FULL ARTICLE

Border Effects on firm's productivity: The role of peripherality and territorial capital

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Abstract

Border effects have long been studied and are a central element of EU regional policies. While most literature takes a macroeconomic approach, this paper adopts a microeconomic one, studying the impact on firm productivity in border areas. The empirical analysis, on Italian land borders, employs a novel two-phases double-matching design, which considers firm-level characteristics as well as the territorial capital of municipalities where they locate. Results suggest that border effects are not limited to territories close to the border but affect larger areas. Furthermore, they are significant and negative in urban areas, while they are insignificant in peripheral areas which are characterized by low accessibility and territorial capital endowment.

KEYWORDS
border effects, border regions, counterfactual analysis, cross-border co-operation, firms' productivity, peripherality, territorial capital

1 | INTRODUCTION

The existence of political and administrative borders is pervasive, even in an era of globalization. Created by politics and history, borders represent discontinuities between territories and are often regarded as obstacles "reducing the opportunities for co-operation between cross-border regions and players and hindering the use of resources for development" (Gramillano et al., 2016, p. 31), but - supported by policy and interventions - can also produce positive

economic impacts on the neighbouring territories, especially for larger metropolitan areas (Sohn & Licheron, 2018). Indeed, obstacles—in the right circumstances—can develop into novel opportunities where local (e.g., economic) actors find innovative ways of compensating for their starting disadvantages (Capello et al., 2018a; Flåten et al., 2015).

With the growth of supranational entities and organizations (such as the World Trade Organization (WTO), the European Union (EU), or the North America Free Trade Area (NAFTA)), large integrated markets evolved alongside the abolition of many economic and institutional obstacles. While these processes reduced many barriers, many obstacles, of different natures, still exist to the movement of people and goods between countries, so border regions are still faced with restrictions hindering their development.

In the context of the European Union, for instance, these obstacles have been long recognized and efforts to mitigate them are concentrated in the INTERREG programme since the late 1980s. Sharing Cohesion Policy's overall goals to "strengthen economic, social and territorial cohesion throughout Europe" the INTERREG programme produces many policy interventions, supported via the ERDF and channelling 2.8% of the total European Cohesion Policy budget for the programming period 2014–2020.

Borders have also always been a rich element of study for academic researchers in different fields, from sociology to history, political science and several economic disciplines (Anderson & O'Dowd, 1999; Brunet-Jailly, 2005; Chilla & Lambracht, 2022; Harguindéguy & Sánchez Sánchez, 2017; Ketterer & Rodríguez-Pose, 2018). In economics, border barriers and their "Border Effect"[1] are widely recognized in a large body of research, also because they can set a sort of quasi-natural experiment (Balaguer & Ripollés, 2018; Capello et al., 2018d). Despite fewer quantitative analyses at regional level for the earlier years (Andresen, 2010), the issue of borders has since also been blossoming at regional level because of its impacts on development and policy, and because of the recent countertrend of sociopolitical changes (e.g., Brexit) resulting in the creation of "new" borders (Figus et al., 2018).

Originally, from the seminal works of McCallum (1995), border effects at regional level have been studied from a demand side through their impacts on trade (Brown & Anderson, 2002). More recently, following the seminal works of Melitz (2003) other studies have tackled the issue from the supply side perspective.

Building on this literature, some papers provided new theoretical and empirical advancements highlighting different potential effects and obstacles to regional development generated by the physical presence of the border. Capello et al. (2018a, 2018b, 2018c, 2018d) do that by employing a macroeconomic perspective and differentiating these obstacles for NUTS 3 regions between "endowment needs" and "efficiency needs," showing the important role played by institutional, physical, and sociocultural obstacles in limiting the exploitation of different growth assets and the resulting missing growth of border regions.

While most literature considers the negative effects of borders, a significant number of studies also point out that border effects can also be positive (Andresen, 2010; Sohn & Licheron, 2018).

This wide scientific literature is largely macroeconomic in its methodological approach and mostly focuses on border regions (e.g., at NUTS 2 or NUTS 3 level in Europe) to identify the existence of borders and connect it to loss in trades or difficulties in exploiting economic and social resources for regional growth.[2]

Building from this stream of literature, this paper takes a side-step focusing instead on microeconomic outcomes by looking at how the presence of a physical border impacts the performance of firms located in border and near-border areas. In doing so, it adopts an analytical perspective in which the effects are territorialized, rather than aggregated at the administrative level. In particular, the interest of the paper lies in understanding the extent—if any—to which border effects are linked to the remoteness of territories since, in many countries, these two aspects are overlapping and hard to disentangle from each other.

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[1]The Border Effect is broadly defined as "the extent to which the volume of domestic trade exceeds the volume of international trade" (Evans, 2003, p. 1291).

[2]Another stream of literature looks at the border from a city perspective, for example on how a border can impact the mirroring and shadowing effects of cities (Sohn et al., 2022).

The empirical analysis uses the case of Italian land borders. This case, although specifically referring to one country, is of wider interest because these borders by and large coincide with the Alps. This is an area in which Italy borders four different countries (France, Switzerland, Austria, and Slovenia) and which historically represented, since their introduction and together with the Rhine valley, the heartland of cross-border co-operation policies in Europe. Italian border regions participated in INTERREG programmes since their institution and have often been considered a laboratory for policy and policy experimentations. For the programming period 2014–2020, the one which most coincides with the analysis, Italian land border regions were involved in four Cross-border co-operation programmes, as well as two (of the four) European macro-regional strategies.

The paper studies the differences in the productivity of firms located in border and near-border areas, and the analysis accounts for different industrial sectors and individual firms' characteristics, but also for differences in surrounding territorial characteristics, remoteness and for differences generated by being physically close to the border or belonging to border regions but being further away. The remoteness of border areas may be relevant in more than one way: not only border areas are usually located far from the political and economic centre of the country but also, especially in the case of Italian land-border areas, the border sits mostly in mountainous territories with low infrastructure endowment.

In this framework, the paper aims at answering to the following research questions:

1. Is it possible to detect a border effect in terms of microeconomic output, i.e., firm productivity?
   In particular, testing whether firms in border areas are less productive than their counterparts, as most literature seems to imply, although the opposite might also be the case according to other scholars.
2. Are these border effects on firm productivity sector-specific?
   Expectations are for border effects to be larger and more significative for those more open industrial sectors, namely, manufacturing and retail.
3. Are these border effects on firm productivity significatively different for territories in close proximity to the border compared to the rest of the border region?
   This question, for which arguments in both directions can be developed, is very important for policy purposes since it questions EU INTERREG programmes—which have addressed cross-border co-operation identifying regions at NUTS 3 level—including areas which are not too close to the border.
4. Are border effects on firm productivity similar in different types of territories? And, in particular, are firms located in more peripheral territories more or less impacted by also being located in border areas?
   This question is of paramount importance because many border regions are also peripheral, while others are not. The analytical framework in this paper is designed to test whether the impact of the border adds to the one of peripherality, or whether the effects of the border are more impactful in larger and more productive territories?

This paper innovates in several ways. First, it builds on the wide literature on the border effect focusing on microeconomic outputs rather than macroeconomics ones like regional growth. Second, it adapts and extends a recent analytical perspective which allows the territorialization of the border effect using firm-level micro-data and applying a counterfactual "double-matching" methodology which controls for industrial sectors, and firms' characteristics but also for several surrounding territorial characteristics (Fantechi & Fratesi, 2022). Third, the paper differentiates border areas between those that are physically close to the border (which we label *Near-Border Areas*) and those that are classified as border regions from institutional sources (labelled *Administrative Border Regions*).

While the specific results produced in the paper only regard Italian land-borders territories, they provide important policy indications on the effect of the border that cannot be individuated with a macroeconomic approach. In this way, the paper provides relevant contributions to the application of cross-border EU policies and INTERREG programmes from a territorial perspective.

The rest of the paper is organized as follows: Section 2, explores the extended literature on borders with specific regard to economic and empirical studies. Section 3 presents the methodology, describes the study area, the two

definitions of border areas and the methodological approach employed to measure the microeconomic border effects. Section 4 shows the results of the analysis for Italian border areas and, finally, Section 5 concludes including the policy implication highlighted by the study.

