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Foreign ownership and productivity growth during the crisis: evidence from the North-West Italy

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Abstract

Nel corso degli ultimi decenni un'ampia letteratura ha evidenziato l'importanza della presenza di multinazionali sul territorio, evidenziando come la loro produttività dei fattori sia più elevata, specialmente nel caso di grandi gruppi stranieri. Questo articolo presenta un'analisi di carattere non parametrico della produttività aziendale, applicando il modello Data Envelopment Analisis ad un ampio campione di imprese medie e piccole localizzate nella provincia di Torino, tra le quali spicca un nutrito gruppo di imprese partecipate da soggetti esteri. I tassi di crescita della produttività calcolati sono stati analizzati attraverso un modello di regressione lineare, capace di offrire una rappresentazione più adeguata dei vantaggi derivanti da una proprietà estera, al netto dell'eterogeneità riscontrata nelle caratteristiche individuali di ciascuna impresa. Le affiliate di gruppi multinazionali mostrano un tasso di crescita della produttività maggiore, ma accompagnato da un livello di profittabilità più basso rispetto alle imprese a capitale interamente italiano, confermando tali evidenze anche attraverso differenti specificazioni del modello di regressione. Restringendo l'analisi alle sole imprese multinazionali, la modalità di ingresso sul mercato locale (investimenti di tipo Greenfield vs Brownfield) non sembra avere influenza sulle performance riscontrate in termini di produttività o profittabilità.

Keywords: Multinational firms, Productivity growth, TFP, Malmquist indexes.

1 Introduction

This paper tries to add new statistical evidence to the long run debate on the desirability of multinationals' presence based on their superior performance, technology, financial sources and, hence, higher productivity growth. Many theoretical interpretations rely on the idea of superior "proprietary assets" which can be exploited and internalized by foreign affiliates. In fact, this view is supported by numerous empirical investigations, arguing, for example, that foreign firms appear in general larger, more productive in term of both labour and Total Factor Productivity (Dunning, 1993) and seem to pay more their workers than domestic firms (Caves, 1996).

The main motivations rely in the superior managerial or organisational skills and higher technological capabilities which characterise a firm able to invest and produce abroad: only highly efficient firms decide to start business in foreign countries. Therefore, multinational affiliates do not have to go through the standard learning process that characterises domestic firms because they achieve a higher level of efficiency in their home country and "export" that tacit knowledge abroad (Jovanovic, 1982). This interpretation is supported by strong empirical evidence, mainly focused on the European case or on emerging countries, that generally confirms previous stylised facts. Dimelis and Luori (2002) analyse the Greek case and show that labour productivity, estimated through a Cobb-Douglass specification, was statistically higher for foreign owned firms, but only in case of a majority ownership. Baker and Sleuwaegen (2003) find a stronger productivity growth for foreign owned firms operating in the Belgian manufacturing sector. Similarly, Arnold and Hussinger (2005) and Crisuolo and Martin (2009) shows a positive differential in TFP levels for MNE firms, respectively in Germany and UK manufacturing sectors. Moreover, these differentials in productivity level are also observed for developing countries: Takii (2004) shows the same evidence for the Indonesian manufacturing sector, while Blomström (1988) does the same for Mexico.

Some recent analysis underline the role of additional factors in determining higher performance of foreign owned firms and additional control factors have been included to refine emerging results. Chacar *et al.* (2010) find a positive sales growth differential for MNEs, even if they underline how the effect is diminishing with firm's age with the implicit conclusion that dissimilarities between domestic and foreign firms decrease over time. Finally, Maffini and Mokkas (2011) underline the important role of corporate tax systems in motivating potential TFP advantage for foreign owned firms.

However, the expected outcome from being a multinational's affiliates can be reversed by some theoretical interpretation proposed by the recent literature. In particular, the idea of superior proprietary assets, internalised by foreign subsidiaries, can be overcome by the so called "liability of foreignness" (Zaheer, 1995; 2002) that becomes a popular way to explain poor performances of multinationals which operate in a foreign environment. Difficulties of making business abroad

could be more important in some particular territories characterised by a high number of small and medium enterprises concentrated on particular activities. In this situation the interaction among MNEs and domestic firms can be hampered by cultural aspects, which become stronger during periods of crisis. The absence of specific institutional competences, distributional networks or marketing strategies can increase transaction costs for MNEs (Hennart, 2010), with a negative final outcome in term of performance differentials. Empirical evidence on the liability of foreignness is particularly strong in services, such as in the banking sector (Young and Nolle, 1996; Boehe, 2011).

