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DETERMINANTS OF EXPORTS: FIRM HETEROGENEITY AND LOCAL CONTEXT

by Pietro de Matteis*, Filomena Pietrovito** and Alberto Franco Pozzolo**

Abstract

It is frequently argued that the geographical context in which firms operate can have a crucial impact on their propensity to internationalize. In this paper, we present the results of an empirical analysis that examines the determinants of export performance for a sample including more than 4,300 Italian manufacturing firms over the period 2000-2013, focusing on the role of provincial context, after controlling for firm-level characteristics. To this end, we first adopt a cluster analysis methodology to classify each Italian province in terms of context variables, such as: the distance to foreign markets, the level of human and social capital and the degree of efficiency of the public administration. Second, we estimate a set of binomial choice and linear models to assess the impact of the economic and social environment on the extensive and intensive margins of trade. The results, after confirming that firm-specific factors (size, experience, productivity, capital intensity, innovation, geographical agglomeration and, to some extent, credit constraints) affect both the intensive and the extensive margins of exports, show that context characteristics at the province level have an additional (statistically and economically) significant impact on the export performances of firms.

JEL Classification: D22, F10, F14, F18.
Keywords: firm internationalization, local context, firm heterogeneity.

Contents

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1.Introduction[1]

In the increasingly globalized world markets, Italian firms are facing rising competition from foreign competitors, especially those from countries with low production costs (Benfratello and Bronzini, 2010; Barba Navaretti et al., 2012). As argued by Banca d'Italia (2009) and Bugamelli and Gallo (2012), the inability of the Italian manufacturing sector to renew its productive structure has rendered many firms incapable of facing mounting competitive pressure. This is even more relevant in the current economic situation, where firms facing extremely weak domestic demand would highly benefit from the more dynamic foreign demand. However, not all firms are able to internationalize, and a clear dualism in their reaction to rising international competition has emerged: some firms are further orienting their sales towards the domestic market, trying to exploit residual local monopoly rents, while others are taking on the challenge of international competition, fostering product and process innovation to increase their export share (Rossi, 2006). The results of this dualistic process are crucial for the evolution, and possibly the survival, of the Italian manufacturing sector.

It has been forcefully argued by academics, policy makers and different commentators that firms' ability to internationalize depends strongly on the local context in which they operate, as well as characteristics such as the availability of physical and immaterial infrastructures, the supply of skilled labor, the efficiency of the public sector, the availability of external financing and the strength of those kinds of human relationships that are generally defined as human capital.

Understanding the impact of these forces on firms' ability to operate internationally is not only an interesting research question, but has relevant policy implications. In this paper,

[1] We would like to thank, Paolo Sestito, Raffaello Bronzini, Elena Mattevi, Paolo De Vita and seminar participants at Banca d'Italia (Rome), Banca d'Italia (Campobasso), Università del Molise, European Trade Study Group (Paris) for comments and suggestions, and Francesco Marchionne and Michele Fratianni for very kindly providing their data on distances from foreign destination markets for our analysis. Opinions expressed are those of the authors and do not necessarily reflect those of the Bank of Italy or the Eurosystem. Any remaining errors are the sole responsibility of the authors. Email: pietro.dematteis@bancaditalia.it; filomena.pietrovito@unimol.it; pozzolo@unimol.it.

we contribute to this strand by analysing the impact of the local context on firms' internationalization based on a large sample of Italian firms.

Two well-established facts in the international trade literature are that firms are extremely heterogeneous within countries and industries, and that internationalization is an endogenous process, with firms self-selecting into exporting depending on their characteristics. Several studies also argue that firms benefit from the geographic environment and the surrounding industrial context in which they operate (Dunning, 1998; Robertson and Chetty, 2000; Giovannetti et al., 2013). Differences between and within regions, countries, cultures and societies have not been attenuated with globalization (Rugman, 2003; Meyer et al., 2011) and the local context – i.e. factors such as institutions, human and infrastructural resources, culture, etc. – continues to be a key factor affecting firms' ability to become international.[2] Such location advantages, including infrastructure endowments, human capital, geographical agglomeration and institutional quality, have been argued to have a significant impact in shaping firm competitiveness and, in turn, their export performance (Bougheas et al., 1999; Levchenko, 2009; Benfratello and Bronzini, 2010; Francois and Manchin, 2013).

These studies emphasize the role of specific features at the national level. However, it is not only country-level characteristics that affect firm competitiveness; the impact of the local environment in which firms operate should also be taken into consideration. Nonetheless, despite its relevance, the empirical evidence on the impact of local characteristics on firms' export performance is still lacking. In fact, most of the literature studying firm internationalization often adopt a regional or macro-regional perspective, for example controlling for the impact of local factors on the export performance of firms through geographical dummies, even in the presence of substantial differences in terms of the economic and social characteristics of different areas within a country.[3]

[2] Meyer et al. (2011, p. 243) argue that 'local context are themselves embedded in broader regional context: issues may pertain to, for example, cities, provinces, nation states, or even supra-national units'.

[3] For instance, Minetti and Zhu (2011) argue that differences among the South, Centre and the North of Italy, in terms of infrastructure, institutions and closeness to the most important markets where firms can export, support the inclusion of dummy variables indicating where the firm is headquartered.

In this paper, we present the empirical results of an analysis of the impact of the local context on firms' exports, where the geographical unit of observation is the Italian province. Italy is a good case study for analysing the role of local characteristics. Italian provinces are indeed characterized by substantial differences in terms of their economic and social development. As has been argued by Sestito (2011), for example, the localism of the network of relationships in which firms are entrenched may have a strong influence on their performance. This notwithstanding, the only local characteristic that has been thoroughly analysed as a determinant of firms' internationalization is the role of local spillovers within industrial districts, following the seminal works of Becattini (1990).[4] Indeed, to the best of our knowledge, the only noticeable exception is Giovannetti et al. (2013), who, in addition to considering the impact of industrial districts, include in their analysis specific measures of infrastructure endowment at the province level.

We conduct our analysis on a sample of more than 4,300 Italian manufacturing firms over the period 2000-2013. The data are of very high quality and come from the Bank of Italy Survey of Industrial and Service Firms (Invind), an annual survey of a stratified sample mimicking the structure of the Italian manufacturing sector and its geographical characterization. Our aim is to examine the determinants of export performance, adopting both a firm-level and a province-level perspective. Our contribution to the previous literature is our focus on the characteristics of the economic and social environment in which firms operate, in addition to controlling for their individual characteristics. In particular, after a careful analysis of the potentially relevant characteristics of the context of operation, we concentrate on three of them: the distance from foreign destination markets, the level of human and social capital, and the efficiency of the public administration. To this purpose, we first draw a picture of the Italian provinces in terms of these specific context variables, and then analyse their impact on firms' export performance.

[4] Bronzini (2000), for example, finds a significant industrial district effect on export performance at the province level. Similarly, Bagella et al. (1998) show that the benefits of geographical agglomeration in terms of export intensity and export participation are decreasing with firm size and are higher in sectors where competition is based on product differentiation. Gola and Mori (2000) argue that trade specialization of the Italian manufacturing sector depends on factor endowments (human and physical capital, labour), as well as on other location advantages.

The empirical analysis is therefore structured in two steps. First, we conduct a cluster analysis to identify homogeneous groups of Italian provinces with respect to economic and social environment characteristics. In this way, we identify the context in which firms operate. Second, we study the explanatory power of the context variables to explain firms' export performance, even controlling for firm-level characteristics. Following the previous empirical literature, export behavior is defined in a dual way: both as the probability of a firm exporting (extensive margin) and as the share of exports over total sales (intensive margin). At the provincial level, we consider the distance to foreign markets, the level of human and social capital and the degree of efficiency of the public administration. At the firm level, we control for a set of standard characteristics that may prevent or promote the presence of firms in foreign markets, such as: size, age, productivity, capital intensity, percentage of white-collar workers, propensity to innovate, and the degree of financial constraints.