2 | LITERATURE REVIEW

The existence of borders and their persistence despite the recent wave of globalization and the growth of supra-national entities, aimed at abolishing institutional and economic barriers, have long enticed scholars from many disciplines. The literature on borders involves disciplines from sociology to history, political science and various economic disciplines describing the effect of often dividing or bridging territories and communities and their culture (Brunet-Jailly, 2005). From an economic perspective, despite the recent wave of integration involving many countries (e.g., the European Union or North America Free Trade Area), borders continue to "matter" (Helliwell, 1998) in their ability to bind social interactions and the space in which they occur. Literature on borders and border communities includes a wide range of approaches: (i) qualitative studies, often involving case studies, investigating the situation of border areas, local firms, or the consequences of processes of aggregation and disaggregation of countries (e.g., Hospers, 2006; Jakubowski et al., 2021; Makkonen et al., 2017, 2018); (ii) analytical studies, which investigate the consequences of borders, for example on firm production and investment choices (e.g., Melitz, 2003; Melitz & Ottaviano, 2021); and (iii) quantitative studies, investigating the border effects on border regions and areas in terms of different variables (e.g., Balaguer & Ripollés, 2018; Capello et al., 2018c; Daumal & Zignago, 2010; Ge et al., 2021; Kashiha et al., 2017). Considering the positioning of this study, the following section will focus on this third stream of literature, the one involving the empirical measurement of border effects on economic outcomes and, in particular, studies at regional level.

The interest in the effect of borders on economic outcomes, however, was born in international economics at national level and can be traced down to the seminal works of Thirlwall (1974), Balassa (1975), and Scitovsky (1958). Borders are also commonly associated with the presence of tariffs which can increase the impedance to trade like distance (see, e.g., Linneman, 1966). Since then, various types of economic variables have been shown to be affected by the presence of borders. In a wide literature composed of many different—often unrelated—approaches, sharing the notion that borders create obstacles to international trade and to the local growth of border areas, many empirical studies have focused on measuring the so-called border effects (Anderson & O'Dowd, 1999; Evans, 2003). In this literature, border effects are hence understood as "the extent to which the volume of domestic trade exceeds the volume of international trade" (Evans, 2003, p. 1291).

Following this stream of literature, border effects have also been studied at regional level, mostly adopting the gravity model[3] following the seminal work of McCallum (1995). Recent empirical works—with some also employing micro-data on the shipment of goods and commodities (e.g., Kashiha et al., 2016)—focus on trade flows applying to measure the border effects (Helpman et al., 2008; Okubo, 2004; Olper & Raimondi, 2008; Wall, 2001). While the results of these studies show the order effect persists even within integrated European countries (Chen, 2004), they also show a wide asymmetry of the effect depending on the type of good, firm, and industry.

A theoretical and empirical step forward in the analysis of border effects at regional level is provided by Capello et al. (2018a, 2018b, 2018c) highlighting different potential effects and obstacles to regional development generated by the physical presence of the border. In particular, Capello et al. (2018b) instead of measuring the border effects in terms of lost trades, measure the "effects that institutional borders have on the exploitation of economic and social resources for regional growth" (Capello et al., 2018b, p. 994). The study identifies endowment and efficiency needs on macroeconomic outcomes tampering with the chances of regional growth of border NUTS 3 regions. The

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[3]For an extended review of the gravity model specification for modelling international trade flows and relative literature, please refer to Kepaptsoglou et al. (2010).

resulting missing growth of border regions is, in this framework, produced by the institutional, physical, and sociocultural obstacles resulting from the existence of borders which limit the exploitation of different growth assets. Among the various obstacles, it is remarkable the persistence of legal and administrative barriers in limiting regional growth (Camagni et al., 2019; Caragliu, 2022).

Another aspect which is heavily impacted by the presence of a border is the mobility of labour. Recently, Ge et al. (2021) study this aspect in the case of Chinese regions and find that the impedance is highly variable and seems to be quite related to the presence of physical obstacles and economic geography effects.

While the majority of the economic literature seems to assume negative impacts from the borders, these should not be given for granted, as there are studies, such as the one by Andresen (2010), which evidence positive or insignificant effects of the border with the US for most Canadian provinces. The idea that such obstacles can be transformed into opportunities is also supported in several business studies, showing how borders can be leveraged by economic actors through cross-border learning and outsourcing (Li et al., 2010; Pérez-Nordtvedt et al., 2015). At the level of European metropolitan areas, Sohn and Licheron (2018) identify and test four different border factors affecting metropolitan functions (separation, contact, differentiation and affirmation) which may conceptually have both negative and positive effects and which, empirically, produce different ones.

In the case of Northern regions, Flåten et al. (2015) also show that some specific socio-economic structures, in particular firms' organizational learning and absorptive capacity, can help competitiveness in otherwise "thin" regions.

The study presented in the current paper takes a side-step from the existing contributions by looking at how border effects impact the performance of firms located in border and near-border areas. The performance of firms, supported by the endowment of the territory surrounding them, is commonly regarded as one of the main drivers of regional growth and firms are primary beneficiaries of policies devoted to regional development, although usually not directly of cross-border co-operation programmes which are more institutional and put the bases for their development.

As shown in Fantechi and Fratesi (2022) factors influencing firms' performance can be divided into three main groups: (i) individual firms' characteristics; (ii) industrial sectors' features and dynamics; and (iii) factors related to the location of firms and the assets it provides, broadly understood as territorial capital.

While factors falling in one of the first two groups are well known and studied, literature on territorial capital (Camagni, 2009; Fratesi & Perucca, 2019; Perucca, 2014) shows that territorial factors are multiple and often heterogeneous in their impact. Territorial capital, as defined in Camagni (2009) includes all factors which are present in a territory and contribute to the long-run development, factors of hard, intermediate or soft nature and public, intermediate and private ownership. These include the endowment of infrastructure, the quality of the administration and services, the presence of resources, private capital, human capital and labour, agglomeration economies, social capital, etc., all impacting the performance of regions and firms located there. Borders, as other institutional obstacles, affect the efficiency in the regional use of the existing endowment of territorial capital (Capello et al., 2018c) which could—from a microeconomic perspective—produce a significant impact on the performance of firms in the area.

3 | METHODOLOGY. MEASURING THE MICROECONOMIC OUTCOME OF "BORDER EFFECTS': A "DOUBLE" MATCHING COUNTERFACTUAL APPROACH

3.1 | Identification of border areas and measurement of peripherality

Compared to the rest of the world, border areas in the EU are extremely interesting not only for their long and often violent history but because they have been the recipients of specific policy programmes for more than 30 years now.

Aiming to foster a cohesive development throughout European territories, since its creation in the late 1980s, the INTERREG programme has always applied a multi-level governance and bottom-up approach to tackling common challenges in the development of border regions. Today in its fifth programming period, INTERREG is one of the pillars of Cohesion Policy contributing to the objective of reducing differences inside the EU. INTERREG programmes are inherently tailored for border regions, recognizing that borders generate obstacles in the flow of people, resources, knowledge, and goods.

Co-operation programmes in Europe are not strictly limited to border regions, intended as those which are physically bordering a different country, since they also include transnational co-operation projects, macroregional projects, and programmes for maritime border areas. Due to the wide scope of the programmes, there is not an institutional definition of border regions but an identification of the areas which are part of each co-operation programme.

An attempt to systematize the identification of EU border areas comes in a recent contribution within the DG Regio project, "Collecting solid evidence to assess the needs to be addressed by Interreg cross-border co-operation programmes" (Gramillano et al., 2016). Here, border regions are defined as those NUTS 3 regions which share either land or maritime border with another country but, methodologically, in the case of land borders, NUTS 3 regions whose territory intercepts a 25-km buffer from the borderline are also identified as border regions.[4]

As mentioned in the introduction, this study takes Italy as a case to study the impact of a physical border on the performance of firms. The study area, i.e. the border regions of the country, needs to be clearly defined and identified.

Due to the heterogeneity of the Italian territory and its borders, the first choice is to only consider land borders. Those are all located in the northern part of the country, bordering France, Switzerland, Austria and Slovenia, and all share similar geographical and morphological characteristics.