Considering the Italian case, literature is limited. Castellani and Zanfei (2006) find that foreign owned firms located in Italy perform better than domestic ones, but these differences disappear when the analysis is restricted to the sample of foreign and domestic-owned multinationals. Similarly, Grasseni (2010) finds higher labour productivity, higher wages and higher capital intensity in favour of foreign MNEs, but she also reveals an higher profitability of Italian MNEs (both in term of ROS and ROI).

Benfratello and Sembenelli (2006) propose a partial re-interpretation of the causal relationship between productivity and multinational status, as one of the possible localization strategies of large groups. The idea of superior technological and managerial capability, one of the pillars of internalization theory, can be partially reversed: foreign owned groups decide to buy only the best locals firms to enter in a new market by acquiring the most productive activities. In the empirical application, they find that after controlling for firm heterogeneity and for the presence of MNEs in more dynamic sectors, the differences between domestic and foreign firms decrease drastically. The result is very similar to those provided by Griffit (1999) and (Globerman et al., 1994), who after controlling for heterogeneity and different inputs levels, do not find evidence in favor of higher performances for the MNEs group.

Once a foreign firm decides to enter in a local market, the issue of the entrance strategy is important for both, firm's and foreign country's sides Previous analyses concerning this point are still limited, but Nocke and Yeaple (2007) show, through a general equilibrium model, how that choice can be endogenous, partially confirming the interpretation proposed by Benfratello and Sembenelli (2006).

The main motivation under direct FDI (Foreign Direct Investment) strategy (or Greenfield investment) versus cross-border M&A (or Brownfield investment), relies in a trade-off between the exploitation of own capabilities and the acquisition of costly country-specific tacit knowledge. Some capabilities are not mobile at international level, such as institutional competences, distributional network or marketing strategy (Arnand and Delios, 2002)

The present analysis is focused on the Turin area that similarly to Milan area, is characterised by the higher concentration of multinational in Italy (Basile, 2004).The less recent debate focused on large enterprises investing abroad large amount of resources, but as it is argued by Li and Hu (2002) for the Asian case, in recent years, also SMEs are increasingly involved in FDI.

This consideration justifies the focus on all the foreign owned firms located in a specific geographical area considering from micro firms to large enterprises. From the one hand that approach is more coherent with reality characterised by differentiated situations, but from the other hand it limits the interpretation of results and their possible extensions.

The methodology adopted is relatively new for this kind of analysis, often concentrated on financial and economic performances or productivity levels estimated under classic production functions. Only one paper applies non-parametric technique to compute TFP growth: Halkos and Tzeremes (2007) use DEA and Malmquist addressing both size and ownership issues with a focus on Greek manufacturing firms. A lack of literature emerges for the case of small and medium foreign subsidiaries, increasingly involved in direct and indirect FDI (Li and Hu, 2002).

In the present work both large and small foreign owned firms are analysed, productivity estimates are based on non-parametric methods considering both the issues of owner's origin and entrance strategy.

The reminder of the paper is organised as follows: section 2 briefly presents the methodological tools, section 3 shows the database and provides descriptive statistics; finally, Section 4 summarises the main results and Section 5 briefly concludes.

2 Methodology

2.1 TFP growth rate: a Malmquist indexes approach

Previous studies on MNEs and their Total Factor Productivity (TFP) trend generally assume a Cobb-Douglass production function, but of course some hypothesis on the shape of technology has to be accepted. Here, on the contrary, a fully non parametric Data Envelopment Analysis approach is applied to get TFP trends for the whole period considered. The main advantage of using a DEA approach is that it does not require to specify a functional form for the production process, then no assumptions have to be done on the shape of technology. A frontier for each year is directly derived from data and all firms in the sample are evaluated in term of their distance functions. Of course this non-parametric approach has a cost: the absence of an error component. Once the frontier has been estimated, for each Decision Making Unit (DMU) all the departure from that frontier is detected as inefficiency, without considering the possibility of stochastic disturbance. DEA methodology is a well-known technique, for additional technical details see Färe et al. (1994).