Comparing the effects of individual characteristics, our results reveal that firm size appears to be the most significant factor for both the decision to export and to expand the intensive margin of export. As firm size increases from small to medium sized, in fact, the likelihood of exporting increases by almost 6%, while the export share increases by more than 7%. If we consider, instead, the effects of the provincial context, the analysis shows that all the factors have a significant economic impact on the decision to export, but only the distance and the efficiency of public administration are important for increasing the share of exports once the company has accessed foreign markets. The human and social capital shows an impact on the decision to export that reaches 4%. By contrast, when we go from those firms located in the most distant provinces to those located in closer provinces, we find that the probability of exporting increases by over 9% (7% is the increase in the export share); an efficient public administration also seems to be a prerequisite for stimulating firms to export and to export more, with a change in the intensive margin of 6%, which is higher than the change in the probability of exporting (3%).

In this regard, it is important to emphasize that our analytical framework identifies the additional effect of the characteristics of the local context on firms' export performance with respect to the indirect impact on other individual firm characteristics that might help them to internationalize. For example, it is well known that large firms have a higher probability of

exporting, and that some characteristics of the local context help firm growth. To address this issue, we also estimate a two-stage regression model in which firm characteristics that favor internationalization are instrumented using local context characteristics. However, such indirect impact of local context characteristics on internationalization is already accounted for in our baseline framework, because we control for firm characteristics such as size and productivity: if anything, our estimate of the impact of the local environment on internationalization suffers from an attenuation bias.

The rest of the paper is organized as follows. Section 2 reviews the recent literature on the determinants of firms' export performance that is relevant for our analysis, focusing in particular on firm characteristics and on local context variables. Section 3 describes the data used and their sources. Section 4 presents the empirical methodology and illustrates the main results of the cluster analysis on province-level indicators. Section 5 presents the results of the econometric analysis. Section 6 concludes.

2. Previous literature and empirical framework

2.1 Previous literature

Our selection of the firm-level determinants of exports is based on existing theoretical and empirical literature (within the limits of data availability on the characteristics of Italian provinces).

A first strand of literature related to our analysis studies the link between firm characteristics and their export performance. According to the seminal paper by Melitz (2003), only the most productive firms find it profitable to export, due to the significant sunk costs of entering foreign markets. Accordingly, a large number of empirical contributions have shown that the characteristics of exporting and non-exporting firms are indeed different, even within the same industry: exporters are more productive, larger, have a higher share of skilled workers, pay higher wages, have more years of activity and have a higher innovative capacity than non-exporters (Bernard and Jensen, 2004).[5] Indeed, there is a fundamental relationship between productivity, firm size and export performance, since more productive firms are larger and therefore find it profitable to sustain the costs of

[5] See Bottasso and Piccardo (2013) for a detailed survey of the literature on firm heterogeneity and exports.

internationalization, extend their market and exploit economies of scale that allow them to further increase their size (Krugman, 1979).[6]

Firm internationalization is also associated with a higher capital intensity, reflecting a firm's technology (Wakelin, 1998; Basile, 2001; Egger and Kesina, 2013), and a stronger propensity to innovate (Damijan et al., 2010; Becker and Egger, 2013), both in terms of inputs (intensity of R&D) and outputs (product and process innovation).[7]

Finally, a recent strand of literature has focused on the impact of credit availability on export performance.[8] In general, operating in foreign markets entails fixed and variable costs above and beyond those necessary to serve the domestic market. This has the important implication of raising the financial needs of firms, making them more dependent on external sources of financing. The theoretical and empirical literature has confirmed this link (Chaney, 2013; Manova, 2013). On a partly related ground, older firms have easier access to the funding means that are necessary for entering foreign markets and have longer experience in the business and therefore higher productivity (Majocchi et al., 2005).

The ample international evidence on the link between firm characteristics and export performance is also confirmed in the case of Italy. Castellani (2002) and Serti and Tomasi (2008) provide evidence that productivity positively affects both the intensive and the extensive margins of exports of Italian firms. Minetti and Zhu (2011) confirm that the extensive and intensive propensities to export are smaller for credit-rationed firms. Sterlacchini (2001), Basile (2001), Becchetti et al. (2007) and D'Angelo (2012) find that innovation and agglomeration of firms in geographically restricted areas are very important competitive factors that explain firm-level heterogeneity in the export performance of Italian firms.

A second strand of literature related to our analysis studies the importance of economies of localization on firms' exports. Francois and Manchin (2013) explore and

[6] Wagner (2007a) provides a survey of the literature on the impact of productivity and export performance.

[7] Love and Roper (2015) provide a detailed survey on innovation, exporting and growth for SMEs.

[8] Wagner (2007b) provides a survey on firm-level studies analysing the impact of credit constraints on export. It concludes that (i) less constrained firms self-select into exporting since financial constraints are important for the export decisions of firms; (ii) exporting firms are less financially constrained than non-exporting firms and (iii) exporting does not improve the financial health of firms.

confirm the influence of infrastructure and institutional quality on the pattern of bilateral trade of developing countries. Similarly, Portugal-Perez and Wilson (2012) estimate the impact on the developing countries' export performance of indicators for 'soft' infrastructures (border and transport efficiency, business and regulatory environment) and 'hard' infrastructures (physical capital and the diffusion of information and communication technology), finding an impact on the extensive and the intensive margins. On a partially related ground, Méon and Sekkat (2008) and Levchenko (2009) show that an improvement in institutional quality would result in an increase in exports. Focusing on Italy, Bugamelli et al. (2000) and Basile (2001) argue that firms located in the southern regions suffer from locational disadvantages, attributable at least in part to institutional and context variables that go beyond specific firm characteristics. More interestingly, in a paper focusing on leading Italian exporting firms before and during the 2007-2008 financial crisis, Bugamelli and Gallo (2012) argue that employing context-specific macroeconomic policy measures that induce firms to increase their size is one way of improving competitiveness in foreign markets. Such measures include improvements in: the quality of schools, market regulations, efficiency of transport and infrastructure endowments, efficiency of the public administration, and better relationships between firms and the public administration. These factors are indeed likely to increase firm competitiveness and favor large exporting firms. Finally, Giovannetti et al. (2013) use a multilevel econometric framework to estimate the impact of geographical and context characteristics (physical infrastructures and district effects) on the propensity of Italian firms to export between 2001 and 2003, controlling for firms' individual characteristics. They find that small firms benefit from operating in industrial districts, whereas the internationalization performance of large firms is not much affected by context variables.

Finally, a third strand of literature related to our work deals with the geographical and socio-economic characteristics of the context in which firms operate. Gravity models developed by Tinbergen (1962), Pöyhönen (1963) and Anderson and van Wincoop (2003) explain bilateral trade flows based on the economic size and distance between two countries. Accordingly, several country-level studies suggest that geographic localization, as well as transport and communication infrastructures, determine the ability of countries to participate in the global production network (Bougheas et al., 1999; Limao and Venables, 2001).

2.2 Empirical framework

The objective of our analysis is to verify the existence of specific conditions that, locally, may promote or hinder firms' internationalization process. We proceed in two steps. First, we perform a cluster analysis to classify Italian provinces according to a set of variables describing the characteristics of the local context where firms operate, chosen based upon the literature discussed above. Second, we estimate two sets of econometric models – one for the intensive and one for the extensive margin of firms' export performance – including as explanatory variables a set of dummies for provinces that have been classified in the same group by the cluster analysis, and a set of firm-level characteristics.

We have adopted this two-step procedure for three reasons. First, local context characteristics are often strongly correlated and therefore they cannot be included simultaneously as explanatory variables in a regression framework without incurring strong collinearity problems. Second, local context variables are often measured in terms of variables that do not have a direct economic interpretation (e.g., the number of blood bags collected yearly per million inhabitants in the province). Third, cluster analysis allows a more direct visualization of how provinces can be grouped homogeneously.

In turn, the provincial variables used in the cluster analysis have been selected from an extensive dataset, including indicators of distance, human and social capital and efficiency of the public administration. These indicators have been used as independent variables in a regression of firm-level export performances, controlling for firm-level characteristics. Only statistically significant indicators have been retained for cluster analysis. This set of indicators has been augmented by other characteristics, marginally significant, but essential to shaping the provincial environment. Results of these regressions are reported in Appendix 1.[9]

[9] We also include a set of indicators of infrastructure endowment: road and railway travel time across provinces, described in Alampi and Messina (2011), as well as telephonic and telecommunication structures and networks indicators, produced by Istituto Tagliacarne. However, the high correlations between these indicators and others included in the specification did not generate significant results.