Considering the lack of an official definition of border regions, the aim of this paper is also to investigate the difference between being located in a border region which is object of border policies or being located near the border. For this reason, the study distinguishes two types of territories: *Administrative Border Regions* and *Near-Border Areas*.[5]

In policy terms, *Administrative Border Regions* are identified as such all NUTS 3 regions participating in cross-border projects (under the INTERREG program) for the programming period 2014–2020. These include 22 NUTS 3 regions belonging to seven NUTS 2 regions.[6]

For the identification of *Near-Border Areas* a similar methodology to that applied in Gramillano et al. (2016) is considered. The paper identifies as *Near-Border Areas* all municipalities whose territory intersects a 25-km buffer from the borderline.

Municipalities within each type of territory, due to the paper's specific interest in accessibility, peripherality and territorial capital endowments, are also classified along a second dimension, that is, the one of the Italian Inner Areas Strategy[7] (Lucatelli, 2015). This follows a methodology developed by the Italian Statistical Institute (ISTAT) and has the advantage of being an existing official classification which provides a map of different levels of peripherality (Modica et al., 2021) for the Italian territory based on the endowment of infrastructures, commonly used for policy purposes.

While the classification is not originally built with the aim of capturing differences in performance or productivity of firms due to their peripheral location, its characteristics make it a relevant proxy of peripherality also in these terms. The classification, indeed, uses the density of services (e.g., hospitals, schools), but also infrastructures such as interports and train stations, to identify municipalities (or adjacent groups of municipalities) that are classified as "Poles"; all other classes are then identified by the average travel time by car to the nearest Pole. Within this

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[4]A similar methodology is also applied to maritime borders which, however, are not included in this study.

[5]In the Italian case, the second one ends up being a subset of the first one.

[6]These NUTS 2 regions are: Piemonte, Valle d'Aosta, Lombardia, Trentino A. A., Veneto, Friuli V. G., and Liguria.

[7]This official classification considers population and remoteness but also access to services.

Administrative Border Regions and their municipalities
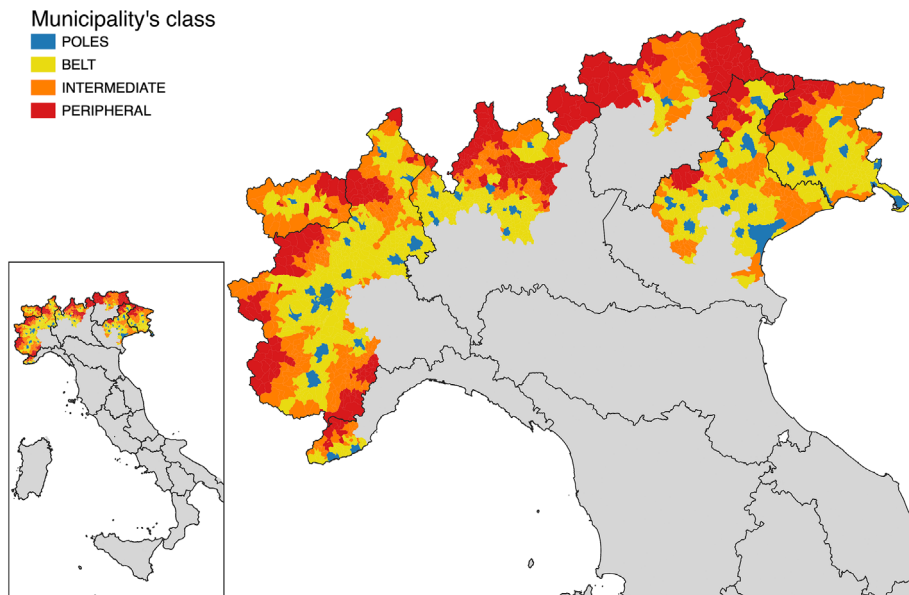
FIGURE 1 Administrative border regions.

classification, municipalities are classified between: (i) poles, if they provide all these services; (ii) belt if they are close to the locations where these services are provided; (iii), intermediate areas, if they are further away; and (iv) periphery if they are very far from the provision of services (more than 40 min by car).[8]

The Appendix shows that—by using granular information (1 km^2) on the actual distribution of population over the Italian territory—being located in one class or the other drastically changes not only the accessibility to services and infrastructure but also the size of the accessible market nearby. Both the accessibility to services and infrastructures and the steep difference in market size available are strong indicators that firms operating in different contexts, endowed by different stocks of territorial capitals, have to deal with different challenges and issues. Considering the specific geography of the Italian territory and land-border area, the use of such classification is very important and helps identify different impacts and dynamics.

Figure 1 presents *Administrative Border Regions*. In this wide area, 2,414 municipalities are located with an average population of 5,068 inhabitants (ISTAT, 2020), and a very high standard deviation of more than 20,000 which indicates a very differentiated composition of large, medium and very small municipalities.

Administrative Border Regions include all types of municipalities, from Poles to Peripheral ones, also including some big urban areas and regional capitals (e.g., Venice, Turin, Trieste). While these urban areas participate in cross-border projects, they are involved in very different socio-economic dynamics compared to other municipalities in the group. Morphologically the group is also quite differentiated internally, including many mountainous areas but also large parts of lowlands and some coastal areas (especially in the two regions of Liguria and Veneto).

As shown in Figure 2, instead, *Near-Border Areas* is a subset of the first group. Here, coastal municipalities—even if intersecting the land-border buffer—end up being excluded due to differences between land and coastal territories which are especially relevant when discussing the effect of a border (Kashiha et al., 2016).

This group includes 1,052 municipalities belonging to 18 NUTS 3 regions, that is, almost half of the municipalities located in NUTS 3 regions participating in cross-border projects and identified in this paper as *Administrative*

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[8]The classification employed and described here is an adaptation of the original classification which includes six categories: Poles, Intermunicipal Poles, Belt, Intermediate, Peripheral, and Ultra-Peripheral. In this paper, both the two classes of poles and Intermunicipal Poles, and Peripheral and Ultra-peripheral have been merged.

Near-Border Areas and their municipalities

Municipality's class
- POLES
- BELT
- INTERMEDIATE
- PERIPHERAL
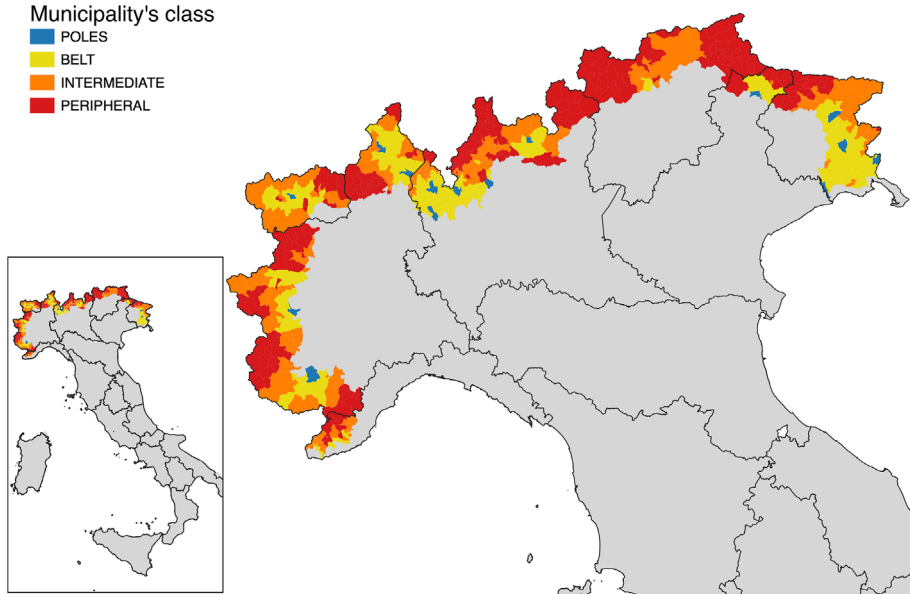
FIGURE 2   Near-border areas.

Border Regions. The composition of the *Near-Border Areas* group is quite homogeneous instead. The identified municipalities have a mean population of 3,815 inhabitants with a much smaller standard deviation of around 8,000 (ISTAT, 2020). As shown in Figure 2, the identified area still includes 17 Poles (compared to 61 in the other group) with the largest however being the relatively small municipality of Udine with under 100,000 inhabitants.