In the estimation of the frontier, constant returns to scale (CRS) are assumed, on the basis of Charnes et al. (1978) model, also called CCR model. The choice

is driven by the interest of calculating TFP indexes, which require CRS for more reliable estimation, as agued by Färe and Grosskopf (1996). TFP growth is computed assuming the standard definition from Malmquist, which exploits ratios of distance functions, based on the reference technology in each year, estimated by standard DEA programs. Following the standard approach by Färe and Grosskopf (1996), a standard measure of TFP growth can be defined as the ratio between output per unit of input at time t+1 over the same at time t, $TFP = \{y^{t+1} / x^{t+1}\} / \{y^{t} / x^{t}\}$. In the non-parametric context output to input ratio at each time can be replaced by an efficiency score obtained through a DEA estiamation. Therefore, TFP growth can be re-written using ratio of distances between each firms and its contemporaneous frontier. The Malmquist approach suggests using the geometric mean of TFP growth indexes evaluated, using t and t+1 frontier. In notation:

$$M_0^{t,t+1} = \left[\frac{D_0^t(x_0^{t+1}, y_0^{t+1})}{D_0^t(x_0^t, y_0^t)} \frac{D_0^{t+1}(x_0^{t+1}, y_0^{t+1})}{D_0^{t+1}(x_0^t, y_0^t)} \right]^{\frac{1}{2}} \quad (1)$$

Where D_0^t represents the technology at time t for a specific firms 0, while D_0^{t+1} represents the technology at the time t+1. The observed inputs/outputs bundles are represented by (x_0^t, y_0^t) for time t and (x_0^{t+1}, y_0^{t+1}) for t+1. The two components $D_0^t(x_0^t, y_0^t)$ and $D_0^{t+1}(x_0^{t+1}, y_0^{t+1})$ are standard DEA efficiency scores estimated at time t and t+1 (eq. 2 and 3), while the other two additional components $D_0^t(x_0^{t+1}, y_0^{t+1})$ and $D_0^{t+1}(x_0^t, y_0^t)$ are obtained as solution of mixed period linear programs (eq. 4 and 5).

$$D_0^t(x_0^t, y_0^t) = \left\{ \max \vartheta : X^t \lambda \geq x_i^t, Y^t \lambda \leq y_i^t, e\lambda = 1, \lambda \geq 0 \right\} \quad (2)$$

$$D_0^{t+1}(x_0^{t+1}, y_0^{t+1}) = \left\{ \max \vartheta : X^{t+1} \lambda \geq x_i^{t+1}, Y^{t+1} \lambda \leq y_i^{t+1}, e\lambda = 1, \lambda \geq 0 \right\} \quad (3)$$

$$D_0^t(x_0^{t+1}, y_0^{t+1}) = \left\{ \max \vartheta : X^t \lambda \geq x_i^{t+1}, Y^t \lambda \leq y_i^{t+1}, e\lambda = 1, \lambda \geq 0 \right\} \quad (4)$$

$$D_0^{t+1}(x_0^t, y_0^t) = \left\{ \max \vartheta : X^{t+1} \lambda \geq x_i^t, Y^{t+1} \lambda \leq y_i^t, e\lambda = 1, \lambda \geq 0 \right\} \quad (5)$$

Improvements in TFP level will result in values of the Malquist index M0(·) exceeding one, value smaller than unity represents deterioration in the TFP, that can be easily observed during crisis periods, as described by Coelli and Rao (2005). Malmquist indexes are in literature often decomposed in order to separate the effect due to changing efficiency level between period t and t+1 and to shifting frontier.

$$EFF_0^{t,t+1} = \frac{D_0^{t+1}(x_0^{t+1}, y_0^{t+1})}{D_0^t(x_0^t, y_0^t)} \quad (6)$$

$$TECH_0^{t,t+1} = \left[\frac{D_0^t(x_0^{t+1}, y_0^{t+1})}{D_0^{t+1}(x_0^{t+1}, y_0^{t+1})} \frac{D_0^t(x_0^t, y_0^t)}{D_0^{t+1}(x_0^t, y_0^t)} \right]^{\frac{1}{2}} \quad (7)$$

The two components represent two different side of TFP improvement. The EFF term represents the efficiency recovery in respect to the time t frontier, which lead to TFP improvements also in absence of technical progress through an increasing capacity in using available techniques, then it coincides with the learning by doing effect.

On the contrary the TECH term represents the pure technological progress able to shift upwards the best practice frontier and then it collects technological advancements which increase factors productivity. This is another important driver of the TFP growth, for additional detail on the definition of technical progress; see Coelli and Rao (2005).