3. Data sources

The clusters of Italian provinces used in the regression analysis are identified based on indicators related to: proximity to the most important foreign markets, human and social capital, and efficiency of the public administration. Details on the sources of data are reported in Table 1.

Table 1 – Variables and sources

Definition	Description and source
Provincial indicators	
distance	weighted average distance to main foreign markets, *Fratianni and Marchionne (2012)*
donation	blood bags/million inhabitants (number), *Guiso et al. (2004)*
invalsi	Invalsi test scores (percentage of correct answers), *Invalsi (2012)*
population age	average age of population (age), *Istituto Tagliacarne*
opportunism	indicator of opportunism in '50-'60 (principal component), *Arrighetti et al. (2008)*
process duration	number of days to complete a civil trial in the courts located in the province (number), *Istat*
education	number of teachers per pupil in the primary and first three years of secondary school (school year 2005-06), *Giordano and Tommasino (2011)*
child and health care	efficiency of public childcare and healthcare, *Giordano and Tommasino (2011)*
trade credit public sector	trade credit from the public administration/total sales (per cent value), *Invind (2009-2012), C1NA/V210*
recycling	share of domestic waste that is recycled (percent value), *Istat - Sistema di indicatori territoriali*
Firm-level characteristics	
export	export turnover (thousands of euros), *Invind (2000-2013), V212*
du_exp	dummy equal to 1 if firm exported in the period 2000-2013
exp_int	export turnover/total sales (per cent value), *Invind (2000-2013), V213/V210*
size	average number of employees in the current, previous and next year (number), *Invind (2000-2013), V24*
age	years of experience from year of founding (years), *Invind (2000-2013), (annoril - V284*)
labor productivity	total sales/number of employees at the end of the year (thousands of euros), *Invind (2000-2013), V210/V205*
capital intensity	investment in tangibles/number of employees at the end of the year (thousands of euros), *Invind (2000-2013), V202/V205*
white_blue	share of white collars/blue collars, *Invind* (2000-2013), (V24 - V25)/V25
R&D	dummy equal to 1 if the firm has realized R&D activity over the period 2008-2010 (or 2009-2011), and zero otherwise, *Invind (2010-2011), RS1*
R&D intensity	R&D expenses/total sales (percent value), *Invind (2010-2013), V451AN/V210*
patents	dummy equal to 1 if firm has registered a patent during the period 2008-2010, and zero otherwise, *Invind (2010), BRM1*
product innovation	dummy equal to 1 if firm has carried out product innovation over the period 2008-2010 and 2011, and zero otherwise, *Invind (2010-2011), BRM4*
process innovation	dummy equal to 1 if firm has carried out process innovation over the period 2008-2010 and 2011, and zero otherwise, *Invind (2010-2011), BRM2*
technological district	dummy equal to 1 if firm belongs to a technological district, and zero otherwise, *Invind (2010), RPD5, RPD6*
increase debts	dummy equal to 1 if firm wanted to increase its debt with banks or other financial intermediaries, and zero otherwise, *Invind (2010-2013), FI53*
stringent loan terms	dummy equal to 1 if firm was willing to accept more stringent loan terms to obtain borrowings, and zero otherwise, *Invind (2010-2013), FI54*
denied loans (f.i.)	dummy equal to 1 if financial intermediaries did not grant the loan, and zero otherwise, *Invind (2010-2013), FI58*
denied loans (others)	dummy equal to 1 if the loan was not granted because of other reasons (e.g. costs of collateral), and zero otherwise, *Invind (2010-2013), FI59*

A first set of clusters of Italian provinces is built based on the physical distance from foreign destination markets, weighted by the GDP of the main destination countries of Italian exporters.[10] Data on distance has been obtained from Fratianni and Marchionne (2012), whereas data on the GDPs of foreign markets is from the IMF World Economic Outlook.[11]

A second set of cluster indicators concerns human and social capital. We include the number of blood bags per million inhabitants in the province, calculated by Guiso et al. (2004) using data collected by the Italian association of blood donors (AVIS) in 1995. The student scores on literacy tests conducted by Invalsi (2011-12) is a measure of the level of schooling in Italian provinces.[12] The average age is drawn from Tagliacarne Institute data, as different generations typically share different values. Last, we include the level of opportunism in '50 and '60, constructed by Arrighetti and Lasagni (2008) as the principal component of the number of protests of promissory notes and cheques and of property crimes.

Our third set of clusters, serving as proxy for the efficiency of the public administration, is based on five variables: the number of days needed to complete a civil trial in the courts located in the province obtained from the Italian National Institute of Statistics (Istat); two measures for public services (education, child and health care) studied by Giordano and Tommasino (2011); the amount of trade credit that private manufacturing firms claim from the public administration, constructed at the provincial level using Invind data as the average share of firm-level trade credit over their total sales; and the share of domestic waste that is recycled, obtained from Istat.

Data on exports and other firm characteristics are obtained from the Invind survey, conducted every year by the Bank of Italy, and covering a representative sample of Italian firms with more than 20 employees operating in manufacturing industries. Invind collects

[10] Main destination markets of Italian exports are: Australia, Austria, Belgium, Bulgaria, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, France, United Kingdom, Greece, Hong Kong, Hungary, Japan, Netherlands, Norway, Poland, Sweden, Tunisia, Turkey, United States of America and South Africa.

[11] Distance could have been introduced in our regression as a continuous explanatory variable. However, estimation of a precise measure of elasticity of exports with respect to the distance from foreign destination markets implies a degree of precision that goes beyond our scope. In fact, we prefer to consider provinces at a 'similar' distance as having a 'similar' local context.

[12] The National Institute for the Educational Evaluation of Instruction and Training (Invalsi) is the agency of the Ministry of Education, University and Research that conducts compulsory literacy and mathematics testing of the entire student population.

qualitative and quantitative information, including: workforce, gross fixed investment, total and export sales, production capacity and financing. Each year, the survey also contains single-subject sections on specific phenomena, such as the propensity to innovate, internationalization and sub-contracting.[13]

For the purpose of our analysis, we construct the extensive margin as a dummy variable (*du_export*) taking the value of one if the firm exported in the period 2000-2013 and zero otherwise. Moreover, we construct the intensive margin of exports (*export_intensity*) as the share of exports over total sales, averaged over the same period. Different control variables at firm level are included in the empirical model. According to the literature reviewed in Section 2, we include standard firm characteristics such as: (i) *size*, measured by the average number of employees in the current, previous and next year, (ii) *age*, measured by the number of years of activity since the firm's founding, (iii) *labor productivity*, measured by total sales over the number of employees at the end of the year, (iv) *capital intensity*, expressed as investment in tangible assets over the number of employees at the end of the year, and (v) the share of white-collar over blue-collar workers (*white_blue*).

In addition, we control for firms' propensity to innovate, distinguishing between input and output indicators. On the side of input indicators, we use the 2010 and 2011 Invind surveys, which contains a single-subject section on 'R&D and innovation', referring only to firms with more than 50 employees. We adopt a binary variable (*R&D*) indicating whether the firm carried out R&D activity over the period 2008-2010 (or 2009-2011). We complete this information with surveys conducted in 2010-13 containing R&D expenses, including internal and external services. We construct an *R&D intensity* indicator, dividing R&D expenses by total sales. The 2010 Invind survey collects information on *patents*, *product innovation* and *process innovation*. Those variables are equal to one if the firm has registered a patent or has realized product or process innovation over the period 2008-2010, and zero otherwise.

[13] The target population is stratified in terms of sectors of economic activity, number of employees and regional location and for each layer a number of firms is randomly drawn. The number of firms to be contacted each year is not determined in proportion to the total population as in a proportional sample, but rather so as to obtain reliable estimates of the aggregate dynamics of investment, employment and total sales. The original sample is a pseudo-panel, since firms identified in the previous survey are always contacted for the next survey, if they are still part of the population of interest, while those no longer willing to cooperate are replaced by other similar firms. A firm is removed from the sample when it is liquidated, it is bankrupt, it is the object of a merger, or simply when it ceases to be representative of the aggregate behavior. For a detailed description of the methodological issues related to the Invind survey, see Banca d'Italia (2014).