Despite one being a sub-group of the other, the two areas identified—*Administrative Border Regions* and *Near-Border Areas*—are quite dissimilar overall. Table 1 reports some descriptive statistics on population and morphology for the two groups and the whole Central-North Italy as reference, grouped by the municipality class. Most notably, the distribution of municipalities among classes can easily give an idea of how different the identified sub-groups are; both in *Administrative Border Regions* and in the baseline Central-North Italy group around 15% of municipalities are classified as peripheral, conversely, in *Near-Border Areas* this share goes up to 24% of the total.

The two identified areas are quite dissimilar also in economic terms. Table 2 reports a few key pieces of information on the economic structures of the firms localized in these areas. It is noticeable that, while differences within the areas are quite constant, comparing the economic structure of the two areas reveals differences showing that—overall—firms operating in *Near-Border Areas*, operate in a more peripheral context. This is evident, not only from the slightly lower share of firms occupied with import/export activities but also from the large difference in terms of average number of employees, especially between the two types of Poles. Manufacturing activities are prevalent in Belt areas (and some Intermediate areas) where their proximity to Poles, and lower cost of production, allow them to reach a larger market. The retail sector contributes, in the largest part, to the economic structure of more peripheral areas, supported mostly by touristic activities and services.

3.2 | The impact of the border and the territorial capital of territories: a territorial matching

In the analytical approach of this paper, the effect produced by the presence and proximity to a border is a factor which affects the territorial capital of places which, in turn, affects the performance of firms alongside firm

TABLE 1 Demographic and geographic statistics for administrative border regions and near-border areas.

Type of municipality	Administrative border regions			Near-border areas			All centre-north Italy		
	Num. of munic.	Mean population	Mean Altitude	Num. of munic.	Mean population	Mean altitude	Num. of munic.	Mean population	Mean altitude
Poles	61	58,734	232 m	17	45,423	227 m	147	68,788	138 m
Belt	1,278	4,821	272 m	475	4,654	301 m	2,584	5,666	197 m
Intermediate	697	2,668	485 m	305	2,252	548 m	1,272	2,746	403 m
Peripheral	378	1,218	863 m	255	1,254	894 m	692	1,604	776 m
Total	2,414	5,068	424	1,052	3,815	502	4,695	6,772	328

TABLE 2 Economic stucture descriptive statistics.

Type of municipality	Administrative border areas						Near-border areas					
	1st sector	2nd sector	Focus on export	N. of firms	Avg VA/E	Avg n. of empl. (std)	1st sector	2nd sector	Focus on export	N. of firms	Avg VA/E	Avg n. of empl. (std)
Poles	Retail 30%	Real est. 30%	0.93%	22,346	47.5	30 (319)	Real est. 35%	Retail 29%	1.27%	4,628	44.5	19 (79)
Belt	Manuf. 33%	Retail 25%	2.25%	28,402	48.5	24 (88)	Manuf. 32%	Retail 26%	2.04%	10,417	47.3	22 (76)
Intermediate	Manuf. 28%	Retail 26%	1.53%	8,066	46.9	23 (105)	Retail 30%	Manuf. 23%	1.08%	2,475	45.5	21 (48)
Peripheral	Retail 35%	Constr. 19%	1.37%	1,818	46.5	19 (59)	Retail 38%	Constr. 18%	0.71%	1,228	45.2	19 (48)

characteristics and industrial dynamics. The methodological difficulty, hence, comes from the need to separate the effects of the border from those of a different endowment of territorial capital. Indeed, border regions, especially in the Northern part of Italy, are quite heterogeneous among themselves (in terms of geography, accessibility, attractiveness, etc.). There is an obvious difference in firms' operation and performance between firms located, for example, in a very strong metropolitan area such as Milan or Turin and those located in the Alps' valleys. For example, employment growth between the global economic crisis and the covid crisis (2011–2019) has been 0.19% in Milan and −0.16% in Sondrio in Lombardy, or 0.09% in Turin (Piedmont) and around 0.05% for most urban areas in Veneto while smaller and peripheral municipalities show different trends (e.g., −0.39% in Ala di Stura and −0.04% in Bardonecchia in Piedmont, or −0.12% in Torreano and −0.15% in Bertiolo in Friuli). These differences, however real, cannot be attributed directly to the presence of the border or the distance from it.

The basic idea to solve this problem is to compare the performance of firms in the border area with that of similar firms not located in the border while also taking into account the heterogeneity of these territories. The simple comparison of firms located close to the border and firms located far from it can lead to biased results, which can be controlled by carefully selecting counterparts that are located in similar territories differing only in the presence or the absence of the border.

Building on the counterfactual workflow proposed in Fantechi and Fratesi (2022), this is achieved with a "two-phase double matching": in the first phase, areas far from the border but with a similar endowment of territorial capital to those in *Administrative Border Regions* and *Near-Border areas* are identified via a "two-step" matching, including an exact matching and a propensity score matching (Rosenbaum & Rubin, 1985) at the municipal level; in the second phase, the firm-level "two-step" matching design of Fantechi and Fratesi (2022), which involves another exact matching combined with a propensity score matching, is employed to compare the performance of treated[9] firms with similar firms operating in the same industrial sector. Among all firms in the Northern part of Italy, those participating in this second phase as control group are identified based on their location in municipalities holding similar endowment of territorial capital to those in *Administrative Border Regions* and *Near-Border areas* (phase one).

Following the two phases of the methodology, the microeconomic effect of the border is measured on the productivity of firms, value-added per employee, often indicated as Labour Productivity. This performance indicator is a simple and established measure commonly employed to compare the productivity of firms in the literature, used—among others—in papers by Aguiar and Gagnepain (2017), Bhattacharya and Rath (2020), Falciola et al. (2020), Laureti and Viviani (2011), Nemethova et al. (2019), Bachtrögler et al. (2020).

Since the literature is not consistent on whether the border effects should be static or dynamic, both the levels of productivity and the growth of productivity will be used.

In the first phase, the territorial matching at municipal level, the key passage is the first one, allowing to identify areas with a similar territorial capital endowment to the bordering areas object of this study. This allows to indirectly measure the microeconomic effect produced by the border by comparing the performance of firms to that of similar firms surrounded by a comparable endowment of territorial capital, where the presence of the border is the main factor of difference.

The wide literature on territorial capital indicates the presence of many factors composing this endowment, both geographic and socio-economic. The factors considered in this study, while not addressing every possible aspect of territorial capital, focus on which are considered the main contributing ones: infrastructural endowment, peripherality and availability of labour and capital.

Considering the absence of direct measures for these factors, this paper relies on proxies at the municipal level to identify areas with a similar endowment. Both the availability of labour and capital are estimated with individual proxies, employing the number of inhabitants of working age (inhabitants between 16 and 64 years) (ISTAT, 2011) for the first and the average declared income for the second.[10] Both the infrastructural endowment and peripherality

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[9]In the context of this study, the treatment is being located—or not—in a border area.

[10]Average declared income is calculated on declared taxable income averaged by municipality. Source: opendata of the Italian Ministry of Economy and Finance (MEF).

are more complex, however, and could not be estimated by relying on individual proxies. Considering the characteristics of the study area both are estimated together, being related concepts, employing two geographical indicators in the propensity score matching, the municipality surface in squared km and its mean altitude. Moreover, the class of the municipality within the Italian Inner Areas Classification (Lucatelli, 2015), is employed to force an exact matching.

Therefore, municipalities holding a similar territorial capital endowment to those in the study area are identified via a probit function—selecting the first nearest neighbour without replacement—class by class.[11] This ensures that, for each municipality in the study area, the most similar one is identified, in terms of the defined proxies, in the exact same class but located in a non-border area.

Finally, several other measures have been put into place to ensure the comparability of territorial capital endowment between the study area and the comparison area: (i) both coastal and island municipalities have been excluded from participating in the matching, due to the focus on land borders and the mountainous characteristics of the Italian study area; (ii) only municipalities from the central-northern part of Italy have been included, considering the large gap in the economic and social structure between the north and the south of the country (Musolino, 2018); and (iii) in order to reduce possible endogeneity problems produced by the participation in cohesion policy for the programming period 2014–2020,[12] all data employed in the matching procedure are sourced from the 2011 Italian Census (ISTAT, 2011) and from incomes declared in 2011.