2.2 Explaining TFP trends using a regression model

Productivity indexes, estimated using deterministic techniques, are analysed in a second stage phase by applying a standard regression model to identify the determinants of TFP growth. In this phase, are included, as regressors, variables on which managers cannot have direct control or "environmental" variables that can play a role in determining the observed TFP growth rates. The estimated equation assumes the following form:

$$TFP_i = \alpha' w_i + \beta' x_i + \varepsilon_i \quad (8)$$

where TPFi is the Malmquist productivity indexes, estimating with a standard DEA, relative to firms i, wi are environmental variable and xi are control variables which catch firms heterogeneity, while εi is the error term. β' are the parameters of interest because the vector xi collects some characteristics of the firms which are considered important in the present study. Those variables are, in particular, dummies reflecting the multinational status, the entrance strategy pursued by the foreign groups, while the country of origin cannot be investigated due to the limited number of firms foreign owned.

According to Kumar (2006), no particular econometric technique need to be applied to run second stage regression on TFP growth indexes obtained via Malmquist formulation; hence OLS can represent a valid tool. However, as underlined by Benfratello and Sembenelli (2006), the causal relationship between TFP and the multinational status should be interpreted with care given the tendency of MNEs to buy most productive local firms.

3 Data and descriptive statistics

3.1 Data sources and stylised facts

The empirical analysis is based on the AIDA database from Bureau Van Dijk that provides balance sheet data for a large and representative sample of firms operating in Italy. According to the illustrated purposes, the attention is focused on the subsample of firms located in the Turin province. The information on the foreign or domestic ownership comes from the Piedmont Agency for Investment and Tourism (CEIP), an agency promoted by Piedmont Region and Chambers of Commerce that maintain direct and indirect contacts with multinational firms. The presence of FDI is particularly relevant in the Turin area, thanks to a massive presence of automotive-related international manufactures, but also to foreign services firms.

The period of investigation, 2007-2009, coincide with the recent international crisis, where 2007 represents the pre-crisis observation. The sample is restricted to firms with complete balance sheet information for all the years considered. The final sample is composed by around 6500 domestic firms, and 292 foreign owned firms for which some additional information are available. In particular the entrance strategy pursued was object, during the previous years, of specific interviews and the data is reliable for the 80% of multinational subgroup (225 firms). Moreover, the origin of the parent multinational and the typology of control strategy chosen are listed in the original database from CEIP. Greenfield investments are an important way to enter within the Turin area, such that around 100 firms take this strategic choice.

In table 1 summary statistics are reported for the set of inputs and output variables used in the DEA framework to obtain efficiency measures and TFP growth rate. All values are in euro and relative to the last observation year 2009. Previous observations (2007 and 2008) are provided in 2009 constant prices, using sector-specific deflators and consumer price indexes by ISTAT series. The 5th and the 95th percentiles are provided with the means for the two groups of MNEs and domestic firms. Input variables represent both the production capacity of firms and the resources needed for the production process, for this reason the efficiency model is computed assuming the usage of 3 inputs to obtain 1 output. Regarding inputs: capital is proxied by total operative assets (tangible and untangible), labour usage is proxied by total wage, a more reliable data in financial statements and intermediate goods are given by the sum of raw materials, net of changes in inventories, services and other operative costs. Total wages have been preferred to the number of employees because the information is more reliable, the number of observation is larger and wages also partially consider the different quality of workers. The output variable coincides with the production value from balance sheet, is given by the sum of revenues from goods and services at the end of the year, net of changes in inventory.

Table 1 – Descriptive statistics of inputs, outputs and other characteristics (2009)

	Domestic firms			Multinationals firms		
	mean	p5	p95	mean	p5	p95
Inputs (th. of €)						
Labor costs (L)	734	20.6	1,816	6,440	96.9	26,900
Assets (K)	2,496	6.8	3,966	11,900	13.3	53,500
Intermediate goods (M)	7,370	93.3	12,200	37,200	509.8	182,000
Output (th. of €)						
Production (Y)	9,020	188.8	16,400	49,500	754.4	241,000
Firms structural characteristcs (indicators)						
Capital Intensity (K/L)	3.10			1.58		
Vertical Structure (M/Y)	68%			70%		
Number or firms	6520			292		

Source: own computations

Table 1 confirms, to some extents, the stylised facts highlighted by the recent literature. Turin MNEs are larger, both in term of production and assets and less capital intensive: in fact they need less capital for unit of wage, suggesting the existence some "proprietary assets" not included, as suggested by internationalization theory. The vertical structure of domestic and foreign firms seems similar, at least on average.