Information on product and process innovation is also available in the survey conducted in 2011. To take into account whether a firm belongs to a *technological district*, we collect information on the survey conducted in 2010. It also reports the year starting from which the firm belongs to a district so that we can extend this information back to previous years.

Finally, the Invind survey for the period 2010-13 reports information on financing, such as: (i) whether a firm wanted to increase its debt with banks or other financial intermediaries (*increase debts*), (ii) its willingness to accept more stringent loan terms to obtain borrowings (*stringent loan terms*), (iii) whether a firm applied for new financing from banks and other financial institutions and was given no loan because the financial intermediaries contacted were not willing to grant the loan (*denied loans (f.i)*), and (iv) whether no loan was obtained from banks and other financial intermediaries for other reasons (e.g., cost or collateral considered to be excessive) (*denied loans (others)*).

4.Provincial clusters

4.1 Methodology

In general, cluster analysis is conducted in three steps. The first step identifies the cluster criteria, that is, the variables used to group objects. The second step defines the distance measure to calculate the proximity (or similarity) between objects in terms of the chosen variables. Then a group-building algorithm is adopted to assign each object to a group, so as to maximize homogeneity within groups and heterogeneity across groups.

We class the 103 Italian provinces established in 2001 into groups based on the three sets of characteristics described above: distance to foreign markets, human and social capital, and efficiency of the public administration. For the second step, we follow the common practice of using the Euclidean distance:[14] the greater the distance, the less similar are the objects. However, since the variables describing provinces to be clustered are not measured

[14] The Euclidean distance is calculated as follows (Everitt et al., 2001, Chapter 3):

$$d_{ij} = \left(\sum_{k=1}^{p} (x_{ik} - x_{jk})^2 \right)^{\frac{1}{2}}$$

where x_{ik} and x_{jk} are, respectively, the k^{th} variable value of the p-dimensional observations for individuals i and j. The distance d_{ij} can be interpreted as the physical distance between two p-dimensional points $x_i' = (x_{i1}, x_{i2}, \ldots, x_{ip})$ and $x_j' = (x_{j1}, x_{j2}, \ldots, x_{jp})$.

in the same units, before calculating the distance, we standardize each of them to unit variance. Finally, with respect to group building, we follow Bentivogli et al. (2013) in adopting Ward's agglomerative hierarchical method on standardized variables and Euclidian distances.[15] The aim of the Ward procedure is to unify groups, such that the variation within these groups does not increase too drastically: the resulting groups are as homogeneous as possible (Hardle and Simar, 2003). The number of clusters is defined by using the Duda et al. (2001) index with the associated pseudo-T-squared method and the pseudo-F index elaborated by Calinski and Harabasz (1974).[16]

4.2 Groups of provinces

Before presenting the results of the cluster analysis, we analyse the correlations among our provincial indicators (their values are reported in Appendix 2). The matrix (Table 2) indicates a high degree of correlation between distance and other groups of variables. The provinces that are more distant from foreign destination markets also show a low level of human and social capital (low blood donation, Invalsi test scores, ageing and high levels of opportunism) and a low efficiency of the public administration (high duration of processes and low levels of child and health care and of recycling). Among human and social capital indicators, we find a positive correlation between donation, Invalsi test scores and ageing. On the other hand, opportunism is negatively correlated with Invalsi test scores (-0.398), donation (-0.358), and ageing (-0.159). Among the variables measuring the efficiency of the local public administration, the positive correlation between recycling level and education (0.512) and the negative correlation between recycling level and process duration (-0.443) are stronger than the others. Recycling is also strongly correlated with blood donation (0.599).

[15] The two most common clustering methods are the partitioning and the hierarchical methods (Hardle and Simar, 2003). In general, partition methods create a distinct number of non-overlapping groups, whereas hierarchical methods create hierarchically related sets of clusters. In particular, a partitioning algorithm starts from a given group definition and proceeds by moving elements from one group to another, until a certain score is optimized, but the assignment of objects into groups may change during the application of the algorithm. In hierarchical clustering, on the contrary, once groups are formed and elements are assigned to the groups, this assignment cannot be changed. More specifically, the hierarchical algorithms include agglomerative and splitting procedures. The first type of hierarchical clustering starts with the assumption that each observation forms a cluster and then groups the clusters. The second type starts with one cluster containing all of the observations and proceeds to split up the single cluster into smaller-sized clusters.

[16] Large values of the Calinski–Harabasz pseudo-F index indicate distinct clustering. The Duda–Hart Je(2)/Je(1) index has an associated pseudo-*T*-squared value. A large Je(2)/Je(1) index value and a small pseudo-*T*-squared value indicate distinct clustering.

Table 2 – Correlations between provincial-level indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) distance	1									
(2) donation	-0.647	1								
(3) invalsi	-0.812	0.539	1							
(4) population age	-0.547	0.376	0.557	1						
(5) opportunism	0.421	-0.358	-0.398	-0.159	1					
(6) education	-0.568	0.382	0.574	0.489	-0.281	1				
(7) child care and health care	-0.300	0.254	0.197	0.051	0.212	0.105	1			
(8) process duration	0.602	-0.474	-0.571	-0.466	0.155	-0.341	-0.347	1		
(9) trade credit public sector	0.024	-0.064	-0.060	-0.032	0.182	-0.122	0.106	0.044	1	
(10) recycling	-0.804	0.599	0.655	0.252	-0.385	0.512	0.284	-0.443	-0.063	1

Figure 1 shows that Italian provinces can be clustered into six groups based on physical distance from foreign markets. The *Closest* provinces (Clusters 1 and 2) are those with a low weighted distance to foreign markets. Twenty provinces belong to the first cluster, all from the North of Italy (closer to Germany and France). Cluster 2 includes 24 additional northern provinces and one from the Centre. The *Mid-distance* group (Clusters 3 and 4) include 26 provinces from the Center of Italy and northern Sardinia. The *Furthest* (Clusters 5 and 6) include the remaining 33 southern provinces of Italy and the southern provinces of Lazio.

Figure 1 – Provincial clusters based on distance indicator

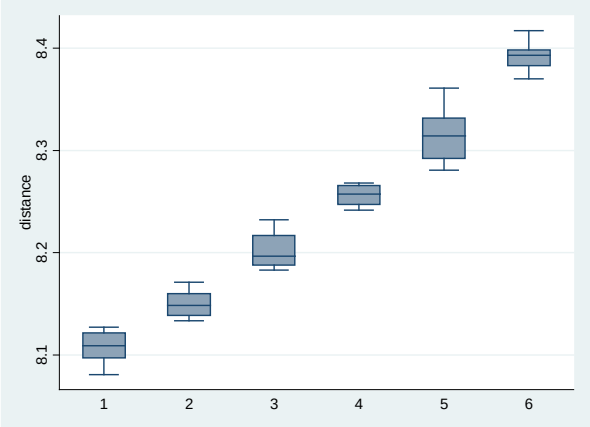
Notes: The *Closest* (Clusters 1 and 2) include provinces with distances, respectively, of less than 8.127 and between 8.134 and 8.171; the *Mid-distance* (Clusters 3 and 4) provinces have a distance between 8.183 and 8.232 and between 8.242 and 8.268; The *Furthest* (Clusters 5 and 6) include provinces with distances, respectively, of less than 8.361 and between 8.370 and 8.417.

Summary statistics for distance, by clusters

Cluster	number of observations	distance	
		Mean	St.Dev
Cluster 1	20	8.108	0.014
Cluster 2	24	8.150	0.012
Cluster 3	16	8.202	0.017
Cluster 4	10	8.257	0.010
Cluster 5	19	8.315	0.024
Cluster 6	14	8.392	0.015

In terms of variability, Cluster 1 is relatively distant from all the other clusters. Moving from Cluster 1 to Cluster 6, not only geographical but also Euclidean distance increases, as shown in the box plot (Figure 2).