3.3 | The microeconomic impact of borders: Matching firms

Once individuated, for each municipality class, a set of comparable municipalities outside of the border area the second methodological passage involves identifying similar firms on which to measure the differential in productivity. This is done following the "two-step" matching delineated in Fantechi and Fratesi (2022), including an exact matching for the industrial sector in which the firm operates and a propensity score matching[13] over relevant individual characteristics of the firm. Balance sheet information, at firm-level, are employed (Bureau van Dijk, 2020).

The first step of this passage is notably relevant not only because enables to control for the different dynamics and characteristics of the industrial sector, but also because it allows the produced results to show and highlight differences between them. Industrial sectors are distinguished through the NACE Rev.two classification aggregated into 11 categories, following the SNA/ISIC "High-level aggregation" (Horvát & Webb, 2020). Among the 11 sectors, four are excluded from the analysis due to either the specific sectorial dynamics involving heavy participation of the public sector (e.g., "Public Administration and Defence") or a very small number of observations available (e.g., "Agriculture" and "Mining and Energy" for which firm-level information are not available).

The second step, instead, controls for individual firms' characteristics addressing different dimensions, including the following covariates: the age of the firm (in years); the size of the firm (in terms of employment); the reliance on immaterial assets (share over total assets); firms benefitting from public policy support (dummy variable); the incorporation typology (in particular firms belonging to the co-operative sector which has specific characteristics and fiscal advantages in Italy); the financial position of firms (ratio of debts on the total gross earnings of firms); firms active in the international markets (dummy for exporting firms, since the size of exports is not available).[14] The selection of relevant covariates for the propensity score matching is done in accordance with Fantechi and Fratesi (2022), where this two-step methodology to measure microeconomic differentials of territorial competitiveness is broken down in detail and the validity of the method alongside the goodness of fit of the propensity score matching are discussed.

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[11]The categorical nature of the SNAI classification help us implement an exact-matching passage, ensuring that municipalities in one class are only matched with municipalities (further from the border) in the same class.

[12]This is relevant considering that the study area is defined among municipalities in NUTS 3 areas participating in cross-border policies for the 2013–2020 programming period.

[13]The propensity score matching is estimated via a probit function with a caliper of 0.05.

[14]The reader can refer to Fantechi and Fratesi (2022) for a detailed discussion of the selection of controls and their participation in the marching procedure.

Such workflow is quite flexible and allows the study of smaller spatial units compared to more conservative approaches based on aggregate data; however, this matching approach is strongly tied to the availability of data and firms' information and can suffer from incomplete and missing data. On the one hand, the matching can only be performed on observable characteristics, leaving out aspects and nuances of firms which cannot be controlled via observable indicators (e.g., managerial ability, in-firm organization, and firm's culture). On the other, the flexibility of the workflow allows—in theory—to step down to very small spatial units, but the extent to which it can be pushed depends on the numerosity of observations for the selected spatial unit.

Overall, as shown in the Appendix, the fit of matchings is good and both Rubin's B and Rubin's R coefficients are within the recommended limits (Rubin, 2001). Moreover, Appendix A also shows the standardized bias of each covariate both before and after the matching indicating the amount of residual bias left between Treated and Control groups.[15]

4 | DISENTANGLING FIRM-LEVEL BORDER EFFECTS ON DIFFERENT TYPES OF MUNICIPALITIES

The empirical results of the presented two-phases double-matching methodology are meant to indirectly capture the effects of the border on territorial capital via the differential it creates in firms' performance. This is done by first matching border municipalities with non-border ones with similar territorial capital endowment and then, matching the firms to similar firms belonging to similar territories and operating in the same industrial sector. Effectively, the productivity firms participating in this control group represent the benchmark against which the microeconomic effect of the border is measured via the Average Treatment Effect on the Treated (ATT for short). The dependent variable to measure the ATTs is Labour Productivity, measured both as the growth rate between 2012 and 2018 and as a static measure averaged between 2016 and 2018.

The analysis is performed, separately, for *Administrative Border Regions* and *Near-Border Areas*; this allows to observe the difference between being located in areas which are considered as border by policies and the physical proximity to the border itself. Results, reported by municipality's class and industrial sectors, show the statistically significant coefficients for the calculated differentials in productivity. Positive coefficients indicate better performances for firms in the border areas, while negative coefficients indicate worse performances.

4.1 | Border effects on administrative border regions

The first set of estimates reports the results measured for *Administrative Border Regions*, measuring the microeconomic border effects on firms located in NUTS 3 regions participating in INTERREG cross-border co-operation programmes.

Column (1) (Total) of Table 3 presents the estimates for the whole study area overall. This column provides important aggregate information, the top part of the table shows that firms located in *Administrative Border Regions* are performing worse than similar firms located away from the border. This holds true regardless of the industrial sector (as also supported by the last row in each table, reporting differential effects matching firms regardless of the industrial sector), with the only not significant coefficient being the one of the Construction sector.

This highlights the presence of a clear disadvantage of border areas in terms of labour productivity. However, moving to the bottom part of the table, results show that the same disadvantage has been reducing over the last few years. Coefficients measuring the differential of growth rate in terms of Labour Productivity for *Administrative Border Regions* overall (column (1)) are indeed significant and positive for Manufacturing, Retail Information and Communication, and Scientific and Technical Professions while there are no negative and significant coefficients.

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[15]Balancing tests for each separate iteration (resolving to around 160 matchings) are available from the authors upon request. The Appendix shows covariate balancing and Rubin's coefficients only for the "general" propensity score matching for each model ("All Sectors" × "Total"). More details are available in the Appendix.

TABLE 3 Estimates of the differential impact on administrative border regions.

Labour productivity differentials	Type of municipality				
Sectors	Total	Poles	Belt	Intermediate	Peripheral
Manufacturing	−0.0243***	−0.0360***	−0.0169**	−0.0703***	0.0195
Construction	−0.0112	−0.0301*	−0.0047	−0.0123	0.0185
Retail	−0.0115*	−0.0381***	−0.0144	0.0369*	0.0474
Info. And Comm.	−0.0504***	−0.0395**	−0.0354	−0.1299*	−0.0456
Finance	−0.1173***	−0.1123**	−0.1805*	−0.3941	
Real Estate	−0.0701**	−0.0743**	−0.0173	−0.2233**	−0.07
Sci. and Tech. Prof.	−0.0561***	−0.0715***	0.0185	0.0117	0.1012
All Sectors	−0.0249***	−0.0413***	−0.0140**	−0.0212*	−0.0199
Productivity growth differentials					
Manufacturing	0.0141***	0.0231**	0.0189***	−0.0254*	0.0852**
Construction	0.0065	0.0085	0.0161	−0.0015	−0.0048
Retail	0.01962***	0.0192**	0.0212**	−0.015	−.069**
Info. and comm.	0.0213*	0.0227	0.0087	0.1001*	0.1441*
Finance	0.0174	0.0023	−0.0921	−0.0771	
Real estate	0.0264	−0.0253	−0.0067	0.1514*	0.1342
Sci. and tech. prof.	0.0257**	0.0247*	0.0495**	−0.0486	0.0566
All sectors	0.02340***	0.01894***	0.02460***	0.00385	−0.0100

***Significant at the 99% confidence level,
**Significant at the 95%, confidence level,
*Significant at the 90% confidence level.

Moving to columns (2) to (5), results of the estimates for each individual municipality class are presented. These columns provide vital information showing differential coefficients of individual municipality classes, where is expected—despite all being border areas—intermediate and peripheral areas to have an overall lower endowment of territorial capital compared to other classes. While column (2) (Poles) confirms the pattern of a still present but reducing disadvantage already highlighted, columns (3) to (5) in the top part of the table show less statistically significant coefficients with negative coefficients for firms located in Belt and Intermediate municipalities but no significant difference for firms located in Peripheral municipalities compared to similar firms located in non-border areas.

Finally, in the bottom part of the table, columns (2) to (5) record several positive and statistically significant growth differential coefficients, with the exception of Manufacturing in Intermediate municipalities and Retail in Peripheral ones which are both negative. Comparing significant coefficients in the top and bottom part of Table 2 highlights how firms located in more peripheral areas and surrounded by lower stocks of territorial capital have—despite the border—bridged the gap with similar firms located in the same municipality class outside of the border area while those firms located in more urbanized areas are still penalized in terms of their performance.