Table 2 – Profitability among sectors during the crisis (industrial ROI in 2009)

	Domestic firms			Multinationals firms		
Industry	mean	p5	p95	mean	p5	p95
Advanced services	7.9%	-9.4%	31.5%	5.5%	-4.6%	17.8%
Automotive Manufact.	-0.6%	-20.3%	14.1%	-2.9%	-24.5%	11.5%
Manufacturing	1.2%	-17.3%	17.6%	0.0%	-27.7%	17.2%
Services	4.8%	-16.3%	31.7%	-1.3%	-25.0%	23.9%
Wholesale and retail	2.8%	-15.0%	19.5%	1.0%	-29.3%	33.7%
Total	3.0%	-15.6%	22.1%	-0.04%	-26.3%	22.1%

Source: own computations

Table 2 gives some first impression on profitability trends during the recent crisis. As Benfratello and Sembenelli (2006) find from a sample of Italian firms, MNEs appear less profitable than their domestic counterparts, and this is also verified in the Turin area, for each industry. The crisis just shifts below ROI's values, but differences in levels between the two groups remain stable from 2007 to 2009, and the same for other indicators such as ROS or ROE.

3.2 Variables affecting productivity growth at firm level

According to the recent literature, some potential determinants of productivity differentials are investigated by including them in the regression phase explaining TFP growth at firm level.

The degree of vertical integration is defined according to the Adelman index (Adelman, 1995) as the ratio of value added to sales. Here, the structure of the firms will be caught by purchases of intermediate goods over total turnover, then the index catch vertical disintegration. The economic reasons for considering the vertical structure are numerous; Calabrese (2001) tries to enumerate some advantages for more integrated firms: quicker adjustment to customer needs, scope economies, reduction in transaction costs and easier quality control. On the same issue Calabrese and Erbetta (2005) conclude that in the modern automotive sector, for example, highly integrated and highly de-verticalised firms seems to perform better.

The capital intensity is measured by two variables to capture the variability between business models and industrial activities. The first aspect concerns the capital endowment per unit of labor and is controlled by the ratio K/L, here computed using the asset to labor cost ratio. The underlying idea is that different capital endowment for unit of labor corresponds to different technology (Latruffe, 2008). Secondly, the differences in the production process are proxied by the amount of capital needed to produce one unit of production. This aspect is considered through the variable (K/Y), named asset to turnover ratio, computed as the ratio between assets and total production.

Size and technical efficiency has been for long time debated in the productivity literature and in recent empirical works results seem to be contradictory. On the Italian situation recent works confirm the relevance of the size effect in the manufacturing sector (Pieri and Zaninotto, 2013). Larger firms are more able to exploit scale and scope economies and this enhance performances, particularly under the DEA framework that is focused on the technical ability of combining inputs to obtain outputs. From previous descriptive statistics a different size emerges for the two subgroups, then some differences in terms of productivity can be due to a different dimensional distribution across MNEs and domestic firms. The variable SIZE, given by the log of the average (2007-2009) own capital assets, is included as a control. From the logarithmic features of the variable, differences in the log scale are much smaller than in the monetary scale. For this reason also an additional squared term Size sq. is included to catch non-linear relationship with size and to control for very large dimension.

The Ownership variable, the key point of present work, is included as a dummy, following the approach adopted by Bottasso and Sembenelli (2004), even if here the ownership variable reflects foreign versus domestic ownership status, rather than the inclusion in a foreign industrial group. Therefore, a dummy variable equal to one in case of foreign owned firms is defined.

Finally, the strategy of entrance on the local market is identified by a dummy variable Greenfield, that indicates if the FDI is pursued through building a new

plant versus a cross-border M&A. The dummy is equal to one if the strategy is Greenfield.

4 Empirical results

Linear problems defined by equation 2, 3, 4 and 5, are solved for each firm and for each year using R and in particular its routines in the package FEAR. Given the heterogeneity of firms involved, efficiency and bootstrap are run separately for each sector, following the sector partition in table 2, estimating 5 separate frontiers within the sample. Given the heterogeneity of multinational firms involved in the analysis, this is the only way to have a sustainable number of MNEs to be compared with each frontier. Outliers have been detected using the routine in the package FEAR.

