Innovation, foreign ownership and multinationality.
An empirical analysis on Italian manufacturing firms

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Abstract

Combining evidence on the ownership structure, internationalisation and economic performance of Italian manufacturing companies with microdata from the second Community Innovation Survey, this paper highlights that significant differences exist in productivity and innovatory behaviour of (foreign and domestic-owned) multinationals relative to domestic uni-national firms in Italy. However, while higher productivity is diffuse throughout all firms belonging to multinational groups, crucial innovative activities, including R&D, product innovation, patenting and technological cooperation with local firms and Universities are more likely in Italian MNEs than in foreign-owned firms in Italy. This suggests that it is highly desirable that the share of dynamic domestic multinationals grows in the Italian manufacturing industry, but it does not necessarily mean that a lower inflow of foreign capital is also desirable. In fact, we find no evidence that incoming foreign firms are taking over the most innovative and productive domestic firms. Hence they appear to add to, much more than substitute for, domestic technological activity. A case could probably be made for a better promotion and selection of inward investments, as to favour entry of higher value added activity.

JEL: D24, F23, L23, O30

Keywords: multinational firms, productivity, innovative behaviour

1. Introduction

Over the past decade there has been a remarkable increase in the foreign ownership of assets in Europe. This has contributed to attract the interest of both scholars and practitioners about the effects of inward investments, and *inter alia* about technological opportunities provided by foreign firms in advanced economies. From this perspective, a key issue is whether and to what extent foreign owned companies possess superior technology as compared to domestic firms. Several empirical studies have attempted to address this issue by analysing differences in productivity of foreign and domestic companies, controlling for a number of attributes of firms. There is large evidence that foreign-owned firms outperform domestic firms in host countries, but more recent works have shown that multinationality is more relevant than foreign ownership as a determinant of performance gaps (see Bellak 2002 for a review). In particular, foreign-owned firms, which are by definition *multinational companies*, exhibit a higher productivity as compared to domestic *uni-national* firms, while non-significant (or even negative) differences emerge with reference to domestic multinationals (Doms and Jensen 1998, Pfaffermayer and Bellak, 2002, Bellman and Jungnickel, 2002, Criscuolo and Martin 2003, De Backer and Sleuwaegen 2003). This is consistent with the theory that firms, whether foreign or domestic owned, need to have some form of *ex-ante* advantage in order to overcome the costs of entering international markets (Dunning 1970, Caves 1974, Markusen 1995). And it is also consistent with the increasing perception that multinationality can generate further (*ex post*) advantages, as it allows to access multiple, geographically dispersed sources of knowledge (Dunning, 1993; Fosfuri and Motta, 1999; Siotis, 1999, Zanfei, 2000; Cantwell and Narula, 2002).

This paper builds on this growing literature, and provides evidence on differences in technological performances of foreign and domestic manufacturing firms active in Italy over the second half of the 1990's, focussing on the role of multinationality as a source of heterogeneity. We improve on existing literature from two points of view. First, we use data on innovative behaviour in 1994-1996, based on Community Innovation Survey (CISII), and we compare them with data on productivity of foreign and domestic (multinational and uni-national) firms. This was never done for Italy, nor do we have knowledge of other works systematically comparing innovative activities across the same categories of firms for the whole of manufacturing industry in any country[1]. Considering productivity alone would provide only a spurious and indirect measure of technology. Although recent studies have attempted to disentangle technical efficiency from scale and monopoly power effects underlying differences in productivity (Girma and Gorg, 2002), it remains

[1] Frenz et al. (2002) have analysed patterns of innovative activities of multinational and uni-national firms in the UK, but with specific reference to a single sector, i.e. financial services, in the UK. Furthermore they did not compare innovation with productivity performances in this sector.

that not all technical change will translate into a higher output to inputs ratio. For example, Parisi, Schiantarelli and Sembenelli (2002) find that while an increase in process innovation is normally associated with higher total factor productivity, product innovation does not have any effect. It thus appears to be useful to consider other, more direct measures of innovative activity and behaviour, indicating for instance whether firms have actually introduced process and product innovation, whether they were engaged in R&D and patenting activities, and whether they were involved in different forms of technological collaborations with third parties.

Second, we also attempt to improve the analysis of technological diversity across firms by introducing a more useful categorisation of multinationals. We do not only distinguish between foreign owned multinationals, domestic multinationals and domestic uni-national firms, as it is more and more frequently done in the empirical literature. We also break-down the subset of domestic multinationals according to the nature of activities carried out by their affiliates abroad, and according to the position of firms within the multinational group they belong to. More precisely, we first separate "domestic manufacturing MNCs" (owned by domestic companies and having at least one manufacturing subsidiary abroad) from "domestic non manufacturing MNCs" (owned by domestic companies and having foreign affiliates carrying out *only* non manufacturing activities, mainly sales)[2]. Domestic firms belonging to the two types of multinationals may have different productivity and innovative behaviour, reflecting their distinct structural characteristics and motivations. In fact, the former are usually larger firms, with more articulated organisation of their global activities; while the latter tend to be more flexible but less structured firms, using their foreign facilities as "ancillary" to their manufacturing activities at home (Motta 1990).

