%**	**22%**	**100%**	**100%**	**100%**	**52%**	**33%**	**25%**

Table 3 –TFP of domestic and foreign-owned firms from French, Spanish and Italian manufacturing firms and TFP Gaps, by SIC, 1992-1997*

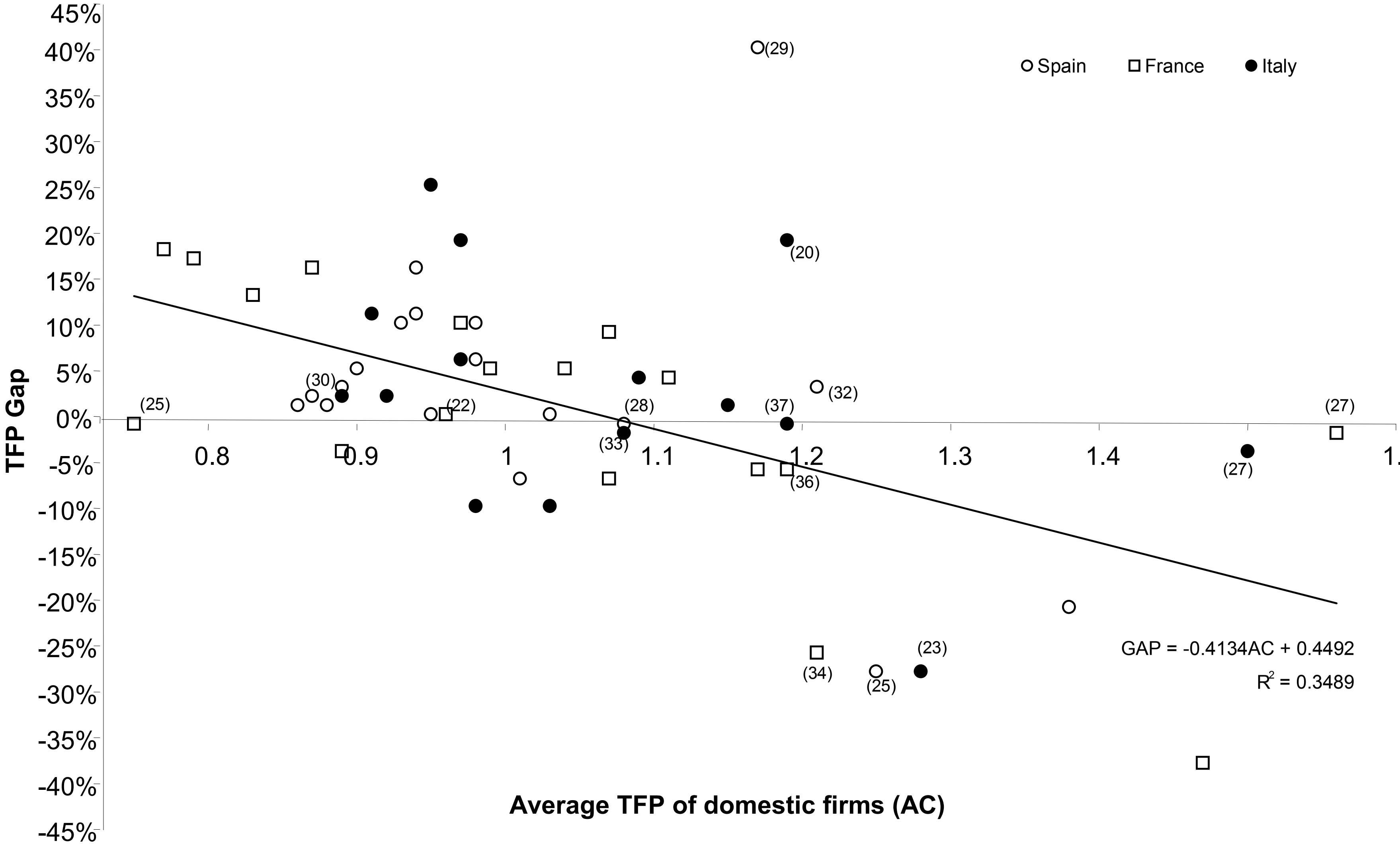
	Average Tfp of Domestic Firms			Average Tfp of Foreign Firms			Tfp GAP**		
2 digit SIC	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**	**Spain**	**France**	**Italy**
Food and kindred products (20)	.98	1.04	1.19	1.05	1.10	1.43	7%	6%	20%
Tobacco products manufacturing (21)	.79				1.68				
Textile mill products manufacturing (22)	.88	.96	.93	.90	.97		2%	1%	
Apparel and other finished products made from fabrics (23)	.87	.97	1.28	.90	1.08	.93	3%	11%	-27%
Lumber and wood products (24)	1.01	.79	.91		.93			18%	
Furniture and fixtures manufacturing (25)	1.25	.75	.98	.91	.75	.89	-27%	0%	-9%
Paper and allied products manufacturing (26)	1.01	.83	1.03	.95	.95	.94	-6%	14%	-9%
Printing, publishing and allied industries (27)	1.38	1.56	1.50	1.10	1.54	1.46	-20%	-1%	-3%
Chemicals and allied products manufacturing (28)	1.08	1.11	1.09	1.08	1.16	1.14	0%	5%	5%
Petroleum refining and related industries (29)	1.17	3.33	2.88	1.65	2.13	2.58	41%	-36%	-10%
Rubber and miscellaneous plastics products manuf. (30)	.89	.89	.89	.93	.86	.92	4%	-3%	3%
Leather and leather products manufacturing (31)	.86	.77	1.10	.88	.92		2%	19%	
Stone, clay, glass and concrete products manufacturing (32)	1.21	.99	1.15	1.26	1.05	1.17	4%	6%	2%
Primary metal industries manufacturing (33)	1.03	1.07	1.08	1.04	1.01	1.07	1%	-6%	-1%
Fabricated metal products (34)	.95	1.21	.92	.96	.91	.95	1%	-25%	3%
Industrial and commercial machinery and computer eq. (35)	.93	1.07	.91	1.03	1.18	1.02	11%	10%	12%
Electronic and other electrical eq. and components (36)	.94	1.19	.95	1.05	1.13	1.20	12%	-5%	26%
Transportation equipment manufacturing (37)	.90	1.47	1.19	.95	.92	1.19	6%	-37%	0%
Measuring, analyzing and controlling instruments (38)	.98	1.17	.97	1.09	1.11	1.04	11%	-5%	7%
Miscellaneous manufacturing industries (39)	.94	.87	.97	1.10	1.02	1.16	17%	17%	20%
Total[§]	**1.02**	**1.11**	**1.04**	**1.04**	**1.08**	**1.12**	**2%**	**-3%**	**8%**

