Asymmetric spillover effects from MNE investment

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Abstract

This article examines the relationship between foreign MNE investments and the productivity of domestic firms, focusing on the *boundary conditions* that channel the emergence of asymmetric spillover effects from foreign companies. We build an original conceptual framework incorporating the novel notions of *pressure to compete* and *pressure to innovate*, both combining different aspects of business-level and industry-wide heterogeneity. By employing data for 12,189 Italian manufacturing firms over the period 2003–2009, we highlight that the interplay between these pressures functions as a catalyst for the emergence of large asymmetries in the relationship between foreign MNEs and domestic firm productivity.

Keywords: MNE investments, firms' heterogeneity, asymmetric spillovers, technological environment, market competition

INTRODUCTION

The study of the impact of multinational enterprises (MNEs) on the performance of domestic firms has received much attention in academic research, but it has also delivered contrasting results (e.g., Alfaro, 2017; Piscitello & Santangelo, 2007; Rojec & Knell, 2018). This ambiguity refers to the observation that MNEs' investments generate two different effects: technology spillovers related to the technology space in which firms operate, and market rivalry dynamics that characterize firms' product market space. Both effects can either harm or benefit the performance of incumbent companies, depending on the balance between gains and losses from technological opportunities and product market competition (Békés, Kleinert, & Toubal, 2009; Bloom, Schankerman, & Van Reenen, 2013). Importantly, the preponderance of positive or negative effects depends on the interplay between two dimensions: the heterogeneity of domestic firms and the characteristics of their operational environments, which has rarely been jointly addressed in previous research (Cantwell, 2009).

This article aims at reconciling the mixed evidence by (re)positioning to the core of the analysis these two aspects, in order to explain the asymmetries in MNE-induced effects. We build on existing research in international business and strategy to substantiate the intuition that domestic companies can hardly take advantage of the mere presence of corporate activities (Barnard & Cantwell, 2006; Chang & Xu, 2008) and that spillovers traditionally associated with MNEs rarely represent a pool that has a common value to all firms, as customarily assumed. Instead, these effects have a directionality, meaning that the size of the relevant pool differs substantially across firms and industries, as does the impact on their performance (Knott, Posen, & Wu, 2009).

Specifically, we argue that these asymmetric effects depend on the interaction between the heterogeneous absorptive capacities and market position of domestic firms as well as the characteristics of their operational environment in terms of technology space and product market space. On these premises, we first qualify the *pressure to compete* as related to differences in the ability to compete as a result of domestic firms' market position (Damijan, Rojec, Majcen, & Knell, 2013; Farole & Winkler, 2012; Nicolini & Resmini, 2006) and the characteristics of their product market space in terms of concentration of market power. Next, we define the *pressure to innovate* as the combination between the diverse abilities of domestic firms to absorb and leverage the knowledge

that spills over (e.g., Arora & Gambardella, 1994; Zahra & George, 2002) and the structure of incentives in terms of risks and opportunities induced by the technology space in which they operate (e.g., Ang, 2008; Chung & Alcácer, 2002; Hill & Rothaermel, 2003).

Building on our original conceptual framework, we produce a set of novel hypotheses, which represent our theoretical contribution to the existing debate. We assemble complementary data sources and construct a panel of 12,189 Italian firms for the period 2003–2009, combining information on their characteristics, industry, and location from Orbis by Bureau Van Dijk, with data on MNE investments by province (NUTS3 level) and industry (2-digit NACE) provided by the Bank of Italy. We also exploit *restricted access* data from the Italian Census of Enterprises (ASIA) to recover information for the provincial market structure.

In line with our theory, the results of this analysis suggest that domestic firms cannot be considered a uniform set of agents that homogeneously gain or lose from the presence of foreign MNEs. Rather, the investigation of domestic-foreign inter-firm dynamics through the lenses of the notions of *pressure to innovate* and *pressure to compete* provide a novel framework for understanding the emergence of asymmetric effects from MNEs' investments. This represents the main contribution of this article to a literature that has rarely focused on the interplay between the heterogeneity of domestic firms and their operational environment when analyzing the implications of MNEs' investments.

CONCEPTUAL BACKGROUND AND HYPOTHESES

Studies on the impact of foreign investments imply that MNEs are systematically different from domestic firms via a number of characteristics, such as the possession of specific ownership advantages in the form of distinctive capabilities and resources (Dunning, 2000; Helpman, Melitz, & Yeaple, 2004). "Multinationality" is accompanied by marked productivity *premia* as compared with the average national firm and also relative to firms that serve foreign markets through arm's-length trade (Griffith, 1999; Helpman et al., 2004). Hence, when a firm endowed with superior knowledge – such as an MNE – locates in a given context, potential spillover effects of two types may emerge: competition effects and technology effects.

Competition Effects

The entry of a highly productive actor can generate detrimental effects due to an increase in competition (e.g., Bresnahan & Reiss, 1991). As MNEs are characterized by significant ownership advantages, business-stealing dynamics at the expense of domestic firms may lead to progressive losses in market shares and lower productivity among domestic companies (Aitken & Harrison, 1999; Caves, 2007; Javorcik, 2004): competition in factor markets drives up factor prices while product market competition drives down prices for goods, which together lower firm value added and performance. However, competition can also deliver beneficial effects as far as it pushes domestic firms to become more efficient by upgrading their production techniques and their managerial and organizational structures (Cantwell, 1989; Rojec & Knell, 2018; Santangelo, 2009), in an effort toward "defensive innovation" similar to that explored in the trade literature (e.g., Wood, 1995). The net balance ultimately depends on both the heterogeneity of domestic firms in terms of market position and the characteristics of the product market space in which they operate. We qualify the interplay between these two dimensions as the *pressure to compete* perceived by domestic firms vis-à-vis the entry of an MNE. Thus, we define the taxonomy of Figure 1.

[Figure 1 around here]

The lower-left and upper-right quadrants are of major interest, as they allow us to qualify the effect of MNE investments at the two extremes in the *pressure to compete.* In fact, we assume the *pressure to compete* stimulated by MNE entry to increase both with market concentration, as these product market spaces are populated by firms without a marked attitude toward competition, and with firms' market power, as the largest incumbents have the most to lose from disruptive changes in competitive dynamic following MNE investments. Accordingly, the upper-right quadrant refers to firms subject to high *pressure to compete* according to their market position and the level of concentration in their product market space. In these contexts, an increase in competition due to inward foreign investments generates fluctuations in sector dynamics that can be particularly detrimental for incumbents with larger market power, as they have more to lose from increased competitive pressures (Bustamante & Donangelo, 2017) while being accustomed to operating in very concentrated product market spaces traditionally inducing weak competitive behaviors. Thus, for these

domestic firms, the productivity effect is expected to be negative. The lower-left quadrant, instead, qualifies firms subject to a lower *pressure to compete*. These companies are characterized by low market shares in very fragmented product market spaces. Therefore, these domestic firms operate at a smaller production scale and possess more flexible structures to adapt to changing external environments, minimizing losses and reaping the gains associated with emerging opportunities (Békés et al., 2009). These beneficial effects are further magnified in more competitive product market spaces where the concentration of market power is low and domestic actors are accustomed to competition. Here, dynamic opportunities of growth are more likely to emerge following the major changes in industry structure associated with MNEs' entry. For this typology of firms, the MNE-induced productivity effect is expected to be positive. In the remaining quadrants, we find firms that are subject to intermediate *pressure to compete*, either on the basis of their weak market position (lower-right quadrant) or because they operate in very concentrated product market spaces (upper-left quadrant). For these firms, the expected productivity effect remains ambiguous, as the opposing forces related to MNE-induced competition can offset each other.