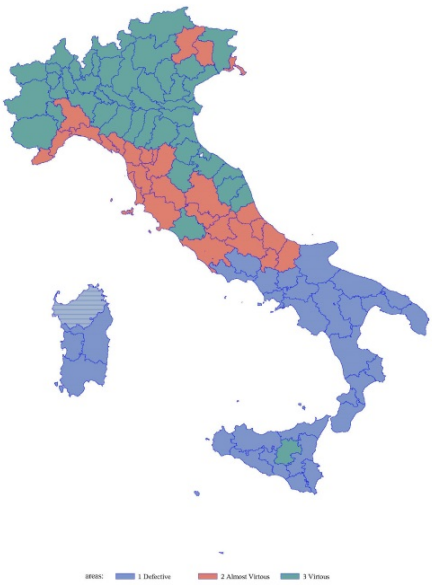
Figure 2 – Box plot for distance indicator



Notes: the ends lines represent the minimum and maximum data values, excluding extreme values. Extreme values are represented by rounds markers. The upper limit of the box represents the first (third) quartile of the distribution.

Figure 3 shows that based on human and social capital, Italian provinces can be clustered into three groups. The *Virtuous* provinces (Cluster 3) have the lowest opportunism indicator (-0.526) and the highest level of blood donation propensity (48 blood bags) and of Invalsi scores (70.232). Most of the 44 provinces belonging to this cluster are in the North, with only one in Sicily. The *Defective* and the *Almost virtuous* provinces (Clusters 1 and 2) show the lowest level of blood donation (10 and 17 blood bags, respectively) and a high opportunism indicator (0.224 and 0.564, respectively); Cluster 1 includes 31 provinces, most southern; Cluster 2 includes 28 provinces.

Figure 3 – Provincial clusters based on human and social capital indicators



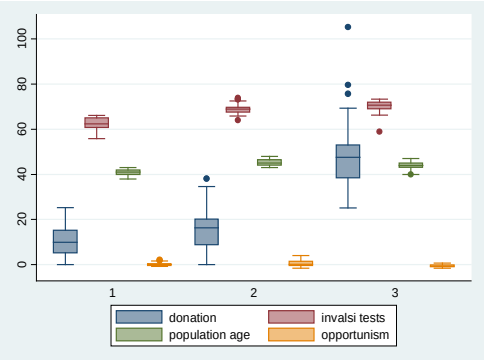
Notes: *Defective* (Cluster 1) provinces are those with the lowest levels of donation and Invalsi test scores. In the *Almost virtuous* (Cluster 2) provinces these values are at a medium level. The *Virtuous* (Cluster 3) provinces have the indicators with the highest levels.

Summary statistics for human and social capital indicators, by cluster

Cluster	number of observations	donation		invalsi		population age		opportunism	
		Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
Cluster 1	31	10.293	7.017	62.656	2.486	40.903	1.165	0.224	0.815
Cluster 2	28	16.593	11.440	68.994	2.438	45.143	1.557	0.564	1.245
Cluster 3	44	48.657	14.672	70.232	2.506	43.841	1.539	-0.526	0.547

The box plots for these indicators, represented in Figure 4, shows that the highest variance between and within clusters is for blood donation. Other indicators show a much lower variability.

Figure 4 – Box plot for human and social capital indicators



Notes: The ends lines represent the minimum and maximum data values, excluding extreme values. Extreme values are represented by rounds markers. The upper limit of the box represents the first (third) quartile of the distribution.

Finally, based on the efficiency of the public administration, three clusters of provinces are identified (Figure 5). *Efficient* provinces (Cluster 3) are characterized by the lowest number of days to complete a civil trial in the courts located in the province (245 days), the highest recycling rate (25%) and the highest level of education (1.040). Fifty-six provinces belong to this cluster, nearly all northern provinces, some in the Centre and one in the South. Cluster 2, *Almost efficient* provinces, includes only two provinces, reporting the highest level of child and health care and trade credit with respect to the public administration (7.9%). Finally, the *Inadequate* provinces (Cluster 1) are those with the highest number of days required to complete a civil trial in the province (153 days more than Cluster 1) and the lowest recycling rate (6.4%). They are mostly located in the South, with a few in the Centre.

Figure 5 – Provincial clusters based on efficiency of public administration indicators

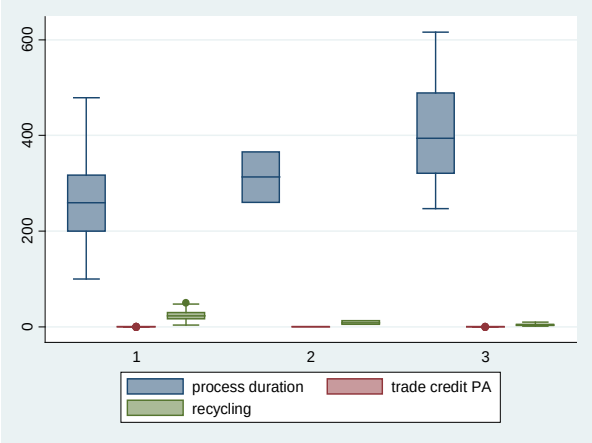
Notes: In the *Inadequate* (Cluster 1) provinces the indicators show the lowest level. In the *Almost efficient* (Cluster 2) provinces these values are at a medium level. *Efficient* (Cluster 3) includes provinces with the lowest number of days to resolute commercial disputes, the lowest level of trade credit from the public administration and the highest recycling rate.

Summary statistics for indicators of efficiency of public administration, by clusters

Cluster	number of observations	education		child care and health care		process duration		trade credit public sector		recycling	
		Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
Cluster 1	45	0.954	0.075	0.860	0.195	398	105	0.003	0.005	0.064	0.057
Cluster 2	2	0.953	0.052	1.187	0.063	313	75	0.079	0.015	0.085	0.060
Cluster 3	56	1.040	0.062	1.111	0.337	245	71	0.003	0.005	0.252	0.108

Concerning this group of indicators, the number of days to complete a civil trial in the province shows the highest variability between provinces and clusters, as can be inferred from Figure 6. Other variables have a lower degree of variability across provinces.

Figure 6 – Box plot for efficiency of the public administration indicators



Notes: The ends lines represent the minimum and maximum data values, excluding extreme values. Extreme values are represented by rounds markers. The upper limit of the box represents the first (third) quartile of the distribution.

5. Export performance of firms

5.1 Summary statistics

Table 3 reports the mean values of firm-level variables included in the analysis for exporters and non-exporters. In the same table, we also report the mean-comparison *t*-test of variables between the two groups (Welch, 1947).

Firms in our dataset operate in the manufacturing sector. Our sample is a cross-section of 4,373 firm observed over the period 2000 and 2013. On average, we have 9 observations per firm. Around 33% of the firms in our sample have between 20 and 49 employees (small firms), whereas the remaining 67% is made of medium-sized firms with more than 50 employees.

In Table 3, *exporters* are firms that exported at least one year between 2000 and 2013, and *non-exporters* are those that never exported during the same period. Around 89% of the firms in our sample (3,880) are exporters. However, firms that exported in every year represent only 5% of the total, implying that our sample shows a significant variability in the

extensive margin of export as well.[17] Export intensity for the sub-sample of exporting is about 35%.