*TFP have been calculated as the estimated fixed effect in a deterministic production frontier with panel data from 1992 to 1997

** TFP GAP is obtained as the percentage distance of Foreign TFP and Domestic TFP. Positive values indicate that foreign firms are more (less) productive than domestic firms.

[§] Average across all firms.

Figure 1 – Average AC and Tfp Gap in France, Italy and Spain by manufacturing industry (2-digit SIC)



Note: The numbers in brackets next to some data points are 2-digit SIC commented in the text.

Table 4 – Descriptive statistics

	Italy					France					Spain				
Variable	**Obs**	**Mean**	**Std. Dev**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev**	**Min**	**Max**
$\Delta Log(Y)_{j,t}$	3,805	.020	.229	-1.722	2.194	6,255	.028	.246	-2.793	4.735	2,945	.003	.255	-1.515	1.648
$\Delta Log(K)_{j,t}$	3,805	-.005	.338	-3.742	3.205	6,255	.010	.331	-2.913	8.531	2,945	-.010	.296	-2.344	3.381
$\Delta Log(L)_{j,t}$	3,805	.027	.194	-1.125	1.518	6,255	.019	.228	-3.483	5.075	2,945	-.041	.190	-1.187	1.309
$\Delta Log(M)_{j,t}$	3,805	.041	.365	-5.030	5.369	6,255	.029	.385	-8.813	4.922	2,945	.014	.313	-2.146	3.009
$\Delta Log(F)_{j,t}$	3,805	-.006	.174	-.728	1.007	6,255	.006	.147	-1.839	1.975	2,945	-.044	.136	-.482	.596
$\Delta Log(F)_{j,t-}$*GAP	3,805	-.005	.197	-1.806	1.256	6,255	.009	.175	-2.522	2.381	2,945	-.049	.148	-.619	.677
$\Delta Log(F)_{j,t}$*AC	3,805	-.012	.216	-2.078	2.237	6,255	.002	.371	-24.064	3.554	2,945	-.045	.138	-1.022	.628
$\Delta Log(D)_{j,t}$	3,805	.010	.133	-.567	.482	6,255	.004	.084	-1.328	1.405	2,945	-.052	.144	-.878	.881
$\Delta HERF_{j,t}$	3,805	.000	.024	-.146	.182	6,255	-.001	.014	-.252	.099	2,945	-.002	.020	-.284	.129
$HERF_{j,t-1}$	3,805	.228	.194	.025	1	6,255	.149	.141	.026	1	2,945	.206	.185	.027	1
$\Delta Log(AGE)_{i,t}$	3,805	.061	.051	.006	.693	6,254	.059	.065	.004	.693	2,945	.049	.047	.004	.693
$Log(AGE)_{i,t-1}$	3,805	3.030	.747	0	5.153	6,254	3.194	.886	0	5.609	2,945	3.278	.771	0	5.645
GAP	4,566	.781	.599	0	2.766	7,506	1.091	.494	0	5.034	3,534	.879	.460	0	1.856
AC	4,566	1.040	.385	.457	3.918	7,506	1.106	.866	.434	13.085	3,534	1.018	.293	.493	3.980