Based on this taxonomy, we develop the following set of testable hypotheses:

H1: Different levels in the pressure to compete experienced by domestic firms give rise to asymmetries in the effect of MNE investment, whereby:

H1a: Firms under high pressure to compete experience negative MNE effects;

H1b: Firms under low pressure to compete experience positive MNE effects.

Technology Effects

MNE investments are associated with positive technological externalities based on interorganizational knowledge exchanges, fundamentally consistent with the view of classic economists regarding the industry-wide sources of scale economies (Alcácer & Delgado, 2016; Alcácer & Chung, 2014; Marshall, 1890). These mechanisms include the interorganizational mobility of workers (Corredoira & Rosenkopf, 2010; Görg & Strobl, 2005), backward and forward linkages (Ernst & Kim, 2002; Javorcik, 2004), and pure knowledge spillovers such as demonstration effects and reverse engineering (Brambilla, Hale, & Long, 2009; Sinani & Meyer, 2004). Although technological spillovers can

contribute to the productivity of domestic firms (e.g., Ascani & Gagliardi, 2015), the strategy and international business literatures stress that this spillover pool hardly represents a common set available to all firms (Knott et al., 2009). Asymmetries may emerge depending on firms' heterogenous absorptive capacities (Blalock & Simon, 2009; Haskel, Pereira, & Slaughter, 2007; Zhang, Li, Li, & Zhou, 2010), intended as the capability to process internally the knowledge that is external to the firm (Arora, Fosfuri, & Gambardella, 2004; Cohen & Levinthal, 1989; Escribano, Fosfuri, & Tribó, 2009; Lane & Lubatkin, 1998) and the willingness of the firm to leverage the absorbed knowledge (Crescenzi & Gagliardi, 2018; Zahra & George, 2002), which in turn depends on the trade-off between the opportunities and risks they perceive in their operational environment (Ang, 2008; Hill & Rothaermel, 2003). Hence, we qualify the *pressure to innovate* as the combination of the knowledge intensity of the technology space where firms operate and their level of absorptive capacities. Consistently, in knowledge-intensive technology spaces, firms experience higher incentives to continue climbing the innovation ladder. Similarly, companies endowed with higher absorptive capacities are better positioned to capture the potential knowledge opportunities arising from MNEs and to exploit them internally. Accordingly, we define the taxonomy in Figure 2.

[Figure 2 around here]

Also in this case, we focus on the lower-left and the upper-right quadrants, where we find domestic companies at the two extremes in the *pressure to innovate* induced by MNE investments.

In the upper-right quadrant, domestic companies with higher absorptive capacities possess the ability to capitalize on the benefits from MNE spillovers while also operating in a technology space characterized by both higher opportunities from technological development and higher risks from technological backwardness (Ang, 2008; Brahm, 1995; Dosi, 1988; Nelson & Winter, 1982). For these firms, the expected productivity effect is positive. The lower-left quadrant, instead, refers to firms with limited absorptive capacities operating in technology spaces where innovating is not perceived as a pivotal element of success. For these companies, the expected effect is either negligible or negative in case MNE investments produce a shift in the technology frontier, slowly leaving these firms behind. In the remaining quadrants, domestic firms are subject to an intermediate *pressure to innovate*, either

because they have limited capacities to take advantage of the presence of MNEs, or because they operate in technology spaces where incentives toward innovation remain limited.

Hence, we develop a set of hypotheses relating the *pressure to innovate* to the asymmetry in the spillover effects from MNE investments experienced by domestic companies:

H2: The different levels in the pressure to innovate experienced by domestic firms give rise to asymmetries in the effect of MNE investment, whereby:

H2a: Firms under high pressure to innovate experience positive MNE effects;

H2b: Firms under low pressure to innovate experience negligible MNE effects.

Finally, we combine the *pressure to innovate* and the *pressure to compete* to capture the net effect of MNE investments on domestic firms. Thus, we simultaneously account for domestic firms' heterogeneity in terms of both absorptive capacities and market position, and for the characteristics of their technology and product market spaces. In this vein, the *pressure to compete* and the *pressure to innovate* are intimately connected: domestic firms respond to the system of incentives they perceive in their product market and technology spaces depending on their competitive position and their capacity to continue climbing the innovation ladder. For instance, firms with larger absorptive capacities and those closer to the technological frontier may be the best positioned to reap additional gains from highly dynamic environments in terms of both technological and market opportunities (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005). On the other hand, the characteristics of their operational environment may interact in a variety of ways in shaping productivity outcomes. In the classic Schumpeterian view, for instance, higher competitive pressures reduce monopoly rents that stimulate innovation efforts and productivity. Alternatively, competition may boost the incentives to innovate, especially in neck-and-neck industries where market power concentration is lower and the perceived opportunities of larger expected incremental profits from innovation are higher (Blundell, Griffith, & Van Reenen, 1999; Geroski, 1995; Nickell, 1996). Accordingly, the *pressure to innovate* dominates in cases where the initial *pressure to compete* is low, whereas the Schumpeterian effect associated with a reduction in the *pressure to innovate* dominates in highly competitive product market spaces (Aghion, Blundell, Griffith, Howitt, & Prantl, 2009). Given the complex system of relationships at play, the

analysis of the emerging net productivity effects is left to the empirical investigation presented in the Methodology section.

DATA DESCRIPTION

We assemble a novel database including information from diverse and complementary sources. We combine data from Orbis by Bureau Van Dijk, a business-level dataset reporting companies' balance sheet, with information on MNE investments taken from the Balance of Payment of the Bank of Italy. The latter provides data on foreign capital flows into Italian provinces (NUTS-3) by 2-digit NACE industry. We also collect information on industry structure at the provincial level through *restricted access* microdata from the Italian Census of Enterprises (ASIA). The final dataset contains 12,189 domestic manufacturing firms,[1] their location, and MNE investments for the period 2003–2009.[2]

Labor Productivity

In line with other studies, we use labor productivity as our dependent variable (e.g., Görg & Greenaway, 2004; Piscitello & Rabbiosi, 2005). Variations in labor productivity provide clear insights on whether domestic firms benefit from MNE investments in terms of performance. We construct this variable by using information on employment and value added, as customary in the literature:

$$Y_{ipt} = \ln \frac{(\text{value added/empl.})_{ipt}}{\frac{1}{N}\sum_{s=1}^{n}(\text{value added/empl.})_{st}} \qquad (1)$$

where *i, p, t,* and *s* stand for firm, province, time, and NACE 3-digit sector, respectively. Thus, we consider the labor productivity of each individual firm relative to its industry mean, to examine variations in firms' performance by accounting for the high variability of productivity across sectors. In support of this choice, Figure 3 shows that firms' heterogeneity is ubiquitous both across and within

[1] We define domestic firms as all business entities with an Italian Global Ultimate Owner, as indicated in the Orbis database. We exclude all subsidiaries of foreign firms, thus minimizing potential measurement issues (e.g., double counting) deriving from the inclusion of foreign entities in both our dependent and independent variables.
[2] Unfortunately, more recent data for MNE investment are unavailable because of a number of methodological changes adopted by the Bank of Italy in collecting this information.

industries: that is, sectors are characterized by very different levels of labor productivity and firms within industries are also very diverse.