Results must be interpreted with care, due to the nature of DEA and Malmquist indexes which are born to compare small sample of homogenous firms producing physical quantity of outputs and implying physical quantity of inputs. In the present work, physical quantities are replaced by monetary variables from balance sheet data, therefore a certain instability of productivity indicators could derive from the data used.

4.1 Firms' efficiency

The estimated efficiency scores are reported in table 3, showing the medians, less dependent from the presence of outliers or un-reliable results, for the total sample and for the subgroup of multinationals.

Table 3 – DEA bias corrected efficiency score, median over sectors

Sector	Domestic firms			Multinationals firms		
	2007	2008	2009	2007	2008	2009
Advanced services	5.442	7.924	4.969	5.471	8.971	5.227
Automotive Manuf.	1.850	1.652	1.486	1.790	1.624	1.443
Manufacturing	2.257	2.249	2.531	2.263	2.062	2.262
Services	2.197	2.051	2.871	1.788	1.819	2.235
Wholesale & retail	1.952	2.016	1.589	1.916	2.208	1.713
Total	2.100	2.242	2.196	1.974	1.965	1.960

Source: own computations

For both MNEs and domestic firms arise good possibility of increasing production: in all years the output can increase substantially if the best technology was applied by each firms. However, these results must be interpreted with care, from the one hand for the usage of monetary values and from the other hand for the heterogeneity of firms in each macro sector. For these reasons the levels of inefficiency must to be interpreted with care, and relative comparison are preferred to absolute conclusions.

Inefficiency results are in general stable along the years, but of course this statement is driven by the fact that the frontier change each year, one of the main issue suggesting the use of Malmquist indexes. Large inefficiency scores, for example in Advanced Services or in Services and Manufacturing in 2009, highlight the coexistence of very efficient firms with marginal firms unable to adopt the best technology. Similar considerations can be done for the manufacturing sector, even if sub-sectors specificities can partially drive the evidence. From simple descriptive statistics, based on the median, MNEs seems to perform better and the evidence is confirmed by more formal non-parametric tests ns. Considering the whole sample, MNEs are more efficient, and this hypothesis can be accepted for each year. Nevertheless, if separate non parametric tests for efficiency differentials are run for each sector and year, the situation become less clear. In 2009, only manufacturing and services show significant differences, according to non-parametric Kruscal-Wallis test. In 2007 significant differences only survive in services, while in 2008 they are significant for Wholesale&Retail, Services and Manifacturing.

However, the interaction between size, sectors and efficiency can determine that evidence, given the observed larger dimension of MNEs affiliates in comparison to domestic owned firms.

4.2 TFP growth: Malmquist indexes results

Table 4 presents estimated trends of TFP for the period 2007-2009 without considering the intermediate observation for 2008, with the aim of increasing robustness of results. As expected, TFP is decreasing during the recent crisis, with an average reduction of 5% along three years. Geometric means of Malmquist indexes, computed individually, are reported for each sector, indexes smaller than 1, highlighting TFP contraction, reveal better performances of multinationals, in accordance with many empirical contributions (Globerman et al., 1994 and Girma et al., 2001). Over the period 2007-2009 only firms operating in Advance Services sectors are able to increase the level of their productivity. Significant differences can be observed for the subgroup of multinational firms, in Manufacturing and Services, while in the other three sectors, performances seem aligned.

Table 4 – TFP and its component, geometric mean by sector, period 2007-2009

Sector	Domestic firms			Multinationals firms		
	ML	EFF	TECH	ML	EFF	TECH
Advanced services	1.027	1.107	0.928	1.021	1.043	0.979
Automotive Manuf.	0.882	1.262	0.700	0.885	1.199	0.738
Manufacturing	0.913	0.895	1.019	0.959	0.954	1.005
Services	0.953	0.797	1.195	0.997	0.854	1.167
Wholesale & retail	0.963	1.132	0.851	0.967	1.066	0.907
Total	0.949	1.013	0.937	0.955	1.020	0.937

Source: own computations

The columns 3-4 and 6-7 of table 4 show the TFP decomposition in Efficiency change and Technical progress, directional results are mixed: in some sectors EFF sustain productivity (Manufacturing and Wholesale&Retail), in other TECH (Services and Manufacturing). The average results, using geometric means, show a positive efficiency recovery over the period; combined with a deterioration of technical possibilities. This result is unusual and in standard settings it is unreliable, but during one of the deeper economical crises after the Second War World, it could be accepted. Moreover, the consideration of economical variable instead of physical quantities could hamper that evidence. A further econometric analysis should be useful, to obtain more reliable conclusion aside from observable individual characteristic and interaction among significant aspects.