Table 5 – The impact of sectoral foreign presence on domestic firms' productivity in France, Spain and Italy, 1992-1997 (OLS regressions)

Dependent Variable: ΔLog(Real Output) Sample: Only Domestic Firms	Italy	Italy	Italy	Italy	France	France	France	France	Spain	Spain	Spain	Spain
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta Log(F)_{j,t}$	.06**	.06**	.01	.02	.05**	.05**	.003	-.005	-.02	-..01	-.02*	-.02
	(4.02)	(3.79)	(.87)	(1.22)	(4.03)	(3.85)	(.29)	(-.49)	(-1.60)	(-.79)	(-1.78)	(-1.29)
$\Delta Log(F)_{j,t-1}$				.04**				-.005				.03*
				(3.51)				(-.35)				(1.66)
Control variables												
$\Delta Log(D)_{j,t}$	.14**	.16**	-.01	.04	.17**	.18**	.008	.04	.05**	.08**	.03	.06*
	(4.14)	(4.54)	(-.48)	(.71)	(4.04)	(4.34)	(.21)	(.96)	(2.10)	(3.52)	(1.23)	(1.65)
$\Delta Log(D)_{j,t-1}$				.01				-.28				-.02
				(.52)				(-.40)				(-1.03)
$\Delta HERF_{j,t}$		-.31**	-.14	-.19		-.42**	-.23	-.28		-.15	-.09	-.16
		(-2.25)	(-.97)	(-1.02)		(-1.91)	(-1.02)	(-1.44)		(-1.43)	(-.81)	(-1.30)
$HERF_{j,t-1}$		.003	.001	.01		.03**	.01	.02*		.003	.005	.01
		(.22)	(.14)	(.88)		(2.22)	(1.04)	(1.73)		(.27)	(.41)	(.91)
$\Delta Log(AGE)_{i,t}$		.08*	.11	.15		.02	-.02	-.09		.08**	.17**	.24**
		(-3.17)	(.87)	(1.29)		(.81)	(-.35)	(-1.25)		(2.03)	(2.34)	(2.07)
$Log(AGE)_{i,t-1}$		-.004**	-.0003	.005		-.00008	-.004	-.01**		.002*	.007**	.01*
		(-3.14)	(-.0001)	(.02)		(-.06)	(-1.08)	(-2.19)		(1.68)	(2.34)	(1.84)
GAP		.005	.006*	.007**		.002	.002	.007*		-.002	-.001	.002
		(1.32)	(1.67)	(2.13)		(.52)	(.72)	(1.72)		(-.48)	(-.30)	(.48)
Inputs												
$\Delta Log(K)_{j,t}$	.04**	.04**	.02**	.01**	.12**	.12**	.10**	.06**	.02**	.01**	.01**	.02**
	(4.79)	(4.68)	(3.31)	(2.02)	(5.80)	(5.78)	(3.68)	(5.95)	(2.96)	(2.56)	(2.39)	(2.67)
$\Delta Log(L)_{j,t}$	.27**	.27**	.29**	.39**	.27**	.26**	.28**	.25**	.33**	.33**	.33**	.34**
	(11.48)	(11.59)	(11.75)	(10.10)	(6.54)	(6.45)	(6.25)	(4.61)	(10.73)	(10.88)	(10.96)	(10.07)
$\Delta Log(M)_{j,t}$	.38**	.37**	.32**	.36**	.38**	.38**	.35**	.32**	.60**	.59**	.58**	.57**
	(10.07)	(9.99)	(8.16)	(8.46)	(10.69)	(10.68)	(9.67)	(8.16)	(27.68)	(26.24)	(25.30)	(22.01)
Time Dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
N. obs.	3805	3805	3805	3044	6255	6255	6255	5004	2945	2945	2945	2356
N. firms	761	761	761	761	1251	1251	1251	1251	589	589	589	589
R-squared	.61	.61	.66	.72	.67	.67	.70	.68	.87	.87	.87	.85
F-test (H_0: $\delta_1 + \delta_2 = 0$)				8.07**				.31				.11
[p-value]				[.004]				[.57]				[.73]