The second distinction we made is between firms that are affiliates of a domestic multinational group, and those that are parent companies. Given this distinction, one can highlight how foreign affiliates in Italy differ from affiliates of domestic multinationals active in the same country; but also from the headquarters of domestic multinationals. While the former comparison may make more sense from an organisational point of view, as firms would occupy a similar position in each other's multinational group; the latter comparison may be more relevant from an industrial policy point of view. One might suggest that it is particularly worth favouring the presence of foreign owned investors when these have significantly higher technological levels than parent companies of domestic multinationals. If this were not the case, the costs of promoting inward direct investments would most likely exceed the benefits, and stimulating the birth and growth of dynamic domestic owned multinationals would be preferable. In fact, parent companies of domestic multinationals can

[2] It might be worth anticipating that firms included in our sample are only manufacturing firms *active in Italy*, including those belonging to these two typologies of domestic MNCs. What thus distinguishes what we defined as Italian manufacturing from non manufacturing MNCs is the composition of their affiliates *active abroad*.

have access to foreign sources of knowledge much like foreign multinationals, but have closer access to national sources of innovation (including their own central R&D facilities at home, if they exist), and might have higher incentives to interact, and exchange technology, with other domestic firms.

The rest of this paper is structured as follows. Section 2 illustrates our data-set, the firm categories we use, and the econometric specification we adopt to analyse differences in productivity and innovation. Section 3 discusses the main results of comparisons between affiliates of foreign firms, domestic multinationals, and domestic uni-national firms. Section 4 analyses the "*ex-ante*" conditions, that is whether foreign investments substitute for pre-existing local innovative activities, or rather add to them; and how productive and innovative were domestic firms which eventually invested abroad and became multinationals. This will shed some light on the link from technology to international production, and will contribute to place the issue of potential spillovers from multinational presence in a more precise perspective [3]. Section 5 concludes the paper.

2. Data and specification

The empirical analysis presented in this paper is based on a dataset resulting from the intersection of two different sources: the Second Community Innovation Survey (CIS II) and ELIOS (European Linkages and Ownership Structure). The former is a survey based on a common questionnaire administered by Eurostat to firms from all European countries which aims at assessing various aspects of firms' innovative behaviour and performances. Subject to a confidentiality agreement, we were allowed to access micro data for Italy from the survey carried out in 1996 and covering innovation occurring in 1994-1996[4]. Innovation data were complemented with ownership, multinationality and economic performance data from ELIOS dataset developed by the University of Urbino, Italy, which combines information from Dun & Bradstreet's Who Owns Whom and Bureau Van Dijck's Amadeus. The sample resulting from this matching is 1,114 manufacturing firms. Balcet and Evangelista (2003) utilize part of the same dataset to characterize innovative patterns of foreign-owned firms in Italy. Different from that work, we do not only draw information on foreign-owned firms (i.e. affiliates of foreign multinationals located in Italy) , but also on domestic-owned firms. As anticipated in the introduction, we break down the subset of domestic firms, distinguishing between uni-national firms and different categories of domestic

[3] Due to data limitations, in this study we are not able to control the technology-internationalisation relationship the other way around, that is whether firms become more productive and innovative by investing abroad, and whether inward investments actually determine productivity and innovation spillovers to domestic firms. In other works focused on Italy we have addressed these relations using productivity as a measure of technology (Castellani 2002, Barba Navaretti and Castellani 2003, Castellani and Zanfei 2003)

[4] We thank Giulio Perani from the Italian National Statistical Office for allowing us access to these data.

multinational firms, namely those that are part of a multinational group with manufacturing subsidiaries abroad, and those which are part of a multinational group with non manufacturing (mainly sales) subsidiaries in foreign markets. For each of these categories of domestic multinational firms we also separate between headquarters and subsidiaries active in Italy. Figure 1 provides a graphical representation of the sample and of its various subsets of firms. To summarize, the 1,114 sample firms are all active in manufacturing sectors in Italy, of which 325 are foreign-owned firms (i.e. Italian affiliates of foreign MNCs) denoted as FOR, 467 are firms part of an Italian multinational (MNCGRP), while 322 are domestic uninational firms (DOM). Out of the 467 firms part of a multinational group, only 275 belong to groups controlling at least one foreign manufacturing firm, that is they are part of "domestic manufacturing multinationals"[5]. We shall denote this subset as MNCGRP_MAN. Some 123 of these firms are headquarter companies of domestic manufacturing multinationals [6]. Firms which are not headquarters but do belong to a domestic manufacturing multinational, and hence are national subsidiaries of such a MNC, will then add up to 152. This sub-sample is the most closely "comparable" to the sub-sample of Italian subsidiaries of foreign firms (FOR), at least from an organisational point of view.