[Figure 3 around here]

Pressure to Compete and Pressure to Innovate

Operationalization of the *pressure to compete* and the *pressure to innovate* measures requires combining the characteristics of incumbent firms with industry-wide features in terms of product market space and technology space. Specifically, the *pressure to compete* is jointly dependent on firms' market power, defined as firm log of sales taken from Orbis, and the competitive structure of the product market space, measured as the Herfindahl-Hirschman Index (HHI) of market concentration, based on census data from ASIA. Taken together, these measures indicate the market position of individual firms within sectors that are characterized by varying degrees of market competition. Figure 4 provides descriptive evidence of the heterogeneity in the *pressure to compete* in our sample. As envisaged in our conceptual framework, the source of this heterogeneity has both a firm-level (vertical axis) and an industry dimension (horizontal axis). With respect to the *pressure to innovate*, we consider firms' absorptive capacities proxied by the log of intangible assets (e.g., Harris & Moffat, 2013; Kogut & Zander, 1996)[3] taken from Orbis, as well as the nature of their technology space, ranked by technological intensity based on the categories provided by Eurostat: namely, high-medium-technology and medium-low-technology manufacturing industries.[4] Figure 5 plots the two key dimensions of the *pressure to innovate* experienced by domestic firms, showing that firm-level absorptive capacities (vertical axis) are subject to a good degree of heterogeneity between technology spaces and also within the same technology space (horizontal axis).

[3] Intangible assets refer to the set of skills and routines embedded within the organization. According to the SNA2008/ESA2010 standards, they include embodied knowledge in equipment/machinery (e.g., software, databases, etc.); scientific knowledge embedded in patents, licenses, and general know-how (scientific R&D); value of brand names; and other knowledge embedded in firm-specific human and structural resources (e.g., tacit knowledge, capabilities, and skills) (EU Commission, 2017).

[4] The OECD classifies manufacturing industries in Low-/Medium-Low-/Medium-High-, and High-Technology-Intensive Sectors (https://www.oecd.org/sti/ind/48350231.pdf). This classification, which accounts for both direct R&D intensity and R&D embodied in intermediate and investment goods, offers a tractable taxonomy of the different technological environments in which firms operate. Initially proposed in Hatzichronoglou (1997), it has been extensively employed to proxy for the degree of technological turbulence across industries (e.g., Ang, 2008; Gagliardi & Iammarino, 2018).

[Figures 4 and 5 about here]

MNE Investments and Other Control Variables

MNE investments are measured by the lagged three-year stock of investments by MNEs as a share of provincial GDP, thus accounting for the amount of global investments weighted by the provincial economic size. GDP data come from ISTAT. We also consider two alternatives for MNE investments by computing a lagged yearly flow measure and the lagged five-year stock of investments. These measures are used in the robustness check regression reported in the Appendix.

Additional covariates include firms' log of fixed assets, derived from Orbis as a proxy for firms' capital, a provincial control for the unemployment rate as a measure of labor market dynamics (from ISTAT). As a robustness check, we also consider foreign disinvestment to capture economic activities that cease to exist (from Bank of Italy data) and a measure of domestic firms exit (based on the number of firms and the employment from ASIA). Appendix Tables A1 and A2 provide a full account of all the variables and the descriptive statistics. All robustness checks are contained in Appendix Table A3.

METHODOLOGY

We exploit the panel nature of our data to explore the relationship between inward MNE investments and incumbents' productivity. Specifically, we test *H1* regarding the role of firms' *pressure to compete* by estimating the following equation:

$$\ln Y_{ipt}^{PMS} = \beta_1 MNE_{pt-1} + \beta_2 \ln S_{ipt-1}^{PMS} + \beta_3 (MNE_{pt-1} \times \ln S_{ipt-1}^{PMS}) + \beta_4 K_{ipt} + \\ + \beta_5 Z_{pt} + \delta_t + \varphi_i + \omega_{st} + \varepsilon_{ipt} \quad (2)$$

where subscripts *i*, *p*, and *t* denote firm, province, and time, respectively; the superscript *PMS* indicates the specific product market space in which firm *i* operates, and is captured by grouping NACE 3-digit industries within high-competition sectors or low-competition sectors according to their HHI; *Y* stands for firm labor productivity; *MNE* denotes inward investment from foreign MNEs; *S*

indicates domestic firm sales; *K* is a vector of firms' attributes, including firm's intangible and tangible assets; *Z* represents provincial unemployment rate; time dummies δ and firms' fixed effects φ are also included, while ω denotes industry-year dummies to account for industry dynamics; and, finally, ε is an idiosyncratic error capturing the residual unobserved heterogeneity. Equation (2) allows us to account for the *pressure to compete* by combining domestic firms' market power with different product market spaces. Therefore, the coefficient *β3* captures the effect of MNEs on domestic firms with heterogeneous market positions within product market spaces characterized by a different competitive structure.

Subsequently, we test *H2* on the role of firms' *pressure to innovate* by estimating the following equation:

$$\ln Y_{ipt}^{TS} = \gamma_1 MNE_{pt-1} + \gamma_2 \ln I_{ipt-1}^{TS} + \gamma_3 (MNE_{pt-1} \times \ln I_{ipt-1}^{TS}) + \gamma_4 G_{ipt} + \\ + \gamma_5 Z_{pt} + \delta_t + \varphi_i + \omega_{st} + \varepsilon_{ipt} \quad (3)$$

where the superscript *TS* indicates the technology space within which domestic firms are active and *I* stands for firms' intangible assets, as a proxy for their absorptive capacities. As explained above, this captures the set of skills and routines embedded within organizations, thus providing a key indication of individual firms' ability to engage in the innovation process. Vector *G* includes controls such as the log of tangible assets and sales. All the other elements are similar to those of Equation (2). Hence, in Equation (3) we analyse how MNE investments impact firms' productivity depending on the *pressure to innovate* experienced by domestic firms. The coefficient *γ3* captures the effect of MNE investment on domestic firms with heterogeneous absorptive capacities within technology spaces characterized by a different structure of incentives, opportunities, and risks related to innovation.

In more detail, to account for the asymmetry in the effects of MNE investments across domestic firms, we estimate Equations (2) and (3) alongside the distribution of firms' market position and absorptive capacities, respectively. Thus, before running the regressions, we reparametrize the interaction terms in both equations and estimate them at specific values of these distributions, including the 10th, 25th, 50th, 75th, and 90th percentiles. This transformation requires the "centering" of sales and intangible assets (i.e., subtraction of specific values from the variable itself) before

generating the interactions as a strategy to estimate coefficients on MNE investments with a useful interpretation (see Jaccard & Turrisi, 2003). Thus, the estimated coefficient on MNE investments can be directly interpreted as the partial effect of foreign MNEs on domestic firm performance at established values of sales or intangible assets. This is equivalent to a procedure where the interaction term is estimated without "centering" the interacted variable, and, subsequently, specific values of each variable are considered to manually calculate the magnitude of the partial effect of MNE investments. Yet, a crucial advantage of the procedure followed here is that it directly provides the standard error of the partial effects, whereas the manual procedure would not (Wooldridge, 2009).

We also address the main sources of potential estimation bias. First, by controlling for firm's fixed effects, we significantly limit the possibility that our estimates are systematically biased by firm-level omitted variables. Second, we account for reverse causality issues by implementing an instrumental variable strategy, as described in the Appendix.