Table 3 – Summary statistics of exporting firms versus non-exporting firms

Variable	Obs	Mean	Std. dev	Min	Max	Obs	Mean	Std. dev	Min	Max		
export	3,882	37.274	262.767	0	11.400	491	0	0	0	0	-8.834	***
du_exp	3,882	1	0	1	1	491	0	0	0	0		
exp_int	3,882	0.350	0.288	0	1	491	0	0	0	0	-75.629	***
size	3,882	244	793	19	26,774	491	68	79	19.333	634	-13.304	***
age	3,882	34	24	0	278	491	25	18	1	149	-10.331	***
labor productivity	3,882	324	979	11	46,893	491	211	383	17	5,031	-4.884	***
capital intensity	3,882	10.585	15.745	0.019	409.429	491	8.577	14.551	0.007	143.913	-1.005	
white_blue	3,882	1.888	13.580	0	579.320	491	1.116	4.851	0	83.625	-2.442	***
R&D	2,048	0.639	0.480	0	1	170	0.171	0.377	0	1	-15.197	***
R&D intensity	3,022	0.010	0.032	0	0.792	371	0.005	0.048	0	0.868	-1.676	**
patents	1,140	0.368	0.483	0	1	117	0.043	0.203	0	1	-13.776	***
product innovation	2,009	0.643	0.479	0	1	180	0.289	0.455	0	1	-9.966	***
process innovation	2,000	0.553	0.497	0	1	180	0.300	0.460	0	1	-7.019	***
technological district	3,317	0.012	0.111	0	1	391	0.005	0.071	0	1	-1.773	**
increase debts	3,269	0.554	0.497	0	1	390	0.559	0.497	0	1	0.116	
stringent loan terms	1,763	0.588	0.492	0	1	214	0.598	0.491	0	1	0.279	
denied loans (f.i.)	1,678	0.147	0.354	0	1	194	0.196	0.398	0	1	1.651	**
denied loans (others)	1,677	0.054	0.227	0	1	195	0.056	0.231	0	1	0.123	

Consistent with the literature, exporters are larger, more experienced, display a much higher labor productivity and a higher share of white-collar over blue-collar workers than non-exporters. In particular, exporting firms show a higher average number of employees (244) compared with non-exporting firms (68). Exporting firms are 9 years older that non-exporting ones, whereas labor productivity is about 50% higher. In addition, exporters show a higher probability of investing in R&D (64% vs. 17%), a higher level of R&D expenses over total sales (1% vs. 0.5%), a higher propensity to register patents (37% vs. 4.3%) and to carry out process innovation (55% vs. 30%) and product innovation (64% vs. 29%). Exporters are much more likely to belong to a technological district (1.2% vs. 0.5%). All these variables differ between the two samples and are statistically significant at least at the 5% level. Finally, exporters also have a 10% higher level of capital intensity, but the difference from non-exporters in this case is not statistically significant. The same reasoning applies to credit constraints variables (*except for denied loans (f.i.)*).

[17] We exploit the panel dimension of our firm-level data in the robustness checks.

Table 4 – Correlations between firm-level characteristics and cluster dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
(1) export	1																													
(2) du_exp	0.048	1																												
(3) exp_int	0.115	0.377	1																											
(4) size	0.739	0.074	0.116	1																										
(5) age	0.044	0.124	0.068	0.079	1																									
(6) labor productivity	0.125	0.038	-0.003	0.028	0.020	1																								
(7) capital intensity	0.106	0.041	-0.016	0.048	0.011	0.238	1																							
(8) white_blue	0.021	0.019	0.003	0.068	0.011	0.045	0.031	1																						
(9) R&D	0.079	0.255	0.317	0.134	0.111	-0.043	-0.050	0.024	1																					
(10) R&D intensity	0.044	0.039	0.096	0.092	-0.028	-0.029	0.142	0.045	0.267	1																				
(11) patents	0.104	0.200	0.269	0.173	0.101	-0.025	0.000	0.038	0.348	0.098	1																			
(12) product innovation	0.079	0.200	0.247	0.121	0.095	-0.028	-0.054	0.022	0.534	0.155	0.416	1																		
(13) process innovation	0.085	0.140	0.165	0.129	0.054	0.002	0.105	-0.016	0.379	0.108	0.283	0.505	1																	
(14) technological district	0.020	0.021	0.036	0.047	0.021	-0.018	-0.011	0.006	0.062	0.102	0.088	0.057	0.080	1																
(15) increase debts	0.010	-0.003	-0.065	-0.008	-0.049	0.003	0.027	-0.023	0.002	0.043	-0.009	0.046	0.020	0.010	1															
(16) stringent loan terms	-0.018	-0.006	0.031	-0.039	-0.020	-0.037	-0.027	-0.007	0.040	0.036	-0.035	-0.002	-0.042	0.002	.	1														
(17) denied loans (f.i.)	-0.034	-0.042	-0.059	-0.046	-0.076	-0.040	-0.079	-0.027	-0.040	-0.008	-0.001	-0.063	-0.054	0.031	.	0.222	1													
(18) denied loans (others)	-0.015	-0.003	0.025	-0.016	-0.024	-0.017	-0.021	-0.017	-0.019	-0.019	-0.059	0.020	-0.024	-0.008	.	0.064	0.023	1												
(19) du1_distance	0.058	0.148	0.162	0.129	0.205	0.018	0.015	0.002	0.147	0.030	0.134	0.126	0.087	-0.019	-0.061	-0.029	-0.070	0.005	1											
(20) du2_distance	0.018	0.117	0.154	0.036	0.067	0.005	-0.032	0.022	0.164	0.004	0.093	0.126	0.083	0.003	-0.043	-0.012	-0.063	-0.016	-0.278	1										
(21) du3_distance	-0.017	0.063	0.073	-0.029	0.015	0.016	-0.055	0.010	0.099	0.005	0.083	0.073	0.065	0.005	0.017	0.037	-0.019	0.010	-0.226	-0.236	1									
(22) du4_distance	0.020	-0.006	-0.058	-0.011	-0.047	-0.005	0.023	0.017	-0.045	0.003	-0.034	-0.035	-0.043	-0.026	-0.025	-0.012	0.040	-0.004	-0.163	-0.170	-0.138	1								
(23) du5_distance	-0.053	-0.223	-0.231	-0.094	-0.206	-0.019	0.032	-0.042	-0.284	-0.018	-0.192	-0.237	-0.162	0.022	0.083	0.058	0.105	0.010	-0.297	-0.310	-0.252	-0.182	1							
(24) du6_distance	-0.031	-0.139	-0.165	-0.053	-0.059	-0.024	0.030	0.000	-0.164	-0.032	-0.123	-0.095	-0.062	0.011	0.031	-0.078	0.003	-0.009	-0.136	-0.142	-0.115	-0.083	-0.152	1						
(25) du1_humsoc_capital	-0.065	-0.269	-0.290	-0.113	-0.204	-0.029	0.052	-0.037	-0.349	-0.033	-0.243	-0.278	-0.185	0.024	0.086	0.005	0.101	0.001	-0.343	-0.357	-0.290	-0.151	0.799	0.379	1					
(26) du2_humsoc_capital	0.010	0.020	0.001	-0.014	-0.006	-0.003	-0.016	0.056	0.041	0.004	-0.012	0.011	0.024	0.009	-0.019	-0.003	0.008	-0.013	-0.204	0.036	0.295	0.364	-0.250	-0.148	-0.373	1				
(27) du3_humsoc_capital	0.051	0.231	0.267	0.116	0.194	0.029	-0.034	-0.014	0.277	0.029	0.240	0.244	0.148	-0.030	-0.064	-0.003	-0.105	0.011	0.492	0.300	0.016	-0.173	-0.525	-0.224	-0.605	-0.513	1			
(28) du1_efficiency_pa	-0.079	-0.255	-0.302	-0.137	-0.244	-0.043	0.031	-0.049	-0.317	-0.041	-0.242	-0.234	-0.157	0.014	0.098	0.014	0.107	0.017	-0.420	-0.419	-0.123	0.208	0.603	0.286	0.700	0.031	-0.674	1		
(29) du2_efficiency_pa	-0.005	-0.024	-0.024	-0.005	-0.020	-0.009	0.011	0.022	-0.021	-0.014	-0.042	-0.084	-0.026	0.048	-0.016	-0.028	0.028	-0.017	-0.069	0.024	-0.059	-0.042	0.140	-0.035	0.115	0.018	-0.122	-0.116	1	
(30) du3_efficiency_pa	0.080	0.260	0.307	0.137	0.248	0.045	-0.033	0.044	0.320	0.045	0.253	0.256	0.163	-0.026	-0.093	-0.006	-0.114	-0.013	0.436	0.411	0.138	-0.196	-0.638	-0.276	-0.727	-0.036	0.703	-0.965	-0.149	1

Notes: See Table 1 for variable definitions.