Table 6 – The impact of sectoral foreign presence, technology gap and absorptive capacity on domestic firms productivity in France, Spain and Italy, 1992-1997 (OLS regressions)

Dependent Variable: ΔLog(Real Output) Sample: Only Domestic Firms	**All countries**	**All countries**	**All countries**	**All countries**	**All countries**	**All countries**	**All countries**	**Italy**	**France**	**Spain**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\Delta Log(F)_{j,t}$	.05**	.05**	.003	-.009	-.07**	.01	-.08**	-.09**	-.03	-.20**
	(5.27)	(5.16)	(.44)	(-.98)	(2.60)	(.86)	(-2.34)	(-2.69)	(-.84)	(-2.99)
$\Delta Log(F)_{j,t-1}$				.01						
				(1.15)						
$\Delta Log(F)_{j,t-}$*GAP					.07**		.07**	.11**	.03	.16**
					(3.80)		(3.35)	(3.35)	(1.04)	(2.69)
$\Delta Log(F)_{j,t}$*AC						-.008	.001			
						(-.61)	(.09)			
Control variables										
$\Delta Log(D)_{j,t}$	.15**	.16**	.01	.02	.01	.01	.01	-.01	.009	.03
	(6.05)	(6.54)	(.60)	(.88)	(.60)	(.58)	(.60)	(-.45)	(.22)	(1.04)
$\Delta Log(D)_{j,t-1}$				.01						
				(1.15)						
$\Delta HERF_{j,t}$		-.35**	-.19**	-.22**	-.20**	-.20*	-.20**	-.15	-.23	-.08
		(-3.69)	(-2.04)	(-2.10)	(-2.09)	(-2.05)	(-2.09)	(-1.05)	(-1.03)	(-.72)
$HERF_{j,t-1}$		.007	.001	.01*	.002	.001	.002	.001	.01	.007
		(.95)	(.26)	(1.64)	(.26)	(.26)	(.26)	(.10)	(1.02)	(.63)
$\Delta Log(AGE)_{i,t}$		.04*	.06	.06	.06	.06	.06	.10	-.02	.17**
		(1.73)	(1.09)	(1.20)	(1.07)	(1.09)	(1.07)	(.83)	(-.34)	(2.38)
$Log(AGE)_{i,t-1}$		-.0007	.0007	.0002	.0007	.0007	.0007	-.002	-.004	.004**
		(-.32)	(.22)	(.07)	(.22)	(.22)	(.22)	(-.03)	(-1.07)	(1.96)
GAP		.003	.005**	.009**	.004**	.005**	.004**	.006*	.002	.001
		(1.52)	(2.26)	(3.76)	(2.21)	(2.30)	(2.22)	(1.86)	(.59)	(.22)
Inputs										
$\Delta Log(K)_{j,t}$	.07**	.07**	.06**	.04**	.06**	.06**	.06**	.02**	.10**	.01**
	(6.30)	(6.31)	(4.31)	(7.74)	(4.30)	(4.32)	(4.29)	(3.24)	(3.68)	(2.38)
$\Delta Log(L)_{j,t}$	.28**	.28**	.29**	.29**	.29**	.29**	.29**	.29**	.28**	.33**
	(10.42)	(10.22)	(9.87)	(7.74)	(9.88)	(9.87)	(9.87)	(11.86)	(6.25)	(10.95)
$\Delta Log(M)_{j,t}$	.42**	.41**	.38**	.37**	.38**	.38**	.38**	.32**	.35**	.58**
	(16.24)	(16.41)	(14.52)	(12.73)	(14.49)	(14.51)	(14.49)	(8.11)	(9.66)	(25.30)
Time Dummies	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. obs.	13,005	13,005	13,005	10,404	13,005	13,005	13,005	3805	6255	2945
N. firms	2,601	2,601	2,601	2,601	2,601	2,601	2,601	761	1251	589
Adjusted R-squared	.69	.69	.71	.71	.71	.71	.71	.66	.70	.87
F-test (H_0: $\delta_1 + \delta_2 = 0$) and [p-value]				.03						
				[.85]						

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