RESULTS AND DISCUSSION

Pressure to Compete and MNE Investments

Table 1 reports the estimates for Equation (2), where we focus on the interaction between MNE investments and domestic firms' market position. We include controls for firm's lagged intangible and tangible assets, capturing the knowledge intensity and the capital intensity of domestic companies, respectively (Guthrie, 2001); we also consider the provincial unemployment rate, accounting for the rigidity of the Italian labor market in terms of workers' mobility (Serafinelli, 2015).[5]

We estimate Equation (2) alongside the distribution of firms' market position and across the two subsamples of domestic firms operating in high-competition and low-competition product market spaces. As mentioned, we reparametrize Equation (2) and estimate it at specific values of the sales distribution. Because this operation does not imply splitting the sample by sales distribution percentile, the number of observations remains constant for all sets of regressions within the same product market space.

[5] Because of the size of the regression table, we omit the coefficients for the control variables. These remain available upon request.

[Table 1 around here]

Panel A presents the results for firms in highly competitive product market spaces, where sales are more equally distributed across incumbents, and Panel B refers to low-competition product market spaces, where sales are concentrated. Our interest is in the coefficient for MNE investments, which can be directly interpreted as the partial effect of foreign investments at each specific threshold value of firms' market position, as explained above. The main effect of sales in Table 1 represents, instead, the impact on domestic firms when MNE investments equal zero. It is therefore stable in all specifications, and it remains of scarce interest for interpretation purposes, similar to the interaction term.

In Panel A, a positive effect associated with foreign investments emerges for all domestic firms operating in high-competition product market spaces, while more diverse effects characterize Panel B for domestic firms active in low-competition product market spaces. Comparison of Panels A and B corroborates the notion that in industries with concentrated market power, the effects induced by MNEs are more asymmetric than in industries with a more competitive product market space. Specifically, in the latter context, MNE investments trigger a relatively homogeneous positive competition effect, whereby all domestic companies are incentivized to become more efficient. In this case, the only element of heterogeneity in the impact of MNE investments relates to the magnitude of the coefficients, which are about three times larger for domestic firms with the lowest market position compared with those with the highest: a 1% increase in MNE investments within a province is associated with a 6.7% increase in the labor productivity of domestic firms at the 10th percentile of the sales distribution (Column 1) compared with a 1.9% increase for those at the 90th percentile (Column 5). These findings provide support for *H1b* and also clarify the ambiguous effects for firms in the upper-left quadrant of Figure 1. In Panel B, however, asymmetries emerge more clearly, as only domestic firms that possess less market power and that are incentivized to be more efficient to avoid market exit (bottom-right quadrant of Figure 1) experience the positive competition effect of MNE investments. Interestingly, Column 5 of Panel B reports a negative coefficient for domestic businesses with the highest market position, suggesting the existence of a potential negative spillover effect. Not surprisingly, this effect could be associated with domestic firms that experience larger fluctuations in

their market shares once MNEs undertake an investment, as argued in our conceptual discussion. However, this remains not statistically significant, leading us to reject *H1a.* Overall, these results provide limited evidence that the *pressure to compete* alone generates asymmetric MNE effects.

Pressure to Innovate and MNE Inward Investment

Table 2 presents the results for Equation (3) and suggests that the *pressure to innovate* provides strong grounds for the emergence of asymmetric MNE investment effects, as not only is the range of partial effects across the intangible assets distribution quite heterogeneous but also notable differences emerge according to the technology space. Within industries characterized by fast-changing technological conditions (Panel A), a 1% increase in inward MNE investments generates an 18% increase in the productivity of domestic firms with a level of absorptive capacities at the 75th percentile (Column 4), and 38% for firms at the 90th percentile (Column 5). This evidence is in line with *H2a.* At the opposite tail of the distribution, firms with low levels of absorptive capacities are negatively affected by co-located MNEs: firms at the 10th percentile experience a 20% reduction in labor productivity due to MNE investments (Column 1). This negative effect implies that domestic companies with lower absorptive capacities operating in high-intensity technology spaces lose ground in terms of efficiency compared with their industry mean, thus providing an evidence-based clarification for the case of firms in the bottom-right quadrant of Figure 2. The striking difference in the effects of MNE investments between domestic companies with heterogeneous absorptive capacities mirrors the coexistence of strong opportunities and risks within the technology space in which they operate (Ang, 2008; Chung & Alcácer, 2002).

Panel B, referring to low-intensity technology spaces, tells a different story. Productivity gains associated with spillovers from MNEs still prevail for firms in the upper tail of the intangibles distribution, although the magnitude of the effect is significantly lower than in the high-intensity technology space, reinforcing the notion that technological opportunities (and risks) are stronger in the latter. A 1% increase in inward MNE investments determines a productivity gain of about 5% among domestic companies at the 90th percentile of the absorptive capacities distribution (Column 5) and 3% for firms at the 75th percentile (Column 4). This substantiates the net effect of MNEs on domestic

firms under intermediate *pressure to innovate* in the upper-left quadrant of Figure 2. Interestingly, although also in Panel B the positive effect of MNE investments declines monotonically with the level of firms' absorptive capacities, the detrimental effects of foreign investments at lower values of absorptive capacities are less severe: domestic companies at the 25th percentile do not experience any significant effect (Column 2), and those with the lowest endowment of absorptive capacities (Column 1), instead, experience a moderately significant and negative effect from MNE investments, but its magnitude is remarkably lower than for their counterparts in the high-intensity technology space. We interpret this finding as supportive of *H2b.* These firms, despite lacking the opportunity to benefit from the knowledge that spills over from MNEs, operate in technology spaces where the cost of being far from the frontier is not extremely relevant. Overall, accounting for the *pressure to innovate* reveals a strong asymmetric impact of foreign investments. Specifically, we show a strong polarization of MNE-induced effects according to domestic firms' capacities, especially within operational contexts where domestic firms are subject to strong pressures to keep climbing the innovation ladder.

[Table 2 around here]

The Interplay between *Pressure to Compete* and *Pressure to Innovate*

In this section, we analyse the interplay between *pressure to compete* and *pressure to innovate.* We expect the reciprocal action of both pressures to generate systematic differences in the relationship between domestic firms' performance and MNE investments in terms of its direction and strength. Tables 3 and 4 present the results of this joint analysis, for the high-intensity technology space and the low-intensity technology space, respectively. Econometrically, the estimated equation is similar to Equation (3) on the role of the *pressure to innovate,* although here the interaction is reparametrized only for the 10th, 50th, and 90th percentiles because of space constraints. Furthermore, the sample is also split by the features of the *pressure to compete*: namely, the median of the HHI, thus reproducing the characteristics of the product market space; and the median of firm sales, capturing the market position of firms within their industries.