Table 1 provides some further details on the sectoral composition of firms, on their size, together with the main indicators of their technological activities, as expressed in terms of total factor productivity, the share of innovative firms and product to process innovation ratio in each of the examined sub-samples. Suffice here to notice three important features of the examined sample. First, the average size of sampled firms is relatively high, certainly higher relative to the universe of manufacturing firms in Italy, but the distribution of firms by Pavitt sectors and by low-medium-high technology classes substantially corresponds to the specialisation of Italy's industry: a high overall weight of traditional, supplier dominated and scale intensive industries, and a very small share of firms active in science based industries (an even smaller share in the case of high technology industries, as classified by Oecd)[7]. Second, the share of science based (and high tech) activities is slightly higher in the case of affiliates of foreign owned multinationals (FOR) than it is the case of domestic firms. This largely corresponds to the sectoral distribution of foreign affiliates as recorded by available statistics produced by Reprint Dataset and ultimately published in Oecd's *Measuring globalisation* for Italy (CNEL 2002, Oecd 2002). Third and finally, foreign owned manufacturing affiliates (FOR) do appear to be systematically more productive and more innovative by all

[5] While 192 firms belong to multinational groups controlling only non-manufacturing subsidiaries. We define this kind of multinational groups as "non manufacturing MNCs".

[6] This suggests that a large proportion of Italian multinationals control only non manufacturing subsidiaries abroad. In particular, 158 firms can be classified as headquarters of multinationals without any foreign manufacturing subsidiary.

[7] To a more detailed analysis, the NACE two digit sectoral distribution of sample firms turns out to be not significantly different from the Eurostat universe of firms over 50 employees.

indicators in table 1, as compared to domestic uni-national firms (DOM), and the former also have a higher product to process innovation ratio than the latter. However the scenario is much more blurred once we compare foreign affiliates to the other categories of domestic owned multinational firms.

Of course, figures in table 1 only allow for rough comparisons without any controls. A more precise analysis requires the use of multivariate techniques. We shall first estimate the following expression:

$$y_i = \alpha + \beta\ FOR_i + \delta_1 MNCGRP_i + Z_i'\gamma\ + \varepsilon_i$$

where y denotes a measure of firm performance or a characteristic of its innovative behaviour (see Table 2), Z is a vector of controls such as firm age, sector, region and size dummies, while FOR and MNCGRP are defined as above. Within this context, β and δ_1 represent the difference in performance or innovative behaviour of foreign-owned firms and of firms belonging to a domestic multinational group relative to domestic uni-national firms (the baseline category).

We then extend this specification in order to test whether it makes any difference being part of a domestic manufacturing multinational and being the headquarter of such a group. In other words, we estimate:

$$y_i = \alpha + \beta\ FOR_i + \\ + \delta_1 MNCGRP_i + \delta_2 MNCGRP\_MAN_i + \delta_3 MNCGRP\_HQ\_MAN_i + Z_i'\gamma\ + \varepsilon_i$$

In this case, β can be interpreted as before, δ_1 captures differences in performance or innovation between firms belonging to domestic non manufacturing multinationals and domestic uni-national firms, while δ_2 measures any gap between firms belonging to domestic manufacturing MNCs and firms belonging to other domestic multinational companies, and δ_3 denotes the additional differential at the headquarter level relative to other manufacturing firms belonging to the same multinational group. The difference between parent companies and domestic uni-national firms is the sum of δ_1, δ_2 and δ_3.

3. Results: comparing productivity and innovative behaviour

Results in Table 3a are consistent with our prior, derived from the theoretical and empirical literature, that firm belonging to multinational groups (either foreign or domestic owned) outperform domestic uni-national firms (higher productivity and wages) and exhibit different innovative patterns (higher propensity to innovate products). However, interesting results emerge when we distinguish within domestic multinationals (see tables 3a and 3b). First, only manufacturing MNCs have higher productivity and pay higher wages *relative to domestic uni-nationals*. Second, while productivity and wages are higher in all the domestic subsidiaries within

an Italian manufacturing multinational, the most crucial innovative activities, including product innovation, R&D, patenting and technological cooperation with foreign parties, appear to be concentrated at the headquarter level.

The fact that productivity premiums are more diffuse across firms belonging to domestic multinationals, than it is the case with innovative activities, might have to do with the different nature of indicators used to capture technology gaps across firms. Even setting aside the problem of disentangling efficiency effects from scale and monopoly power effects, productivity indicators are rather limited measures of technology. Changes in productivity may well reflect modifications in managerial practices, in the organisation of labour and improvements in manufacturing procedures. However, they can hardly account for other innovative activities, such as the introduction of new products or the setting up of technical alliances, which will possibly, but not immediately nor necessarily, translate into changes of output per unit inputs. It is not surprising that these innovative activities, which tend to require significant R&D efforts and strategic decision making, are relatively concentrated at both the geographical and organisational level. Conversely, one might venture saying that these results support the hypothesis that managerial practices, organisation of labour and improvements in manufacturing procedures can be more easily transferred to all firms belonging to the multinational group than the ability to introduce new products.