4.3 Intra-multinational comparisons

A focus (table 5) on foreign owned firms, and in particular on the origin of the owner, shows that if the owner comes from growing countries, such as BRIC, MNEs subsidiaries do not show better TFP dynamics. The table 5 partially confirms the evidence by Chen (2011) arguing that TFP is lower for multinational from emerging countries; non-parametric Kruskal-Wallis test confirms that differences in table 4 are significant. The unexpected result relies in the poor performance of UK and Germany: affiliates of their MNEs seem to growth less than other foreign-owned firms. Similarly, Japanese firms, show lower TFP growth, but in this case the number of observations is small and the evidence can be determined by sectoral effects. On the contrary to previous literature on the Italian case (Benfratello & Sembenelli, 2006), the performances of North-American firms are similar to domestic firm. However, subsidiaries from North America are mainly concentrated on Automotive activities, where the effect of the recent crisis has been particularly strong.

The best performances are reached by firms from Benelux and France, the most growing subgroup within MNE firms, and these better performances are confirmed by non parametric test based on Kruskal-Wallis methodology.

Table 5 – MNEs in the North-Western Italy: Malmquist indexes and components (geometric mean)

	Malmquist 2007-09		
Owner origin	M	EFF	TECH
Benelux	0.999	0.992	1.008
BRIC	0.909	0.878	1.036
France	0.993	1.038	0.957
Germany	0.936	1.033	0.906
Japan	0.870	0.937	0.928
North America	0.982	1.035	0.949
Other Countries	0.924	0.981	0.942
Scandinavian countries	0.925	1.081	0.856
UK	0.846	0.964	0.878
Total foreign firms	0.955	1.020	0.937

Source: own computations

Considering entrance strategy of multinationals near Turin (from table 6), Greenfield investments, pursued when capabilities can be easily transferred (Nocke and Yeaple (2007), show higher TFP growth than Brownfield investments (M&A). This evidence partially confirms the idea of more effective technology transfer from parent company in case of direct FDI. Moreover, from a policy viewpoint, Greenfield instruments are related to a higher effect on local job creation (Basile, 2004), then they represent win-win opportunities for MNEs and for the local community.

Table 6 – TFP growth indexes by MNEs' entrance strategy

Entrance strategy	N.	TFP growth 2007-09
Greenfield	103	0.960
Brownfield	121	0.925
Unknown	67	0.980
Total MNE	291	0.950

Source: own computations

However, this first impression in favor of higher efficiency for Greenfield plants cannot be deeply investigated due to the small number of firms involved. In particular, sector effects are significant and limited information on the year of entrance combined with a limited number of observations do not allow further

analysis. A dummy variable Greenfield is included into the regression model, even if its representativeness is limited. own

4.4 Explaining productivity trends

The regression reported in eq. (8) has been estimated using OLS and its robust versions for heteroskedasticity, reporting results in table 7. Additional regressions have been estimated assuming a sector-clusterization of error terms with the idea that firms belonging to the same sector will be subject to similar shocks, but the results are very similar to those reported in table 7. The econometric phase tries to explain TFP trends and some interesting points emerge from estimates, reported in table 7.

First of all, three different models have been run to check for the sensitivity of results and the evidence on the MNE status is robust to all these different model specifications.

In particular, the industry control has been analysed in two different ways. From the one hand, five main macro-sectors, in which multinationals are particularly active, have been identified (Manufacturing, Automotive, Wholesale&Retail, Services and Advance Servives) and five corresponding dummies have been created to isolate the effect on TFP. Moreover, a finer disaggregation of activities has been based on 2-digits ATECO codes which allow the creation of 21 homogeneus activities: for each of them a dicothomic variable isolate each specific effect.

Foreign owned firms show higher TFP growth in the period 2007-2009, on average 3.5% higher than domestic owned firms. The control for the firm's size and for different level of capital intensity is crucial and the three variables included appear significant. The relationship between TFP and size is negative, as well as the capital endowment per worker. However, this evidence is driven by the fact that large firms (larger and more capital intensive) are near the frontier in all considered years. Therefore, the only way for them to increase TFP is by creating technical progress, a difficult task during the recent crisis. Small and medium firms are facilitated in term of TFP growth because they can advantage of technical progress created elsewhere, by large firms in this case.