Within high-intensity technology spaces (Table 3), firms' absorptive capacities guide most of the asymmetric effect of MNE investments, supporting the results presented above. Domestic

incumbents with the strongest endowments of absorptive capacities benefit from the presence of MNEs (Columns 9–12), in line with *H2a*, whereas domestic businesses with scarce absorptive capacities experience a negative technological spillover effect (Columns 1–4). The role of the *pressure to compete* becomes important within groups of firms experiencing the same *pressure to innovate*, that is, companies within the same technology space and with similar absorptive capacities. In fact, among the companies experiencing the negative effects of MNE investments, efficiency losses are quite heterogeneous in strength depending on the *pressure to compete* experienced. The largest detrimental effect is concentrated on companies with a strong market position within low-competition product market spaces, in line with *H1a.* Not only are these the companies that experience the largest fluctuations in their market position once foreign MNEs enter the market, but their weak absorptive capacity within a fast-changing technology space also makes them highly vulnerable to negative competition dynamics in terms of both product market and technology. According to our results, a 1% increase in MNE investments within a province is associated with an efficiency loss of about 56% for this very specific category of vulnerable domestic firms (Column 3). Other domestic companies with low absorptive capacities in this technology space experience detrimental productivity effects as a result of MNE investments, but their different exposure to the *pressure to compete* mitigates their losses. For instance, within more competitive product market spaces, the loss of efficiency is remarkably lower (Columns 1 and 2), although even in this case domestic firms with a larger market position tend to be more subject to larger business-stealing dynamics associated with the foreign presence. The heterogeneous *pressure to compete* experienced by domestic firms also moderates the beneficial effects of MNE investments in the group of companies with the highest endowment of absorptive capacities. Within this group, the largest benefits are concentrated on companies with a below-median market position operating in low-competition product market spaces. These are companies that are "protected" from both the *pressure to compete* and the *pressure to innovate* in consideration of their sheltered position in their product market space and the strong capacity to leverage external knowledge within their technology space (Crescenzi & Gagliardi, 2018; Zahra & George, 2002). More ambiguity on the effects of MNE investments remains for companies with median absorptive capacities, although the strength of this impact is in any given case less pronounced

(Columns 5–8). In this sense, the *pressure to compete* on each individual group of firms becomes the dimension crucial to disentangling the beneficial from the detrimental impact of inward foreign investments: on the one hand, domestic companies with individual market positions that protect them from competition-induced market fluctuations are better off, in combination with their average capacity to absorb and exploit the external knowledge possessed by MNEs (Columns 6 and 8). On the other hand, negative competition dynamics prevail the case of businesses with a market position exposed to potential larger volatility (Column 7). Nevertheless, compared with their counterparts with weak absorptive capacities, these firms limit significantly better the efficiency losses due to their relatively greater ability to innovate.

[Table 3 around here]

With respect to the case of low-intensity technology spaces, Table 4 shows the less-acute effects of MNE investments, in line with the idea that this operational context offers limited opportunities for leveraging external knowledge but also lower risks of efficiency losses. A comparison of the different technology spaces of Tables 3 and 4 suggests that this industry-wide feature of the *pressure to innovate* generates a clear asymmetry in the impact of MNE investments. In Table 4, significant detrimental effects are experienced only by domestic companies with weak absorptive capacities, holding an above-median market position, and operating in low-competition product market spaces (Column 3), again in line with *H1a.* These are the firms most exposed to intense market-stealing dynamics after an MNE investment, and, at the same time, they are not endowed with sufficient knowledge resources to compensate for the efficiency loss by continuing to climb the innovation ladder. Nevertheless, the magnitude of the impact of MNEs remains limited because of the very nature of the technology space. Overall, while the *pressure to compete* introduces some heterogeneity in the impact of MNEs for domestic firms experiencing beneficial spillovers in low-intensity technology spaces, all effects remain quite moderate (Columns 5–12), suggesting that the main source of asymmetry is to be found across typologies of technology spaces and particularly within the high-intensity technology space.

[Table 4 around here]

CONCLUSIONS

This article contributes to the literature on the impact of MNEs on domestic firms by focusing on the *boundary conditions* that channel asymmetric effects across domestic firms. We inspected the composition of the multifaceted local–global linkages between domestic and foreign MNEs by theoretically building and empirically exploiting the notions of *pressure to compete* and *pressure to innovate*, both consisting of a combination of business-level and industry-wide heterogeneity. These notions not only allow us to consider firms' heterogeneous market competitiveness and absorptive capacities; they also capture the heterogeneous strategic behavior of domestic companies in response to the opportunities provided and constraints imposed by the specific product market space and the technology space they belong to. We argued that these two dimensions and the interplay between them provide a novel and coherent framework for understanding the impact of foreign MNEs on domestic companies, in which an articulated set of asymmetric effects coexist, thus reconciling the mixed results of the extant literature.

Our main results for foreign MNE investments in Italy suggest that the combination of domestic firms' internal absorptive capabilities to exploit new external knowledge and the contextual industry-wide impulse to capture new technological opportunities represents a crucial condition for the realization of MNE-induced beneficial effects. By contrast, firms endowed with fragile capacity to seize new knowledge-related external opportunities can experience detrimental consequences, especially within technological environments where climbing the innovation ladder is a key element for success. Interestingly, domestic firms operating in low-technology industries face fewer risks despite the slightly weaker benefits once a foreign MNE invests in a province. The specific competition dynamics experienced by domestic companies as a consequence of their exposure to the *pressure to compete*, although less relevant when taken in isolation, play a key role in fragmenting the MNE-induced impact into a plethora of asymmetric and counterbalancing effects when combined with the notion of *pressure to innovate*. Especially within fast-changing technology spaces, where beneficial technological spillovers and business-stealing dynamics can coexist within narrowly defined groups of domestic incumbents, asymmetric effects emerge more pronouncedly.

Our study offers managers an evidence-based interpretative framework for the design of effective tools to both (i) enhance the opportunities of domestic firms to realize the gains from the presence of foreign MNEs and (ii) mitigate the potential risks of efficiency losses. In this sense, reinforcing domestic companies' internal capacities by investing in the development of intangible assets, for instance, represents a fundamental strategy to appropriate the benefits of MNE investments or to alleviate the risks of a vulnerable market position. This includes workers' training; improved organization of activities by adopting ICT, in which Italian firms are laggard compared with European standards; and stimulating R&D expenditure and inter-firm collaborations. In policy terms, our results entail that industrial policy tools should not merely aim at attracting MNEs in the belief that this would lead to successful interactions with domestic actors, as this type of top-down initiatives can easily produce so-called cathedrals in the deserts whenever the specific contingencies of the industrial structure are not taken into consideration (Hospers & Beugelsdijk, 2002). Instead, the attraction of foreign firms should align inward MNE activities with the profile of domestic firms in terms of both their capacity to interact with foreign actors and the opportunities provided by the technological environment they belong to. Consistently, policies for the attraction of MNEs should be accompanied by measures for reinforcing domestic companies' ability to connect with foreign enterprises, with the aim of embedding these international actors into a localized market and nonmarket mediated network of relationships.

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TABLES AND FIGURES

Figure 1 Pressure to compete.

Firm market position	Market concentration: Low	Market concentration: High
	Pressure to compete: **INTERMEDIATE** Firms with relatively stronger market position in fragmented markets. The entry of an MNE may trigger efficiency gains. However, they are also at greater risk of market-share erosion. Expected effect on productivity: AMBIGUOUS	*Pressure to compete:* **HIGH** Firms with stronger market position in concentrated markets. These are firms that are both not used to fierce competition and potentially subject to significant erosion in their market share following the entry of an MNE. Expected effect on productivity: NEGATIVE
	Pressure to compete: **LOW** Firms with relatively weak market position in very fragmented markets. Following the entry of an MNE, their flexible structure makes it easy to adapt to the changing external environment, minimizing losses due to market-stealing effects and reaping the gains associated with emerging opportunities. Expected effect on productivity: POSITIVE	*Pressure to compete:* **INTERMEDIATE** Firms with weak market position in concentrated markets. The MNE entry can generate significant changes in the structure of the market, thus opening up potential growth opportunities. However, being accustomed to operating in very concentrated markets, they may also be subject to crowding-out. Expected effect on productivity: AMBIGUOUS

Figure 2 Pressure to innovate.