Having highlighted some important diversities across domestic multinationals relative to domestic uni-national firms, some remarkable differences also emerge between foreign-owned firms and domestic firms belonging to Italian multinationals (see tests 1, 2, and 3 in tables 3a through 3c). *Relative to foreign multinationals*, headquarters of domestic multinationals have much the same propensity to set up international technological cooperation, but they are more involved in product innovation, in R&D and patenting activities and in cooperation with national partners than affiliates of foreign owned companies. This is consistent with Balcet and Evangelista (2003) who find that foreign affiliates in Italy are often less innovative than domestic firms (including Italian MNEs) and characterized by relatively low technological profiles (especially in science based industries). The point to be made, however, is that the potential for spillovers for the Italian economy is even higher from headquarters of domestic multinationals than in the case of affiliates of foreign firms. This seems to apply in terms of both technological opportunities provided to other domestic firms and in terms of linkage creation with local counterparts. In particular, as shown in table 3c, domestic multinationals have a higher propensity to cooperate with other Italian firms within the same group but also, and most importantly, with domestic suppliers and Universities. Linkage creation has long been considered perhaps the most important channel through which investment can create technology and productivity spillovers. This view, originally put forward by

Hirschman (1958) with reference to all categories of investment creating new demands for inputs and/or new opportunities for downstream activities, has been usually applied to the case of foreign direct investment (see, *inter alia* Rodriguez-Clare 1996) although empirical evidence is scarce and most often based on indirect measures of linkage creation (Castellani and Zanfei, 2004). In the case of Italy, we find direct evidence of higher linkage creation for investment by domestic multinationals, than is the case of foreign investors.

By contrast, the other (non headquarter) domestic firms belonging to manufacturing MNCs pay much the same salaries as Italian affiliates of foreign owned firms and have even higher productivity; but have a lower propensity to innovate products, to set up technological alliances with foreign partners. One can think of at least four reasons for such differences. First, foreign subsidiaries need to overcome the cost of operating in a foreign market, thus the parent company might decide to transfer a higher share of strategic activities to affiliates active abroad than to domestic affiliates. Second, foreign affiliates might learn through the interaction with firms and institutions in the host country, thus increasing their innovative ability. Third, a home country effect may play a role, causing multinationals from relatively more advanced economies and systems of innovation to exhibit better innovation performance. Fourth, foreign multinationals might acquire better firms in the host country. In the next section we will address this latter "picking-the-cherries" issue, while in Table 4 we shed some light on the home country effect, estimating performance and innovative differentials for foreign-owned firms originating from European countries, from the US and from other countries (mainly Japan). Results suggest that EU-owned multinationals carry out relatively more R&D and innovative activities in their Italian affiliates than US multinationals, while the latter, consistently with a general characteristic of US firms, tend to pay higher wages and show a very high propensity to engage in international technological cooperation[8]

4. The ex-ante conditions: "Picking-the-cherries" and self-selection

In the previous section we have found significant differences in performances and innovative behaviour between foreign multinational, domestic multinationals and domestic uni-national firms. These diversities might be interpreted as signals that foreign owned and domestic multinationals have different potentials for spillovers to the other (uni-national) firms active in Italy. And often this potential has appeared to be higher in the case of domestic multinationals than in the case of foreign multinationals. Nevertheless, we cannot claim we have identified any causal relation.

[8] Similar patterns of involvement in international technological cooperation by US multinationals have been found by Hagedoorn (2002) with reference to most high-technology industries monitored by the Merit-Cati database. The propensity to pay higher salaries of US multinational companies in Europe has been highlighted *inter alia* by Basile et al. (2003).

Here we shall focus on a related issue, i.e. the *ex ante* conditions which characterised investment decisions of (foreign and domestic) multinationals in Italy. We shall ask ourselves whether foreign multinationals have acquired the best domestic firms ("picking-the-cherries" hypothesis); and whether Italian multinational possess some ex-ante performance and innovation advantage over domestic firms (self-selection hypothesis). Using information from Who Owns Whom (Wow) editions of 1998 and 2001 (data refer to 1997 and 2000 respectively) we select two subsamples: (a) firms which were not foreign-owned in Wow1998 (b) domestic-owned firms which were not (Italian) multinational in Wow98. We then looked for the ownership and subsidiaries of those firms in Wow2001 and defined:

- within sample (a): firms which were acquired in 1997-2000 (i.e. became foreign-owned)
- within sample (b): firms which became domestic owned multinationals in 1997-2000.

Then we tested whether performance and innovation before 1997 explain the probability of either being acquired or become a MNC.

On the one hand, results from Table 5 suggests that ex-ante size, productivity and innovation in the target firms do not explain acquisitions by foreign multinationals. In other words, it does not seem that foreign multinationals "pick-the-cherries" . This could be interpreted as evidence of the fact that foreign multinationals are not a serious threat to Italy's development of its own technological capabilities; and rather a source of technological opportunities. Yet an alternative interpretation, less encouraging for the host country economy, is that foreign multinationals do not resort to cherry-picking strategies in Italy for the plain and simple reason that there are "not many cherries to pick". Whichever interpretation holds true, it remains that a cherry-picking strategy is not a recurrent pattern of entry. Although this is far from demonstrating that inward investments actually create technological spillovers [9], the dangerous perspective of foreign owned multinationals spoiling domestic economy by gaining control over its best performing activities seems to be out of sight.