The robustness of results is guaranteed by the three specifications, with and without controlling for specific industrial effects through two set of dummies, and by the stability of estimated coefficients along these specifications. The results seem to confirm that being a subsidiary of a foreign firm gives a TFP growth rent, quantified by an additional growth around 3.5% over three years. These considerations are valid at all size class, from SMEs to large firms, even if the TFP trend is decreasing with size, as suggested by the negative coefficient. Size negatively affects productivity during crisis and then results suggest that flexibility is more important than scale economies in sustaining TFP growth when the firm is in

troubles. No evidence can be found regarding entrance strategy in the Turin area in relation to TFP growth.

Table 7 – The determinants of TFP trends

Independent variables	Dependent variable		
	TFP growth (1)	TFP growth (2)	TFP growth (3)
Mne	0.0342*	0.0358*	0.0387*
	(0.0198)	(0.0204)	(0.0208)
Greenfield	-0.00642	-0.0206	-0.0184
	(0.0288)	(0.0290)	(0.0280)
Vertical disintegration	0.103	0.161*	0.111
	(0.0777)	(0.0918)	(0.0832)
K/L	-0.00323**	-0.00339**	-0.00312**
	(0.00152)	(0.00152)	(0.00150)
K/Y	0.0818**	0.0813**	0.0776**
	(0.0375)	(0.0375)	(0.0373)
Size	-0.0136***	-0.00625**	-0.0104***
	(0.00283)	(0.00295)	(0.00276)
Macro-Sectoral dummies	No	Yes	No
2-digit ATECO	No	No	Yes
Constant	1.060***	0.961***	1.007***
	(0.0602)	(0.0684)	(0.0633)
Observations	6,811	6,811	6,811
R-squared	0.076	0.095	0.091

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: own computations

The capacity of the two models to explain variability of data is not high, as the R-square under 10% underlines, but it seems to be sufficient considering the cross-sectional nature of data, the high number of firms considered and the index nature of TFP. Of course, the positive statistical evidence in favor of multinationals in terms of productivity growth differentials, a robust evidence after controlling for size, industry effect and other structural differences among firms, cannot be interpreted as a strong causal relation, as highlighted by Benfratello & Sembenelli (2006). Without a more sophisticated model accounting for the potential endogeneity of the ownership status, results only suggest the existence of a positive relationship and they should be interpreted with care. In fact, this outcome can be due to the combination of a double effect. From the one hand, theoretical provisions suggesting the access to additional tangible and intangible assets can help multinational affiliates in performing better. From the other hand, the focus of multinationals on best local firms in the phase of new firms acquisition can play a not secondary role in determining the econometric results. Of course, some further

analyses in this direction are suggested to obtain more precise estimates of the ownership effect.

5 Conclusions

Theoretical and empirical literature converges in underling a competitive advantage for MNE owned firms due to superior technologies and higher managerial skills. Other contributions highlight some difficulties of making business abroad: the liability of foreignness can increase during crisis periods or in some particular geographical regions.

The aim of this study is to analyse productivity from a different perspective in comparison with previous empirical literature on MNEs: a particular area characterised by a high concentration of MNE firms operating in different sectors has been selected. Also the idea of productivity is relatively new in this contest: instead of classical parametric estimates of Total Factor Productivity, here the variable of interest is the results of a non-parametric estimate based on linear programming (DEA) in order to obtain TFP growth indexes. Productivity indicators, named Malmquist indexes, are analysed using a regression model to isolate the effect of size, vertical integration and capital intensity, for a more precise estimate of the influence of foreign ownership. The outcome of estimates confirms previous theoretical literature on the productivity advantage showed by foreign firms, evidence that remains significant also if the industry effect has been considered. However, the still open debate on the endogeneity problem about the multinational status does not allow an interpretation of empirical findings as a causal relationship.

Finally, the contribution on entrance strategy suggests that foreign firms choosing a Greenfield investment show higher TFP growth in comparison to Brownfield strategies. This evidence is confirmed by non-parametric tests across the two groups, even if it does not emerge from the regression model due to the small amount of data available. Presented results add new interesting features to the debate on foreign ownership which cannot be easily generalised due to the specificity of geographical area and to data limitations. This latter point will suggest further analysis in this direction by extending the work to other regions and by refining industry controls.

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