Absorptive capacity		
	Pressure to innovate: **INTERMEDIATE** Firms with high absorptive capacities in low technological environments. These are firms that have the capacity to benefit from MNE entry in terms of learning opportunities but operate in contexts in which marginal gains from innovating are limited. Expected effect on productivity: POSITIVE	*Pressure to innovate:* **HIGH** Firms with high absorptive capacities in fast-changing technological environments. These are firms that are capable of learning from MNEs and operate in contexts offering very strong technological opportunities. Expected effect on productivity: POSITIVE
	Pressure to innovate: **LOW** Firms with low absorptive capacities in low technological environments. Due to low external incentives to innovate and low internal capabilities, these are firms that are likely to be affected to a limited extent by MNE entry. Expected effect on productivity: NEGLIGIBLE	*Pressure to innovate:* **INTERMEDIATE** Firms with low absorptive capacities in fast-changing technological environments. The entry of an MNE can exacerbate their status of technological laggardness in environments where continuing to climb the innovation ladder is crucial. Expected effect on productivity: NEGATIVE
		Technological intensity

Figure 3 Between- and within-industry firms' heterogeneity. NACE 3-digit codes are reported on the horizontal axis, and the vertical axis measures industry-mean labor productivity. The green line is the between-industry mean level of labor productivity, and the red lines delimit the shaded band of one standard deviation from this mean. Circle sizes represent standard deviations in firms' labor productivity within each industry.

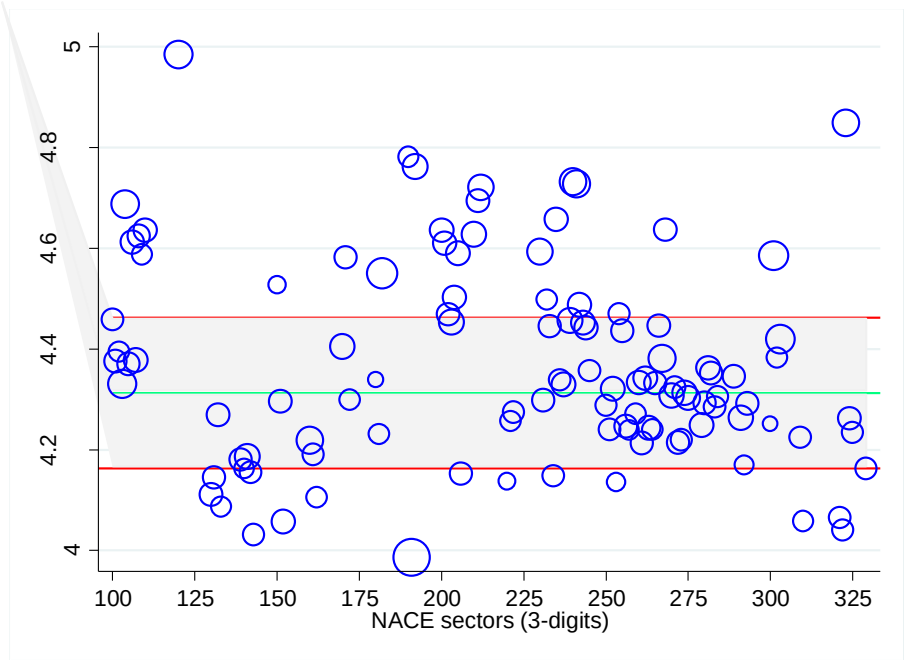

Figure 4 Between- and within-industry heterogeneity in the *pressure to compete*. Industry pressure-to-compete is represented on the horizontal axis, and the vertical axis measures firm average sales by industry. The vertical green line is the between-industry mean level of pressure-to-compete, and the horizontal green line indicates the between-industry mean of firm sales. Circle sizes represent standard deviations in within-industry firms' sales.

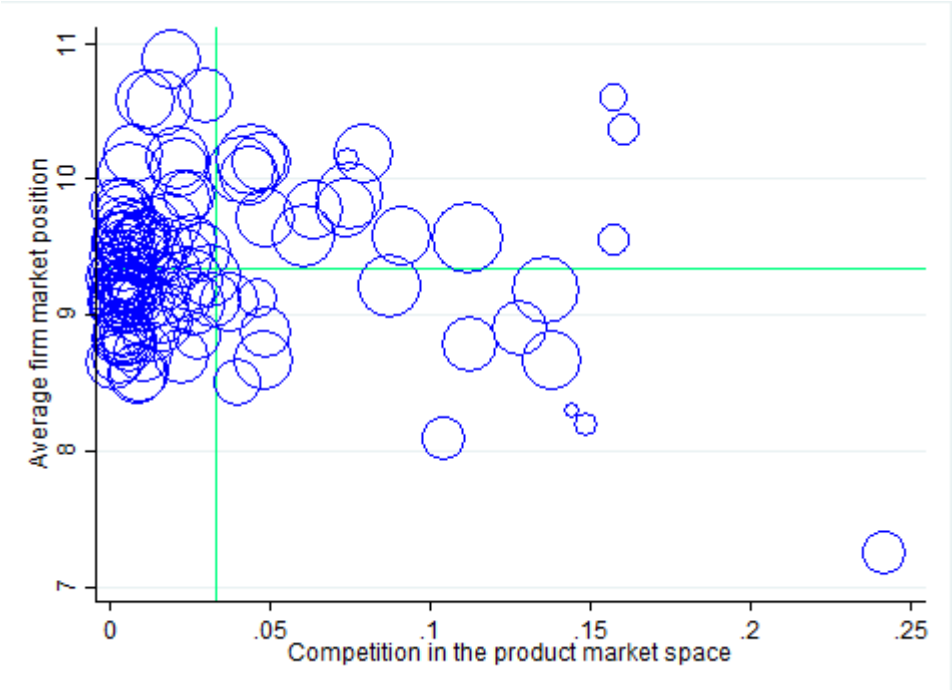

Figure 5 Between- and within-industry heterogeneity in the *pressure to innovate*. NACE 3-digit codes are reported on the horizontal axis, and the vertical axis measures firm average capacity-to-innovate by industry. Circle sizes represent standard deviations in within-industry firms' capacity-to-innovate. Red circles represent medium-low-technology NACE 3-digit industries, and blue circles show high-medium-technology NACE 3-digit industries.