On the other hand, there is some evidence that an ex-ante advantage explains the choice to become multinationals, but interesting differences emerge if one consider domestic firms investing abroad in manufacturing or non-manufacturing activities. In particular, Table 6a suggests, consistently with other studies on Italian firms (Barba Navaretti and Castellani, 2003) that companies switching to international production (i.e. previously uni-national firms which set up at least one manufacturing subsidiary abroad in the examined period) are larger and more productive;

[9] A number of other structural and behavioural circumstances affect spillovers from presence of multinationals. These include: the extent to which multinationals create linkages with local (uni-national) firms, the process through which multinationals learn by internationalising and increase their potential for technology transfer, the effectiveness of institutions in bridging innovative activities carried out by different actors, and the capability of public policies to prevent and solve monopoly effects of multinational presence.

however they do not exhibit any particular ex-ante propensity to innovate. On the contrary, as shown in table 6b, firms investing abroad in non-manufacturing activities, which most often consist in setting up sales and distribution channels, are relatively smaller in size and do not exhibit any particular productivity edge, but they tend to have some innovative product ex-ante[10].

The overall picture we have drawn highlights different self-selection patterns of domestic firms going multinational. While the largest and most productive firms are likely to be able to set up manufacturing facilities abroad, the most innovative firms seem to prefer not to commit to manufacturing activities in foreign markets. These latter firms try the "easier way out" which, apart from exporting, consists of setting up sales facilities (and in some circumstances in the provision of after sales assistance services) through which innovation obtained at home is exploited abroad. This is probably a more flexible and quick way to reach foreign markets with innovative products. However, it might prove to be a more fragile strategy, as firms appear to give up the possibility of more extensively plugging into foreign sources of knowledge, which would require a higher recourse to manufacturing and R&D activities abroad. This interpretation is consistent with evidence on *ex post* productivity advantages of internationalisation strategies (Castellani 2002), showing that firms investing in manufacturing activities abroad increase their productivity more and at a faster rate than firms investing only in non manufacturing activities.

5. Concluding remarks

We have shown that significant differences exist in productivity and innovation behaviour of manufacturing firms active in Italy and that multinationality accounts for a large part of this heterogeneity. Foreign and domestic multinationals both pay higher wages, exhibit a higher productivity and a greater propensity to get involved into R&D, product innovation, and technological collaboration than domestic uni-national firms. To a closer look, it appears that among domestic multinationals, those with at least some manufacturing activity abroad (and not those with non manufacturing activity only) exhibit a higher productivity. Furthermore, while higher productivity is diffuse throughout all firms belonging to manufacturing multinational groups, crucial innovative activities, including R&D, product innovation and international technological cooperation, are more concentrated at the headquarter levels. Finally, headquarters of domestic

[10] It is worth mentioning that the contribution of size, TFP and innovation to the probability of switching into *non-manufacturing* MNC (Table 6b) increases substantially when we exclude from the regression firms which became *manufacturing* MNC over the same period (Sample II, last column of table 6b). This can be easily explained with the fact that the excluded firms have some ex-ante advantage (as resulting from Table 6a) over the appropriate control group of firms remaining uni-national which slightly distorts the result obtained with sample I.

multinationals are even more innovative, and set up more linkages with local firms and institutions, than affiliates of foreign firms in Italy.

It is thus highly desirable that the share of dynamic domestic multinationals grows in the Italian manufacturing industry. This does not necessarily mean that a lower inflow of foreign capital is also desirable. This for at least three reasons. First, the inflow is already very low, and foreign owned assets represent a much lower share of fixed capital formation in Italy than in other EU countries. Second, there is no evidence that incoming foreign firms are gaining control of the most innovative and productive domestic firms. Hence they appear to add to, much more than substitute for, domestic technological activity. Third, evidence from previous studies show that there have been positive spill-overs to domestic firms in Italy over the 1990's, at least in terms of productivity. A case could probably be made for a better promotion and selection of inward investments, as to favour entry of higher value added activity.

As far as domestic multinationals are concerned, our study has shown that it is the largest and most productive firms that will eventually set up manufacturing facilities abroad; while the most innovative ones seem to prefer "lighter" foreign investment strategies, consisting in the set up of non manufacturing facilities, mainly for the commercialisation of manufacturing and innovative activity carried out at home. We have suggested that this is certainly a lower cost investment strategy but it is a weak one, that is likely to produce limited results in terms of learning and of access to foreign sources of knowledge.