Table 4 confirms the evidence of Table 3, revealing a positive correlation between standard physical characteristics of firms and export performance at both the extensive and the intensive margins. Export performance is positively correlated with firm size, age, propensity to innovate, capital intensity and productivity. However, capital intensity and productivity are negatively correlated with the intensive margin of exports. As far as the provincial clusters dummy is concerned, we find a positive correlation between export performance and Clusters 1 and 2 based on distance, and a negative correlation with other clusters, except for Cluster 4 (depending on the export margin considered). Positive correlations are also found between both margins of exports and Clusters 2 and 3 of human and social capital and Cluster 3 of efficiency of public administration.

Since simple correlations between variables do not take into account their interrelationships and the fact that some firms show industrial and localization specificities different from others, we now turn to a multivariate analysis.

5.2 Empirical methodology and econometric issues

Having identified provincial clusters, in terms of three crucial dimensions (distance to foreign markets, human and social capital and the efficiency of the public administration), in the second step of our analysis we estimate the impact of these context-level variables on firms' export performance, controlling for their characteristics. Export performance is defined in terms of both the extensive and the intensive margin.

In order to test the hypotheses described in Section 2 on the extensive margin (i.e., probability of firms to export), we estimate the following binomial model, where *i* indexes for firm, *p* for province and *s* for sector:

$$\begin{aligned} du\_export_{ips} = {} & a + \beta_1 size_{ips} + \beta_2 age_{ips} + \beta_3 productivity_{ips} + \beta_4 capital\_intensity_{ips} + \beta_5 white\_blue_{ips} \\ & + \beta_6 X_{ips} + du_1\_distance_p + du_2\_distance_p + du_1\_humsoc\_capital_p + \\ & + du_1 pa\_efficiency_p + du\_sector_s + \varepsilon_{ips} \end{aligned} \quad (1)$$

where: *du_export* is a dummy taking the value of one if firm *i* exported during the period 2000-2013, and zero otherwise; *size*, *age*, *productivity*, *capital_intensity* and *white_blue* are firm characteristics defined above; X is a set of other control variables at firm level, such as innovation and financial constraints; *du_distance*, *du_humsoc_capital* and

du_pa_efficiency are dummy variables indicating the cluster to which the province *p* belongs. More specifically, *du1_distance* indicates whether the province belongs to the *Mid-distance* (Clusters 3 and 4) group, *du2_distance* is equal to one for provinces belonging to Clusters 5 or 6 (i.e. *Furthest* provinces); *du1_humsoc_capital* identifies provinces with the lowest level of human and social capital (Clusters 1 and 2 – *Defective* and *Almost virtuous* provinces); *du1_pa_efficiency* identifies provinces in *Inadequate* and *Almost efficient* Clusters (1 or 2). The error term, ε, is a residual with the usual properties for binomial choice models. In the specifications we include sector dummies, defined in terms of two-digit Ateco-2007 classifications. We estimate equation (1) by using a logit model.

For the intensive margin of exports we adopt a similar specification, substituting the dependent variable with $export\_intensity_{ips}$, the share of exports over total sales averaged over the sample period, and using a standard OLS model.[18]

Equation (1) does not include one dummy for each cluster identified in the Section 4. This is because being located in a province that belongs to a given cluster does not necessarily have a statistically significant impact on a firm's export performance. In fact, it might even be the case that the characteristics of clusters that have been identified as different according to Ward's hierarchical method adopted in Section 4 nonetheless have an identical impact on firms' export performance. For example, once a certain distance from foreign markets is reached, it might be that reducing it further does not have a statistically significant impact on exports. To account for these patterns, in choosing the specification of equation (1) we follow a two-step procedure: first, we run a regression including all dummies for each provincial cluster and test the hypothesis that their coefficients are significantly different from each other; second, we group dummies for clusters with coefficients that are not significantly different from each other. The results of this specification search are available upon request.

In equation (1), the coefficients $\beta 1$-$\beta 5$ express the impact of standard firm-level variables on the probability and propensity that a firm exports (Wakelin, 1998). As suggested by the literature, we expect all these coefficients to be positive, meaning that larger, older, more productive, more capital intensive firms and firms with a higher

[18] Export intensity is motivated by the literature (see Katsikeas, et al., 2000; Majocchi et al., 2005; D'Angelo, 2012) and is by far the most widely used indicator in empirical research, even if it has been subject to some criticism.

percentage of white-collar employees are more likely to export and have a higher share of exports over total sales. The coefficients of dummies for clusters should be interpreted as the differences in export performance between provinces belonging to clusters included in the regression and the cluster not included, for each dimension, given other province-level controls and firm characteristics. Given that we have repeated observations on provinces, the standard errors are clustered at the provincial level (Javorcik, 2004).

In addition to the baseline specification, to better control for potential omitted variable problems and to test additional hypotheses, we also present the results of some specifications, including a set of firm-level and time-varying characteristics (X), such as the propensity to innovate and financial constraints. Consistent with the literature discussed above, the coefficients on the propensity to innovate are expected to be positive, while those on financial constraints negative.

We also conduct a number of robustness checks of our baseline results. First, we adopt different estimate strategies for the intensive margin: (i) we use a Tobit regression given that the dependent variable is censored and (ii) we estimate the impact on the level of exports, instead of on the share of exports over total sales. Second, we exploit the panel structure of our firm-level data and we estimate: (i) a pooled logit on the extensive margin, (ii) a random effects and a GMM model on the intensive margin.

5.3 Determinants of exports: econometric evidence

5.3.1 The role of provincial context

Table 5 presents the results of the estimate of equation (1) on the impact of firm and local-context characteristics on their probability of exporting. Column 1 presents the results including only standard firm characteristics. Columns 2-4 use the provincial cluster indicators, respectively for: distance, human and social capital and efficiency of the public administration, controlling for firm characteristics as well. Column 5 reports all provincial cluster variables and firm-level characteristics. Column 6 reports the marginal effect as the change in the probability of exporting after a variation from the value at the 25th and that at

the 75th percentiles for continuous variables, and after a variation of provincial cluster dummies from zero to one.[19]

Table 5 – Baseline estimates on the extensive margin of exports: the impact of provincial clusters

	Coefficients					Marginal effects
	(1)	(2)	(3)	(4)	(5)	(6)
size (log)	0.648***	0.516***	0.537***	0.509***	0.482***	0.056
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	
age (log 1+)	0.459***	0.294***	0.348***	0.332***	0.278***	0.019
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	
labor productivity (log 1+)	0.743***	0.580***	0.624***	0.583***	0.551***	0.038
	(0.09)	(0.09)	(0.08)	(0.09)	(0.09)	
capital intensity (log)	0.159**	0.175***	0.180***	0.183***	0.185***	0.021
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	
white_blue	0.001	-0.001	0.001	-0.001	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
du1_distance		-0.916***			-0.553*	-0.044
		(0.28)			(0.31)	
du2_distance		-1.891***			-1.133***	-0.095
		(0.27)			(0.33)	
du1_humsoc_capital			-1.279***		-0.487**	-0.037
			(0.20)		(0.25)	
du1_pa_efficiency				-1.236***	-0.381*	-0.030
				(0.17)	(0.20)	
Observations	4,373	4,373	4,373	4,373	4,373	
R^2	0.20	0.24	0.23	0.23	0.25	

Notes: Logit estimates conducted using Invind data averaged over the period 2000-2013. Robust standard errors, corrected for provincial clusters, are reported in parentheses. Marginal effects are computed using model (5) as a variation of the probability of exporting after a variation between 25th and 75th percentiles of continuous variables and after a variation of provincial cluster dummies from 0 to 1. Industry dummies are included in all specifications. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level. See Table 1 for variable definitions.

The estimated coefficients on the traditional firm-level determinants of export decisions show the expected sign (Column 1). Size and experience clearly play an important and positive role in the decision to export. Consistent with the implication of Melitz (2003), labor productivity also has a positive and statistically significant coefficient, meaning that more productive firms are more likely to export. The capital intensity variable also has a positive and significant effect on the probability of exporting, but its effect is economically

[19] In unreported regressions, available on request, we also control for cluster dummies constructed from four indicators of the financial system in a province, such as: the number of branches over 10,000 inhabitants, the amount of total deposits over GDP, the amount of total loans over GDP and the share of non-performing loans over total loans. Possibly because of the high correlations between our indicators, the impact of financial characteristics is not statistically significant, while the results on the other dimensions are unchanged.

weaker than that of other firm characteristics. The share of white-collar over blue-collar workers does not seem to affect export probability.