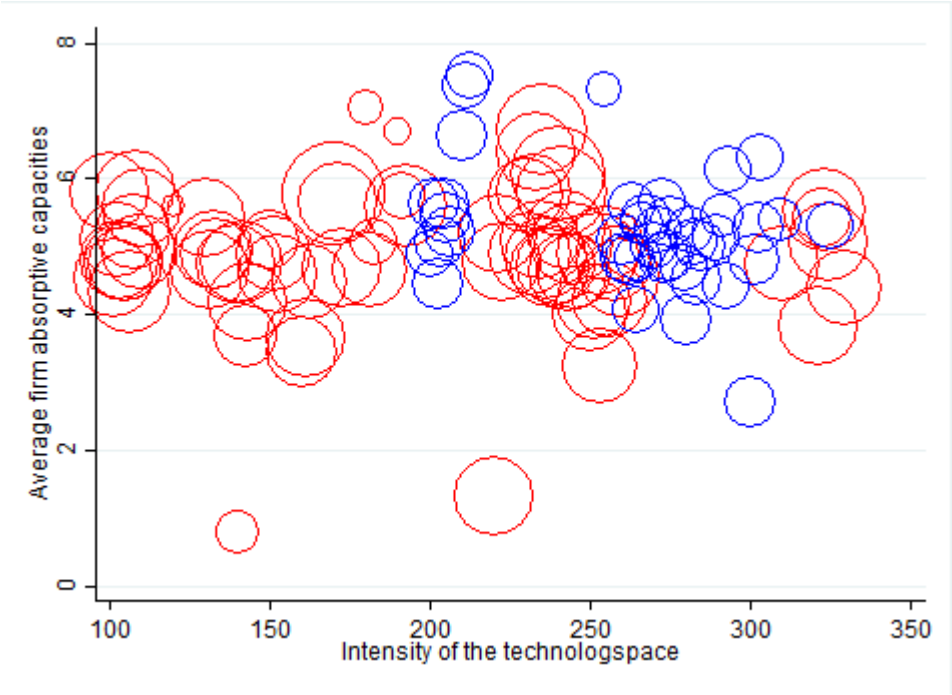

Table 1 MNE investment and domestic firms' *pressure to compete*

	(1)	(2)	(3)	(4)	(5)
Dep Var:	Firm market position				
Ln Labor productivity	Very low	Low	Median	High	Very high
	A. High-competition product market space				
MNE investments$_{t-1}$	0.067***	0.057***	0.043***	0.032***	0.019***
	(0.008)	(0.007)	(0.005)	(0.005)	(0.007)
Ln sales$_{t-1}$	0.334***	0.333***	0.332***	0.330***	0.330***
	(0.025)	(0.025)	(0.024)	(0.025)	(0.025)
MNE investments$_{t-1}$ *	-0.012***	-0.012***	-0.012***	-0.011***	-0.011***
ln sales$_{t-1}$	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Observations	43,183	43,183	43,183	43,183	43,183
R-squared	0.403	0.403	0.403	0.403	0.403
Number of firms	6,169	6,169	6,169	6,169	6,169
	B. Low-competition product market space				
MNE investments$_{t-1}$	0.057***	0.045***	0.025***	0.010	-0.004
	(0.007)	(0.005)	(0.004)	(0.006)	(0.010)
Ln sales$_{t-1}$	0.471***	0.471***	0.469***	0.467***	0.467***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
MNE investments$_{t-1}$ *	-0.017***	-0.017***	-0.018***	-0.016***	-0.016***
ln sales$_{t-1}$	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Observations	42,140	42,140	42,140	42,140	42,140
R-squared	0.231	0.231	0.231	0.231	0.231
Number of firms	6,020	6,020	6,020	6,020	6,020
	C. Both panels				
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry-year dummies	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are clustered on provinces. Significance levels are: *** p<0.01, ** p<0.05, * p<0.1.

Table 2 MNE investment and domestic firms' *pressure to innovate*

	(1)	(2)	(3)	(4)	(5)
Dep Var:			Absorptive capacities		
Ln Labor productivity	Very low	Low	Median	High	Very high
			A. High-intensity technology space		
MNE investments$_{t-1}$	-0.203***	-0.077***	0.045***	0.183***	0.359***
	(0.014)	(0.010)	(0.010)	(0.013)	(0.019)
Ln intangibles$_{t-1}$	0.014***	0.014***	0.014***	0.014***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
MNE investments$_{t-1}$ *	0.466***	0.466***	0.466***	0.466***	0.466***
ln intangibles$_{t-1}$	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Observations	27,461	27,461	27,461	27,461	27,461
R-squared	0.496	0.496	0.496	0.496	0.496
Number of firms	3,923	3,923	3,923	3,923	3,923
			B. Low-intensity technology space		
MNE investments$_{t-1}$	-0.014*	-0.001	0.014***	0.030***	0.047***
	(0.008)	(0.006)	(0.004)	(0.004)	(0.007)
Ln intangibles$_{t-1}$	0.014***	0.014***	0.014***	0.014***	0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
MNE investments$_{t-1}$ *	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***
ln intangibles$_{t-1}$	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	57,862	57,862	57,862	57,862	57,862
R-squared	0.073	0.073	0.073	0.073	0.073
Number of firms	8,266	8,266	8,266	8,266	8,266
			C. Both panels		
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry-year dummies	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are clustered on provinces. Significance levels are: *** p<0.01, ** p<0.05, * p<0.1.

Table 3 Interplay between *pressure to compete* and *pressure to innovate* in the high-intensity technology space

Dep Var: Ln Labor productivity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Low absorptive capacities				Median absorptive capacities				High absorptive capacities			
Product market space competition	High		Low		High		Low		High		Low	
Firm market position	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
MNE investments$_{t-1}$	-0.246***	-0.124***	-0.558***	-0.274***	0.005	0.094***	-0.183***	0.109***	0.322***	0.371***	0.290***	0.594***
	(0.021)	(0.014)	(0.077)	(0.047)	(0.014)	(0.009)	(0.033)	(0.028)	(0.016)	(0.023)	(0.033)	(0.096)
Ln intangibles$_{t-1}$	0.0008	0.005	0.003	0.027**	0.0008	0.005	0.003	0.028**	0.0007	0.005	0.003	0.027**
	(0.004)	(0.007)	(0.005)	(0.013)	(0.004)	(0.007)	(0.005)	(0.013)	(0.004)	(0.007)	(0.005)	(0.013)
MNE investments$_{t-1}$ *	0.470***	0.410***	0.703***	0.719***	0.470***	0.410***	0.704***	0.718***	0.471***	0.410***	0.703***	0.719***
ln intangibles$_{t-1}$	(0.022)	(0.027)	(0.087)	(0.114)	(0.023)	(0.027)	(0.088)	(0.113)	(0.022)	(0.027)	(0.087)	(0.114)
Observations	10,616	10,629	3,110	3,106	10,616	10,629	3,110	3,106	10,616	10,629	3,110	3,106
R-squared	0.541	0.596	0.192	0.170	0.541	0.596	0.192	0.169	0.541	0.596	0.191	0.170
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are clustered on provinces. Significance levels are: *** p<0.01, ** p<0.05, * p<0.1.

Table 4 Interplay between *pressure to compete* and *pressure to innovate* in the low-intensity technology space

Dep Var: Ln Labor productivity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Low absorptive capacities				Median absorptive capacities				High absorptive capacities			
Product market space competition	High		Low		High		Low		High		Low	
Firm market position	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
MNE investments$_{t-1}$	0.006	-0.024	-0.013**	-0.026	0.030***	0.017*	0.018**	-0.003	0.057***	0.065***	0.054***	0.023**
	(0.011)	(0.016)	(0.0066)	(0.018)	(0.011)	(0.0097)	(0.007)	(0.010)	(0.016)	(0.012)	(0.015)	(0.009)
Ln intangibles$_{t-1}$	0.005	0.006	0.010**	0.013**	0.005	0.006	0.010**	0.013**	0.005	0.006	0.010**	0.013**
	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)
MNE investments$_{t-1}$ *	-0.008***	-0.013***	-0.010***	-0.007**	-0.008***	-0.013***	-0.010***	-0.007**	-0.008***	-0.013***	-0.010***	-0.007**
ln intangibles$_{t-1}$	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
Observations	10,962	10,976	17,963	17,961	10,962	10,976	17,963	17,961	10,962	10,976	17,963	17,961
R-squared	0.105	0.092	0.064	0.081	0.105	0.092	0.064	0.081	0.105	0.092	0.064	0.081
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are clustered on provinces. Significance levels are: *** p<0.01, ** p<0.05, * p<0.1