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Figure 1 – Definition of groups of firms in the sample

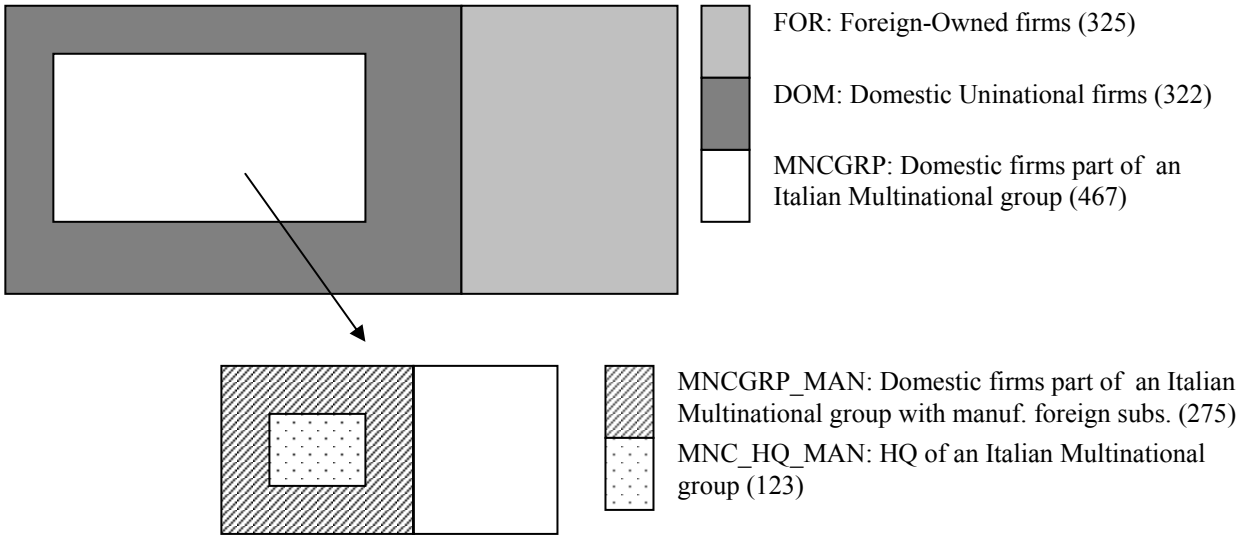

Table 1 – Descriptive statistics

	DOM	FOR	MNCGRP	MNCGRP MAN	MNC_HQ MAN	Total
N. of firms	322	325	467	275	123	1114
%	*28.9*	*29.2*	*41.9*	*24.7*	*11.0*	*100*
N. of firms						
By pavitt sectors						
Science Based	8.3	15.6	9.8	10.1	8.1	10.5
Scale Intensive	39.9	46.7	38.9	46.5	39.8	41.9
Specialized Suppliers	19.2	22.1	20.7	21	26.8	20.1
Supplier Dominated	32.4	15.3	30.4	22.1	25.2	27.4
	100	100	100	100	100	100
By tech class						
Low tech	32.8	17.1	29.0	26.8	26.0	28.2
Medium-Low tech	27.2	24.6	27.3	24.6	25.2	26.4
Medium-High tech	34.3	46.7	37	40.1	43.0	38.0
High tech	5.5	11.5	6.6	8.3	5.6	7.3
	100	100	100	100	100	100
N. of employees	90,199	209,136	512,208	345,649	202,395	811,543
%	*11.1*	*25.8*	*63.1*	*42.6*	*24.9*	*100*
Avg. n. employees	338	706	1208	1382	1732	822
Avg. TFP	1.02	1.05	1.05	1.08	1.10	1.04
N. product innov.	169	225	306	184	98	700
Share in total firms	*52%*	*69%*	*66%*	*67%*	*80%*	*63%*
N. process innov.	179	206	304	188	95	689
Share in total firms	*56%*	*63%*	*65%*	*68%*	*77%*	*62%*
Product/process inno	0.94	1.09	1.01	0.98	1.03	1.02

Table 2 – List of indicators of firm performance and innovative behaviour

Variable	Description	Source
Performance		
TFP	Log of the TFP of firm i	ELIOS
WAGE	Log of the (gross) Cost of labour per employee	ELIOS
Innovation		
INPDT	=1 if firm i introduced product innovation in 94-96	CIS2
INPCS	=1 if firm i introduced process innovation in 94-96	CIS2
RTOT	=1 if firm i spent any money in R&D activities (both intra and extra muros)	CIS2
PAT	=1 if firm i applied for at least one patent in 94-96	CIS2
CO_NAZ	=1 if firm i had some technological cooperation with Italian counterparts in 94-96	CIS2
CO_INT	=1 if firm i had some technological cooperation with foreign counterparts in 94-96	CIS2
CO1	=1 if firm i had some technological cooperation with firms within the same group	CIS2
CO3	=1 if firm i had some technological cooperation with clients	CIS2
CO5	=1 if firm i had some technological cooperation with suppliers	CIS2
CO6	=1 if firm i had some technological cooperation with Universities	CIS2

Table 3a – Differences in performance and innovation, by multinationality and foreign ownership

Dep. var.	TFP	WAGE	INPDT	INPCS	PAT*	RTOT*	CO_NAZ*	CO_INT*
Estimation method	OLS	OLS	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT
Sample	All firms 1996-2000	All firms 1996-2000	All firms 1996	All firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996
FOR	.024**	.083**	.068*	-.019	-.095*	.029	.011	.763*
	(.011)	(.011)	(.042)	(.043)	(.054)	(.020)	(.047)	(.048)
MNCGRP	.037**	.044**	.074*	.014	-.030	.052**	.054	.026
	(.010)	(.009)	(.039)	(.038)	(.052)	(.022)	(.044)	(.044)
Test 1	-.013	.039**	-.006	-.033	-.065	-.023	-.043	.737
(p-value)	(.150)	(.000)	(.891)	(.389)	(.170)	(.383)	(.271)	(.199)
N. obs	4407	4417	1075	1109	769	634	778	769