4.2 | Border effects on near-border areas

The second set of estimates reports the results measured for *Near-Border Areas*, measuring the microeconomic effect produced by the physical proximity to the border. As shown in Section 3, the study area involved in this set of

estimates is in fact composed of firms located in municipalities whose territory intercepts a 25 km buffer from the land-border line.

The layout of Table 4 is the same as Table 3, where, in the top part are reported the measured coefficients for the differential in Labour Productivity and in the bottom part coefficients for the differentials in growth rate. Despite that, the information provided and the pattern emerging from the results for *Near-Border Areas* are quite different from those measured for *Administrative Border Regions*.

The top part of Table 4 shows that almost no statistically significant coefficient is identified, with the exception of a positive one in the Manufacturing sector and a negative one in Scientific and Technical Professions for the Poles. Overall, this suggests that firms located in municipalities close to the border are mostly performing comparably to similar firms located in municipalities with similar stocks of territorial capital but farther from the border. Similarly, the bottom part of the table also shows very few statistically significant coefficients suggesting that despite the closeness to the border firms located in these municipalities have grown comparably in terms of Labour Productivity to similar firms located farther from the border. Significant growth differentials are found in the Manufacturing, Construction and Scientific and Technical Profession sectors for firms located in Peripheral and Intermediate municipalities.

The absence of, overall, statistically significant border effects on the microeconomic output of firms recorded in *Near-Border Areas* is overall, quite informative. The generalized absence of statistically significant differentials indicates that the null hypothesis cannot be refused in this particular context: there is, indeed, no empirical evidence of a difference in microeconomic output between *Near-Border Areas* and the control group. In more simple terms, the model shows no evidence of a border effect when comparing the performance of firms in *Near-Border Areas* with that of similar firms located in similarly peripheral areas further from the border.

TABLE 4 Estimates of the differential impact on near-border areas.

| Labour productivity differentials | Type of municipality | | | | |
Sectors	Total	Poles	Belt	Intermediate	Peripheral
Manufacturing	−0.0149*	0.0917***	−0.0066	−0.0239	0.0223
Construction	0.0022	−0.028	−0.0186	0.0169	0.0267
Retail	−0.0077	−0.012	0.0005	0.0181	0.0328
Info. And Comm.	0.0041	0.0761	0.0137	−0.0625	0.0109
Finance	−0.0719	−0.1442	0.0481		
Real estate	−0.0112	0.1204	0.0093	0.0002	0.1137
Sci. and tech. prof.	−0.033	−0.0719*	−0.0049	−0.012	−0.0308
All sectors	−0.0078	0.01101	−0.0239**	−0.0266	0.00569
Productivity growth differentials					
Manufacturing	−0.0077	−0.0309	0.0016	−0.0202	0.0939**
Construction	0.0313**	0.0216	0.0136	0.0572*	0.0788*
Retail	0.0054	−0.0278	0.0101	−0.0028	−0.053
Info. and comm.	−0.0327	0.0084	−0.0439	−0.0604	0.1639
Finance	0.1096	0.0145	0.1861		
Real estate	0.0585	0.0772	0.0434	−0.1123	−0.2381
Sci. and tech. prof.	0.0146	−0.0067	−0.0279	−0.0334	0.1751*
All sectors	0.00487	0.00004	0.00005	0.01667	0.02177

***Significant at the 99% confidence level;
**significant at the 95%, confidence level;
*significant at the 90% confidence level.

In order to interpret and understand the relevance of the lack of statistically significant differentials in *Near-Border Areas*, results shown in both Table 3 and Table 4 need to be considered together. On the one hand, the empirical results presented in Table 3 are quite consistent, both in the directionality of the effect and its significance; on the other hand, however, results presented in Table 4 are consistently not significant.

The two-phase matching design employed in both contexts suggests such difference to be due to the composition and specific characteristics of the two groups and their counterparts. Indeed, despite *Near-Border Areas* being a sub-group of the *Administrative Border Regions*, their composition is quite differentiated both in terms of their territorial capital endowment, geography, and their firms. The matching procedure enacted to produce differential coefficients compares these firms to similar firms located in similar areas farther from the border, therefore the comparison group for *Near-Border Areas* is also composed of less performant firms overall located in more peripheral areas.[16]

Considering these differences in the composition of the two groups, the results presented in Tables 3 and 4 suggest that if there is a border effect in *Near-Border Areas*, this is surmounted and hidden by the larger effect of being peripheral which affects both the study area and their counterparts in the control group.

5 | CONCLUSIONS

This study investigated border effects in Italian border regions from a microeconomic perspective employing firm-level data and a two-phase double-matching methodology. This allows territorializing the effect produced by the border rather than relying on administrative boundaries. Moreover, the methodology is designed to isolate this effect on the microeconomic output from those produced by individual firms' characteristics, industrial sector dynamics and other sources of territorial effect so that aggregation effects, due for example to the fact that firms located in the border are on average different from those located elsewhere, are avoided.

In order to understand the difference produced by the physical proximity to the border on firm productivity, two definitions of border regions were used: *Administrative Border Regions*, composed of municipalities located in all NUTS 3 regions participating in INTERREG cross-border programmes for the programming period 2014–2020 and *Near-Border Areas* which is a sub-group of the first one, composed of municipalities whose territory intercept a 25 km buffer from the borderline.

Once applied to Italian land-borders, the methodology shows the presence of border effects penalizing firms in border regions compared to similar firms operating in similar municipalities but further from the border. The reply to the first research question is hence that firms in border regions are less productive than their counterparts, although results also show that this gap is shrinking.

As expected, the level of this disadvantage depends on the industrial sector in which the firm operates and is particularly evident in the manufacturing and retail sectors, confirming the expectations on the second research question that borders matter more to more open industries.

Concerning the third research question, border effects on firm productivity seem to be more affected by being in a border region than by being very close to the border. Applying the methodology to only those firms located in *Near-Border Areas* shows the disappearance of statistically significant border effects. The distance from the border is hence not as relevant as the type of territory and activity, leading into the fourth research question: border effects on firm productivity are indeed different in different territories and, in particular, they seem to be less impactful for firms in peripheral territories, where the effects of peripherality seem to prevail.

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[16]Such difference, both in overall socio-economic context and firms' performance, is already discussed in subsection 3.1 and is what, originally, led to the decision of employing a two-phase matching design.

In fact, firms located in urban and belt areas are those most penalized in comparison to their counterparts located in urban and belt areas farther from the border. Confirming the asymmetry, firms located in more peripheral areas show less statistically significant differences from their counterparts.

Following the terminology introduced by Capello et al. (2018b), the difference in results shown between *Administrative Border Regions* (Table 3) and *Near-Border Areas* (Table 4) could indicate that the presence of borders affects the *efficiency* in the use of territorial capital and assets, rather than impacting their *endowment*. In fact, the negative border effect is concentrated in the poles of administrative border regions, those with higher endowment of territorial capital, while for *Near-Border Areas* the comparison with firms located in similar very peripheral areas, all with a very low endowment of territorial capital, does not produce statistically significant differentials.

The specific results produced via this matching design are strongly tied to the Italian context, its culture, economic structure, and geography; however, the general dynamic and interplay between border and peripherality are most likely expected to impact similarly also in other contexts and Central European countries, since it is possible to speculate that similar countries and regions (e.g., the "four motors" for Europe)[17] will show the same dynamics identified in this research. The full extent of external validity of the presented results, or the identification of different specificities of different contexts, can only be confirmed by replicating the analysis in other contexts and countries, opening the road for further research avenues to better understand the role of borders and their interplay with peripherality.

In terms of policy implications, first, the effect produced by the border on firm productivity is not limited to territories very close to the borderline but affects larger areas, confirming the relevance of policy instruments like Cross-Border programmes, whose eligibility is identified at the NUTS 3 level.

Second, the performance of firms could benefit from programmes targeting the governance of existing local resources and the collaboration among governing bodies rather than programmes only aiming to increase the endowment of territorial capital. In fact, the results of this study show that the firms most penalized by the border are those located in urban and belt areas.