APPENDIX

Table A1 Variable list

Variable	Obs	Mean	Std. Dev.	Level of detail	Source
Ln labor productivity	85.323	-0.175	0.538	Firm	Orbis
Ln intangible assets$_{t-1}$	85.323	4.884	2.639	Firm	Orbis
Ln tangibles assets$_{t-1}$	85.323	7.263	1.848	Firm	Orbis
Share of MNE investment$_{t-1}$	85.323	0.068	0.151	Province	Bank of Italy
Share of MNE investment (3 yrs stock)	85.323	0.173	0.388	Province	Bank of Italy
Share of MNE investment (5 yrs stock)	85.323	0.221	0.450	Province	Bank of Italy
Ln foreign disinvestment	85.323	-4.892	3.397	Province	Bank of Italy
Unemployment rate	85.323	4.943	2.651	Province	ISTAT
Herfindahl index	85.323	0.134	0.059	Province	ASIA
Market exit (ln employment)	85.323	9.066	1.055	Province	ASIA
Market exit (firms)	85.323	8.307	0.919	Province	ASIA

Table A2 Correlation matrix

	Variable	1	2	3	4	5	6	7	8	9	10
1	Share of MNE investment$_{t-1}$	1									
2	Share of MNE investment (3 yrs stock)	0.93	1								
3	Share of MNE investment (5 yrs stock)	0.89	0.99	1							
4	Ln intangible assets$_{t-1}$	0.01	0.01	0.01	1						
5	Ln tangibles assets$_{t-1}$	-0.07	-0.06	-0.06	0.50	1					
6	Herfindahl index	-0.26	-0.25	-0.24	-0.02	0.01	1				
7	Unemployment rate	-0.13	-0.09	-0.08	-0.06	0.02	0.08	1			
8	Ln foreign disinvestment	0.43	0.37	0.34	0.01	-0.04	-0.13	-0.06	1		
9	Market exit (ln employment)	0.60	0.58	0.56	0.02	-0.11	-0.44	-0.14	0.33	1	
10	Market exit (firms)	0.60	0.57	0.56	0.02	-0.11	-0.45	-0.09	0.33	0.98	1

Table A3 Robustness checks

Dep Var: ln labor productivity	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
MNE investment flow$_{t-1}$	0.090***					
	(0.011)					
MNE investments $_{t-1}$ (5 yrs stock)		0.023***				
		(0.003)				
MNE investments $_{t-1}$ (3 yrs stock)			0.032***	0.031***	0.031***	0.028***
			(0.004)	(0.005)	(0.004)	(0.004)
Ln tangible assets$_{t-1}$	0.059***	0.060***	0.060***	0.060***	0.060***	0.060***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Ln intangible assets$_{t-1}$	0.014***	0.013***	0.013***	0.013***	0.013***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Unemployment rate		-0.009***	-0.008***	-0.009***	-0.009***	-0.010***
		(0.0026)	(0.0026)	(0.0028)	(0.0028)	(0.0028)
Foreign disinvestment			0.0009			
			(0.0008)			
Market exit (ln employment)				-0.024		
				(0.017)		
Market exit (firms)					-0.017	
					(0.032)	
Observations	85,323	85,323	85,323	85,323	85,323	85,323
Number of firms	12,189	12,189	12,189	12,189	12,189	12,189
R-squared	0.243	0. 243	0.243	0. 243	0. 243	0. 243
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Area trends	No	No	No	No	No	Yes

Notes: Standard errors are clustered on provinces. Significance levels are: *** p<0.01, ** p<0.05, * p<0.1.

Addressing Reverse Causality

Our estimation assumes that inward MNE investments affect firms' productivity. Causality, however, could also run in the opposite direction if, for instance, MNEs are attracted to locations with more-productive firms. To mitigate this concern, we employ an instrumental variable approach inspired by the classic Bartik's (1991) instrument. Our data on MNE investments are particularly suited to adopting this strategy since we observe capital flows by province-industry. Specifically, our instrument is defined as:

$$\widetilde{\mathrm{MNE}}_{\mathrm{pt}} = \sum_{\mathrm{s}} \frac{\mathrm{E}_{\mathrm{sp},1991}}{\mathrm{E}_{\mathrm{p},1991}} \times \left(1 + \ln \mathrm{MNE}_{\mathrm{st}}^{\mathrm{Italy}}\right)$$

where subscripts *s, p,* and *t* indicate industry, province, and time, respectively; *E* stands for employment. The term $E_{sp,1991}/E_{p,1991}$ is the initial share of employment in each industry by province calculated with census data referring to 1991, as a measure of provincial specialization. The second term refers to the yearly national amount of MNE investments by industry. By multiplying these quantities and summing them up by industry, we obtain specialization-driven MNE investments for each province and year, $\widetilde{\mathrm{MNE}}_{\mathrm{pt}}$. Conceptually, the instrument assigns national MNE investments undertaken over the period 2003–2009 by industry to Italian provinces according to their specialization profiles in 1991. The underlying assumption for the exogeneity of the instrument is based on the counterfactual that, in the absence of area-specific shocks, each province would have received in our study period an amount of MNE investments proportional to its industrial structure in 1991. Hence, this instrument should capture the variation in actual MNE investments that is uncorrelated with idiosyncratic shocks in the aggregate productivity of domestic firms over the period 2003–2009. In addition, by including firm fixed effects, we satisfy the exclusion restrictions. Results are shown in Table 4A. A concern on the IV results presented in Column 1 is the possibility that the instrumental variable correlates with omitted provincial characteristics, even if firms' fixed effects are included. Hence, in Column 3 we present an alternative estimation where all variables are averaged at the provincial level. Though limiting the possibility to exploit the heterogeneity of domestic firms, this new setting makes it possible to include provincial fixed effects to

test for the robustness of our strategy. The main result remains stable and qualitatively similar to that derived from our baseline approach.

Table A4 2SLS estimates

Dep Var: ln labor productivity	(1) Second-stage	(2) First-stage	(5) Second-stage	(6) First-stage
MNE investment$_{t-1}$ (3 yrs stock)	0.031***		0.0001***	
	(0.006)		(0.00003)	
Predicted MNE investments		0.084***		0.081***
		(0.009)		(0.005)
Ln tangibles assets$_{t-1}$	0.060***	0.001	-0.121	7.252
	(0.011)	(0.001)	(0.105)	(11.707)
Ln intangible assets$_{t-1}$	0.013***	-0.0004	0.033	-4.256
	(0.002)	(0.0005)	(0.027)	(5.724)
Unemployment rate	-0.008***	-0.026*	-0.00006*	-0.141***
	(0.0025)	(0.013)	(0.0003)	(0.389)
Observations	85,323	85,323	721	721
R-squared	0.243	-	0.352	-
Number of firms	12,189	12,189	-	-
Number of provinces	-	-	103	103
Firm FE	Yes	Yes	-	-
Province FE	-	-	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry-year dummies	Yes	Yes	-	-
F-Stat	-	81.83	-	322.41

Notes: Standard errors are clustered on provinces. Significance levels are: *** p<0.01, ** p<0.05, * p<0.1.