* CIS2 provides detailed information on innovative behaviour only for innovative firms

Estimated equation $y_i = \alpha + \beta\ FOR_i + \delta_1 MNCGRP_i + Z_i'\gamma\ + \varepsilon_i$

All regressions are estimated with a constant and controlling for age of the firm, sector, region and size dummies. Standard Errors in parenteses below estimates. Asterisks denote confidence levels (**: p<.05; *: p<.10)

Test 1: Difference between β and δ_1. Asterisks denote whether it is statistically different from zero

Table 3b – Differences in performance and innovative behaviour, by multinationality and foreign ownership

Dep. var.	TFP	WAGE	INPDT	INPCS	PAT*	RTOT*	CO_NAZ*	CO_INT*
Est. method	OLS	OLS	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT
Sample	All firms 1996-2000	All firms 1996-2000	All firms 1996	All firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996
FOR	.026**	.086**	.073*	-.015	-.096*	.028	.017	.080*
	(.011)	(.011)	(.042)	(.043)	(.054)	(.018)	(.047)	(.048)
MNCGRP	.010	.002	.058	-.008	-.003	.038	-.033	-.067
	(.012)	(.011)	(.047)	(.047)	(.064)	(.024)	(.055)	(.054)
MNCGRP_MAN	.042**	.071**	-.037	.001	-.110	.015	.110*	.083
	(.144)	(.013)	(.060)	(.057)	(.072)	(.034)	(.067)	(.066)
MNCGRP_HQ_MAN	.014	.003	.154**	.098	.129*	.062**	.071	.136**
	(.016)	(.015)	(.055)	(.060)	(.079)	(.016)	(.065)	(.069)
Test 2	-.026**	.013	.052	-.008	.017	-.025	-.06**	.064
(p-value)	(.048)	(.318)	(.330)	(.876)	(.786)	(.792)	(.030)	(.188)
Test 3	-.04**	.01	-.102**	-.106*	-.112*	-.087**	-.131**	-.072
(p-value)	(.003)	(.499)	(.05)	(.057)	(.089)	(.032)	(.016)	(.238)
N. obs	4407	4417	1075	1109	769	634	778	769

* CIS2 provides detailed information on innovative behaviour only for innovative firms

Estimated equation $y_i = \alpha + \beta\ FOR_i + \delta_1 MNCGRP_i + \delta_2 MNCGRP\_MAN_i + \delta_3 MNCGRP\_HQ\_MAN_i + Z_i'\gamma\ + \varepsilon_i$

All regressions are estimated with a constant and controlling for age of the firm, sector, region and size dummies. Standard Errors in parenteses below estimates. Asterisks denote confidence levels (**: p<.05; *: p<.10)

Test 2: Difference between β and $(\delta_1 + \delta_2)$. Asterisks denote whether it is statistically different from zero

Test 3: Difference between β and $(\delta_1 + \delta_2 + \delta_3)$. Asterisks denote whether it is statistically different from zero.

Table 3c – Differences in technological cooperation, by multinationality and foreign ownership in innovative firms*

Dependent var.	CO1_NAZ	CO1_INT	CO3_NAZ	CO5_NAZ	CO6_NAZ	CO6_INT
Estimation method	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT
Sample	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996	Innovative Firms 1996
FOR	.012	.184**	.011	.001	-.025	-.007
	(.029)	(.047)	(.028)	(.022)	(.028)	(.018)
MNCGRP	-.005	-.041	-.033	-.032	-.036	.028
	(.035)	(.043)	(.034)	(.026)	(.036)	(.028)
MNCGRP_MAN	.064	.096*	.040	.090**	.080*	-.040**
	(.048)	(.067)	(.048)	(.051)	(.053)	(.019)
MNCGRP_HQ_MAN	.070*	.096**	.022	.017	.044	.164**
	(.047)	(.057)	(.042)	(.029)	(.044)	(.096)
Test 2	-.047	.129**	.004	-.057	-.069*	.005
(p-value)	(.196)	(.000)	(.756)	(.195)	(.069)	(.391)
Test 3	-.117**	.033	-.018	-.074**	-.113*	-.159**
(p-value)	(.007)	(.249)	(.704)	(.027)	(.001)	(.002)
N. obs	743	760	654	676	723	498

* CIS2 provides detailed information on innovative behaviour only for innovative firms

Estimated equation $y_i = \alpha + \beta\ FOR_i + \delta_1 MNCGRP_i + \delta_2 MNCGRP\_MAN_i + \delta_3 MNCGRP\_HQ\_MAN_i + Z_i'\gamma\ + \varepsilon_i$

All regressions are estimated with a constant and controlling for age of the firm, sector, region and size dummies. Standard Errors in parenteses below estimates. Asterisks denote confidence levels (**: p<.05; *: p<.10)

Test 2: Difference between β and $(\delta_1 + \delta_2)$. Asterisks denote whether it is statistically different from zero

Test 3: Difference between β and $(\delta_1 + \delta_2 + \delta_3)$. Asterisks denote whether it is statistically different from zero.