Studies on globally competitive economic actors located in "penalized" contexts show that innovative ideas and solutions are able to compensate for such a disadvantage. A recent example of such capacity of economic actors is shown in competitive firms located in Norwegian "thin regions" which developed the idea (and practice) of workplace learning to compensate for the lack of local resources and compete with firms in core areas (Flåten et al., 2015). Similarly, with the right combination of policy and cross-border co-operation, the presence of the border could be exploited to be an opportunity rather than an obstacle, especially for urban and belt areas, by leveraging the advantages of contamination and cross-border learning (Pérez-Nordtvedt et al., 2015). A focus on cross-border learning, in particular, could be a factor tilting the scale in favour of "border economic actors" operating in high-tech sectors.

A third relevant policy suggestion contained in the study regards the need for dialogue and the possible integration of cross-border co-operation programmes with regional policies, of national and EU sources, targeted to reduce the disadvantage of peripheral areas. Indeed, while the most peripheral border areas are the least impacted by the presence of the border, they are however the most disadvantaged overall, due to their peripherality.

Co-operation programmes, aimed at reducing barriers and especially institutional ones can hence be most suitable to border cities and urban areas, enhancing their efficiency in using territorial capital assets through the exploitation of synergies and complementarities, while border peripheral areas might need, prior to these interventions, other more basic interventions in the endowment of territorial capital assets, similar to those for other peripheral areas further away from the border.

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[17]The "four motors" are a group of self-described very similar European regions (Auvergne-Rhône-Alpes, Baden-Württemberg, Catalonia, Lombardy, all NUTS 2), all in border areas, which collaborate in the shared goals to further the economic development (and their leadership position) of Europe (www. 4motors.eu).

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APPENDIX A

Following Fantechi and Fratesi (2022), the goodness of the matching in the second stage has been estimated by running balancing tests for each matching. Balancing tests have been performed for each matching (160 separate iterations, one for each differential computed) specific results are available upon request. Given the large number of the tests performed, below are only reported the results for one differential from each table, matching firms operating in any industrial sectors, located in any territory ("All Sectors" × "Total").

The overall goodness of the fit is evaluated computing Rubin's B and Rubin's R coefficients (Rubin, 2001). Rubins' B is the absolute standardized difference of the means of the linear index of the propensity score in the treated and (matched) non-treated group, while Rubin's R reports the ratio of treated to (matched) non-treated variances of the propensity score index. For a sufficiently balanced matching it is recommended a Rubin's B less than 25 and a coefficient of the Rubin's R falling between 0.5 and 2 (Figures A1–A4).

In order to test the relevance of the classification, applied to capturing difference in performance of firms due to the peripherality of the territory in which they operate, a proxy of the size of the available market (in nearby territories) has been developed. The size of the market is proxied by the number of inhabitants living in nearby territories; the accessibility of different territories is measured by the size of the market in a radius from the centroid of municipalities.

For this test, the size of the accessible market is calculated via a very detailed dataset, reporting the distribution of population over a regular grid (1km $\times$ 1km) of the Italian territory produced by ISTAT for the year 2011. Using such fine dataset allow to derive a precise measure of the proxy for the available market, taking into account difference of population distribution even within administrative areas.

Table A1 shows the results an average large difference in the size of the reachable market for firms operating in different class, noticeable up to a radius of 50 km which, considering the size and geography of Italy, is quite relevant. For completion, Tables A2 to A5 shows the difference in size of the available market within all relevant subgroups of the study area (North and central-North of Italy), none of the tables show results diverging from those of Table A1.
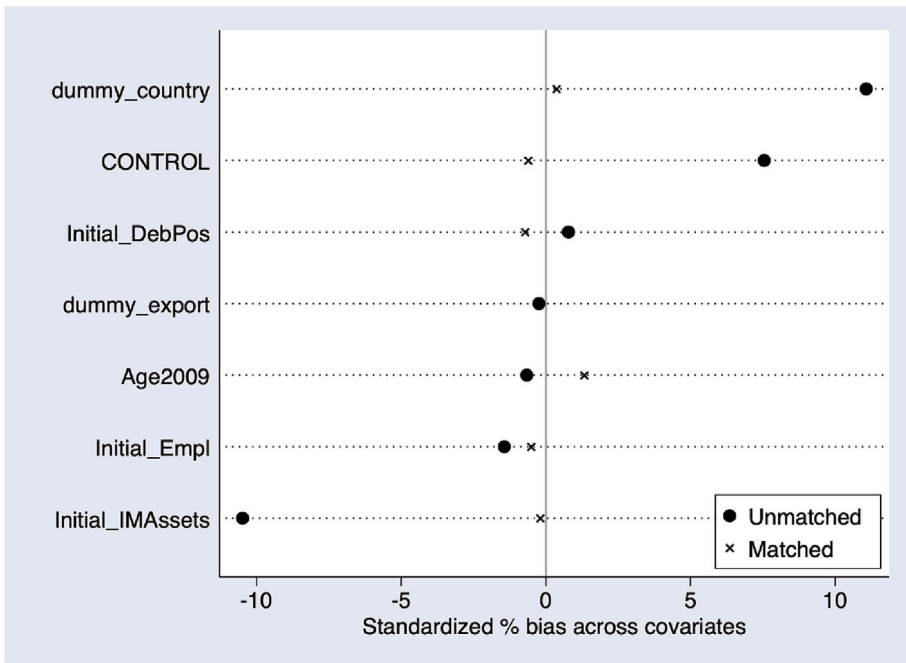
FIGURE A1 Balancing Bias of covariates of the matching on Administrative Border Regions, static. Rubin's B: 1.8 Rubin's R: 0.90.
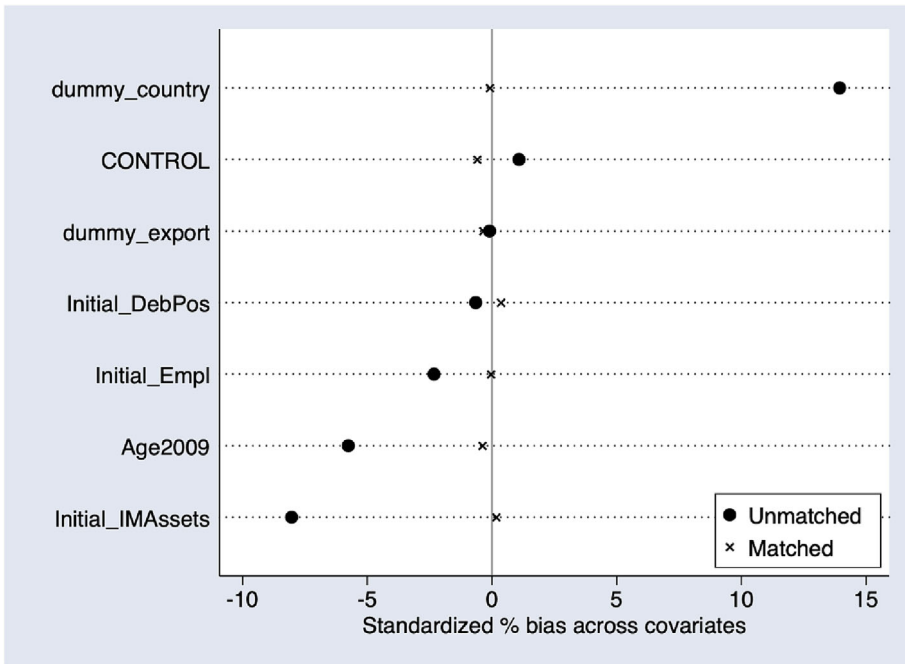
FIGURE A2   Balancing Bias of covariates of the matching on Administrative Border Regions, dynamic. Rubin's B: 0.9 Rubin's R: 0.91.
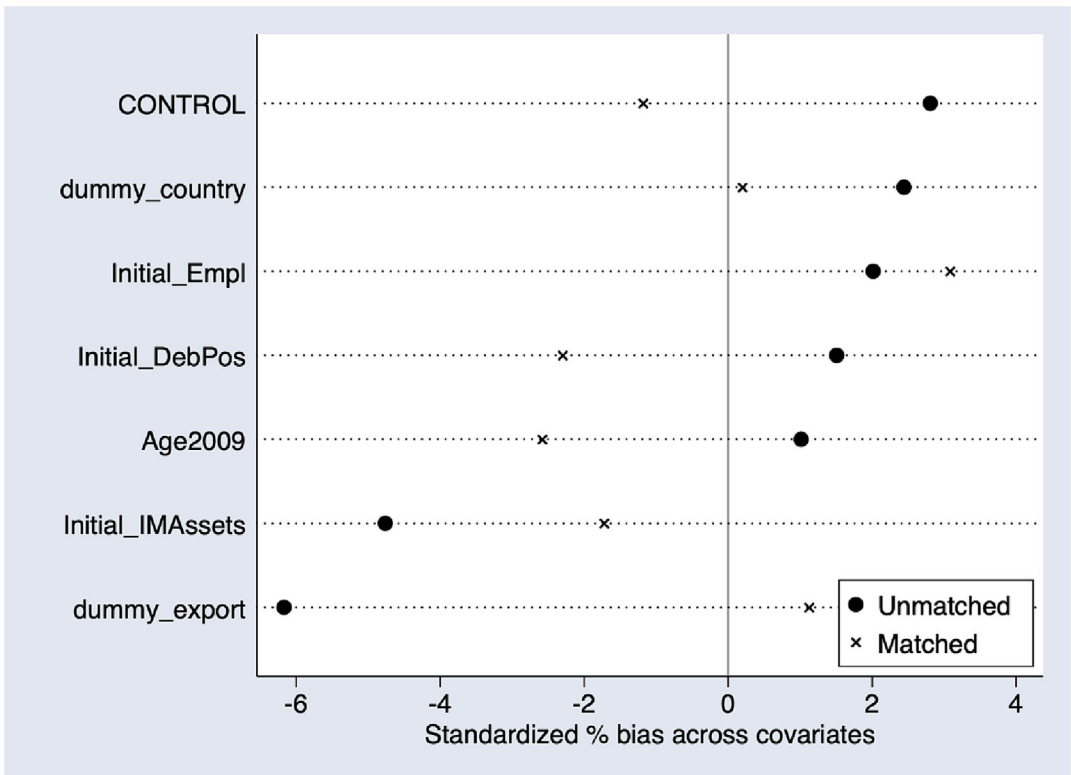
FIGURE A3   Balancing Bias of covariates of the matching on Near-Border Areas, static. Rubin's B: 6.7 Rubin's R: 1.19.
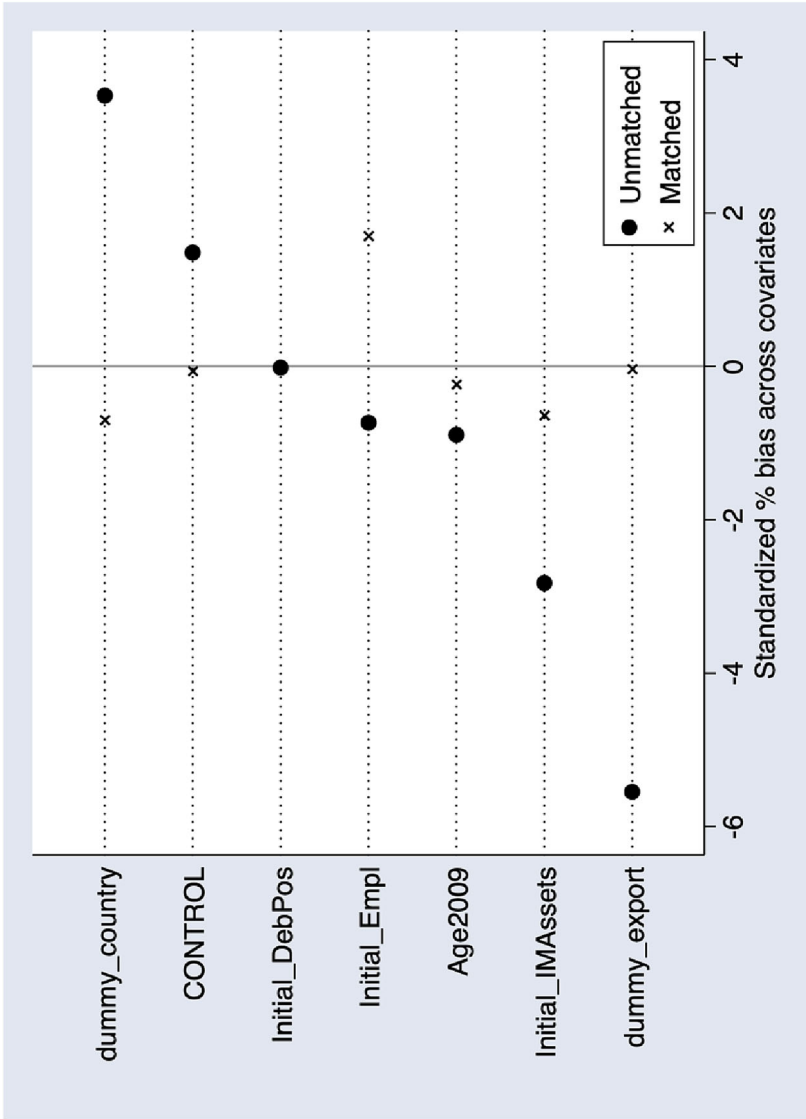
FIGURE A4 Balancing Bias of covariates of the matching on Near-Border Areas, dynamic. Rubin's B: 2.4 Rubin's R: 0.39.