Table 4 – Differences in performance and innovative behaviour, by area of origin

Dep. var.	TFP	WAGE	INPDT	INPCS	PAT*	RDTOT*	CO_NAZ*	CO_INT*
Est. method	OLS	OLS	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT	PROBIT
Sample	All firms 1996-2000	All firms 1996-2000	All firms 1996	All firms 1996	Innov. firms 1996	Innov. firms 1996	Innov. firms 1996	Innov. firms 1996
US	.055**	.121**	.042	.024	-.088	-.005	.003	.125*
	(.015)	(.016)	(.062)	(.063)	(.074)	(.031)	(.064)	(.075)
EU	.012	.069**	.088*	-.015	-.090	.037*	.031	.077
	(.011)	(.011)	(.045)	(.047)	(.058)	(.016)	(.052)	(.053)
OTH	.096**	.150**	-.019	-.348	-.293	.037	---	---
	(.048)	(.039)	(.186)	(.176)	(.164)	(.024)		
MNCGRP	.010	.002	.058	-.008	-.003	-.015	-.035	-.070
	(.012)	(.011)	(.047)	(.047)	(.064)	(.033)	(.055)	(.054)
MNCGRP_MAN	.043**	.072**	-.038	.002	-.109	-.015	.111*	.086
	(.014)	(.013)	(.060)	(.057)	(.072)	(.033)	(.067)	(.067)
MNCGRP_HQ_MAN	.013	.002	.155**	.098	.129*	.061**	.072	.137**
	(.016)	(.015)	(.055)	(.060)	(.079)	(.016)	(.066)	(.069)
Test 4	.043**	.052**	-.046	.039	-.002	-.042*	-.028	.048
(p-value)	(.003)	(.001)	(.467)	(.531)	(.985)	(.097)	(.657)	(.500)
N. obs	4407	4417	1075	1109	769	631	774	769

* CIS2 provides detailed information on innovative behaviour only for innovative firms

Estimated equation: $y_i = \alpha + \beta_{US} US_i + \beta_{EU} EU_i + \beta_{OTH} OTH_i + \delta_1 MNCGRP_i + \delta_2 MNCGRP\_MAN_i + \delta_3 MNCGRP\_HQ\_MAN_i + Z_i'\gamma\ + \varepsilon_i$

All regressions are estimated with a constant and controlling for age of the firm, sector, region and size dummies. Standard Errors in parenteses below estimates. Asterisks denote confidence levels (**: p<.05; *: p<.10)

Test 4: Difference between β_{US} and β_{EU}. Asterisks denote whether it is statistically different from zero

Table 5 - Determinants of acquisitions by foreign multinationals: testing the "cherry-picking" hypothesis (probit estimates)

Dep. Var =1 if firm *i* is **acquired** in 1997-2000

Innovate in 94-96	.005		.007	.009
	(.016)		(.015)	(.020)
Log(Tfp96)		-.041*	-.041*	-.051
		(.023)	(.023)	(.034)
Log(empl96)			-.001	-.006
			(.007)	(.010)
Sector dummies	No	No	No	Yes
N. obs.	582	582	582	381

Table 6a - Determinants of international production: testing the "self-selection" hypothesis for domestic manufacturing MNCs (probit estimates)

Dep. Var =1 if firm *i* **became "manufacturing" MNC** in 1997-2000 (firms with at least one manufacturing subs)

Sample	I	I	I	I	II
Innovate in 94-96	.038		.024	-.001	.014
	(.023)		(.023)	(.032)	(.037)
Log(Tfp96)		.090**	.078**	.108**	.150**
		(.039)	(.039)	(.049)	(.060)
Log(empl96)			.024**	.030**	.055**
			(.009)	(.013)	(.018)
Sector dummies	No	No	No	Yes	Yes
N. obs.	471	471	471	375	279

Sample I: All domestic-owned firms not controlling any manufacturing subsidiary at 1997
Sample II: All domestic-owned firms not controlling any manufacturing subsidiary at 1997 and non-manufacturing MNC at 2000

Table 6b - Determinants of international production (probit estimates): testing the "self-selection" hypothesis for domestic non manufacturing MNCs (probit estimates)

Dep. Var =1 if firm *i* **became "non-manufacturing" MNC** in 1997-2000 (firms with only non-manufacturing subs)

Sample	I	I	I	I	II
Innovate in 94-96	.063**		.059**	.060**	.072**
	(.016)		(.016)	(.020)	(.026)
Log(Tfp96)		.061*	.048*	.062*	.100**
		(.032)	(.026)	(.034)	(.041)
Log(empl96)			.002	.007	.030**
			(.007)	(.010)	(.015)
Sector dummies	No	No	No	Yes	Yes
N. obs.	438	438	438	335	242

Sample I: All domestic-owned firms not controlling any non-manufacturing subsidiary at 1997
Sample II: All domestic-owned firms not controlling any non-manufacturing subsidiary at 1997 and manufacturing MNC at 2000