TABLE A1 All Northern municipalities.

	10 km	20 km	50 km	100 km
Poles	297,323	885,576	3,252,161	7,038,029
Belt	176,634	648,871	3,086,118	7,671,953
Intermediate	50,730	237,172	1,628,137	6,049,217
Peripheral	21,874	100,065	1,079,053	5,316,910

TABLE A2 Border areas.

	10 km	20 km	50 km	100 km
Poles	250,250	715,614	2,892,499	6,096,783
Belt	163,508	592,602	3,015,906	6,948,242
Intermediate	54,328	244,629	1,699,683	5,659,480
Peripheral	20,294	94,800	1,075,781	5,128,865

TABLE A3 Near-border territories.

	10 km	20 km	50 km	100 km
Poles	184,966	541,465	2,978,141	6,101,125
Belt	182,159	665,343	3,228,623	6,333,463
Intermediate	41,150	169,790	1,369,262	4,718,778
Peripheral	16,936	69,462	839,133	4,378,790

TABLE A4 Border area controls.

	10 km	20 km	50 km	100 km
Poles	393,868	1,168,641	3,828,586	8,545,125
Belt	222,790	821,833	3,354,660	8,793,682
Intermediate	44,881	224,060	1,427,378	6,545,136
Peripheral	24,528	105,191	1,033,639	5,499,467

TABLE A5 Near-border territories controls.

	10 km	20 km	50 km	100 km
Poles	341,562	949,401	3,209,938	7,714,295
Belt	210,653	752,005	2,979,749	7,768,083
Intermediate	50,006	248,486	1,625,652	6,533,722
Peripheral	23,346	114,907	1,223,314	5,819,829

Resumen. Los efectos fronterizos se estudian desde hace tiempo y son un elemento central de las políticas regionales de la UE. Mientras que la mayor parte de la literatura adopta un enfoque macroeconómico, este artículo adopta uno microeconómico, estudiando el impacto sobre la productividad de las empresas en las zonas fronterizas. El análisis empírico realizado sobre las fronteras terrestres italianas emplea un novedoso diseño de doble emparejamiento en dos fases, que tiene en cuenta las características a nivel de empresa, así como el capital territorial de los municipios donde se ubican. Los resultados sugieren que los efectos fronterizos no se limitan a los territorios cercanos a la frontera, sino que afectan a zonas más amplias. Además, son significativos y negativos en las zonas urbanas, mientras que son insignificantes en las zonas periféricas que se caracterizan por una baja accesibilidad y dotación de capital territorial.

抄録: 国境効果については長期にわたって研究されてきているが、これはEUの地域政策の中心的要素である。多くの研究ではマクロ経済的アプローチが採用されているが、本稿ではミクロ経済的アプローチを採用し、国境地域における企業の生産性に対する影響を検討する。本研究の実証分析では、イタリアの国境地域を対象とし、企業レベルの特性と企業の立地する自治体の州都を考慮に入れた、新しい2段階の2重マッチング設計を採用している。結果から、国境効果は国境に近い領域に限定されず、より大きな地域に影響を及ぼすことが示唆される。さらに、国境効果は、都市部では有意かつ否定的であるのに対し、アクセシビリティが低く地域資本の賦存が少ないという特徴の周辺地域では有意ではない。