Columns 2-4 focus on the coefficients of the provincial clusters dummies, our key variables of interest. With respect to distance, the excluded cluster is that for provinces in greater proximity to the destination markets. The negative and statistically significant coefficients of *du1_distance* (-0.916) and of *du2_distance* (-1.891) confirm that provinces located in the Centre-South have less propensity to export as compared with those located in the North of Italy.[20] Similar results are obtained when we consider human and social capital. The dummy is negative and significant at the 1% level (-1.279). This indicates that firms located in *Defective* and *Almost virtuous* areas have, *ceteris paribus,* a lower propensity to export than those located in provinces defined as *Virtuous*. Finally, similar results are obtained for the efficiency of the public administration. The coefficient of the dummy for *Almost efficient* and *Inadequate* provinces is negative (-1.236) and statistically significant at the 1% level, meaning that firms located in these provinces are less likely to export than those located in the *Efficient* ones.

The results reported in Column 5, obtained from a specification including firm-level characteristics and all provincial clusters, broadly confirm those of the previous specifications. Interestingly, this suggests that the impact of each local characteristic is confirmed when controlling for firm characteristics and the other local characteristics too.

The marginal effects on specification (5) reported in Column (6) show that the largest effect is exerted by firm size. Increasing firm size from 37 employees (the value at the 25th percentile) to 173 employees (the 75th percentile) increases the probability of exporting by 5.6%. Similarly, as productivity increases from 127 to 324 thousand euros, the probability of exporting increases by 3.8%.[21] Other firm characteristics have a smaller impact (2.1% for capital intensity and 1.9% for experience).

[20] However, there is no evidence that being located in Clusters 3 or 4 (*Mid-distance*) has a significantly different impact on export performance, nor is there evidence of a significant difference between Clusters 5 and 6 (*Furthest*).

[21] Labour productivity has also been measured by comparing total sales to the average number of employees, to rule out seasonality effects, and results in the regressions remain unchanged.

Marginal effects are also relevant for provincial clusters. An otherwise identical firm moving to the *Closest* provinces (Clusters 1 and 2) would increase its export probability by 9.5% if coming from the *Furthest* provinces (Clusters 5 and 6) and by 4.4% if from the *Mid-distance* provinces (Clusters 3-4). We do find that in moving to a *Virtuous* province an otherwise identical firm would experience an increase of 3.7% in export probability if originating from a *Defective* or *Almost virtuous* province. An otherwise identical firm moving from an *Inadequate* or *Almost efficient* province to an *Efficient* province would increase its probability of exporting by 3%.

Comparing the effects on exports of individual characteristics and context variables, we can conclude that they are all economically sizeable. However, size and proximity to foreign markets are the most relevant factors for a firm in deciding to export.

Splitting the sample into small and large firms, based on the median level of employees, we find that results, in terms of coefficients and R-squared, hold for firms with fewer than 50 employees, whereas for larger firms only distance matters.

Table 6 – Baseline estimates on the intensive margin of exports: the impact of provincial clusters

	Coefficients					Marginal effects
	(1)	(2)	(3)	(4)	(5)	(6)
size (log)	0.060***	0.050***	0.052***	0.049***	0.047***	0.072
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
age (log 1+)	0.013*	-0.001	0.005	0.000	-0.003	-0.003
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
labor productivity (log 1+)	0.042***	0.029***	0.035***	0.028***	0.025***	0.023
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
capital intensity (log)	0.015***	0.017***	0.016***	0.017***	0.018***	0.026
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
white_blue	-0.001*	-0.001**	0.000	-0.001*	-0.001*	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
du1_distance		-0.022			-0.006	-0.006
		(0.02)			(0.02)	
du2_distance		-0.122***			-0.066***	-0.066
		(0.02)			(0.02)	
du1_humsoc_capital			-0.074***		-0.008	-0.008
			(0.01)		(0.01)	
du1_pa_efficiency				-0.100***	-0.055***	-0.055
				(0.01)	(0.02)	
Observations	4,373	4,373	4,373	4,373	4,373	
R^2	0.23	0.26	0.25	0.26	0.26	

Notes: OLS estimates conducted using Invind data averaged over the period 2000-2013 are reported. Robust standard errors, corrected for provincial clusters, are reported in parentheses. Marginal effects are computed using model (5) as a variation of the probability of exporting after a variation between 25th and 75th percentile of continuous variables and after a variation of provincial cluster dummies from 0 to 1. Industry dummies are included in all

specifications. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level. See Table 1 for variable definitions.

Table 6 reports the results of investigating the impact of provincial clusters on the intensive margin of exports, controlling as usual for firm-level characteristics. The structure of the table is similar to that of Table 5: Column 1 includes only firm-level determinants, Columns 2-4 add provincial cluster dummies, and Column 5 includes all provincial cluster dummies and firm-level variables at the same time.

As with the extensive margin, larger, more productive and more capital intensive firms also have a higher foreign sales ratio. However, the coefficient of firm experience is small or statistically insignificant, while that of the share of white-collar workers is negative and statistically insignificant (-0.001). As in the case of the extensive margin of trade, the strongest impact on export intensity is that of firm size.

Turning to the impact of local context characteristics, the effect is statistically significant with respect to the intensive margin too. As expected, firms located in the *Furthest* provinces (Clusters 5 and 6) show a lower export share compared to those in the *Closest* provinces (Cluster 1). The coefficient of the dummy for the *Furthest* provinces is -0.122 (Column 2), and it is statistically significant at the 1% level. By contract, the coefficient for the *Mid-distance* provinces is -0.022 and is not statistically significant. Together with the results on the extensive margin, this suggests that firms at a *Mid-distance* from destination markets find it more difficult to become exporters, but once they become so they have a similar export performance as those located in the *Closest* provinces.

The impact on the intensive margin of trade of human and social capital and efficiency of the public administration (Columns 3 and 4) is similar to that on the extensive margin.

However, from a statistical point of view, when we include all provincial dummies in the same regression (Column 5), the dummy for human and social capital is not significant in the intensive margin results, probably due to collinearity problems.[22]

An increase in the number of employees from the 25th to the 75th percentile of the distribution (from 37 to 173) leads to an increase of 7.2% in a firm's share of exports. Other

[22] Reassuringly, we have verified that the results remain unchanged if we split the sample between firms with more or fewer than 50 employees.

determinants exert a positive, but less pronounced impact. Productivity increases export share by 2.3% and capital intensity by 2.6%. The impacts of the shares of age and white-collar workers are negligible. The marginal effect for distance is also economically sizeable: if firms headquartered in provinces that are more remote from foreign markets belonged to the *Closest* cluster, their export intensity would increase by 6.6%. Similarly, by relocating to an *Efficient* province from an *Almost efficient* or *Inadequate* one, the same firm would experience an increase in its export share of 5.5%.

A comparison of the effects on the extensive and intensive margins reveals that closeness to foreign markets, higher human and social capital and higher institutional quality have a greater and more significant impact on the decision to export than on the level of exports over total sales. In other words, once a firm overcomes environmental obstacles to trade, it then finds it easier to increase its share of exports over total sales. For the same reason, we find that the economic impact of distance is lower than that exerted on the decision to export. On the contrary, the efficiency of the public administration is more relevant to the intensity of exports.[23]

In general, our results are in line with most of the empirical literature. In particular, they support many views underlying the importance of location assets in determining firm competitiveness (Dunning, 1998; D'Angelo, 2012; Giovannetti et al., 2013), in addition to firm characteristics.[24] Our estimates likely underestimate the total impact of local context on

[23] We conduct two robustness checks on our main results. The first consists in adopting an alternative methodology to cluster analysis. Indeed, we extract the principal components from our set of indicators and we retain three components, explaining about 70% of the variability. These components, whose correlations with original indicators are available on request, are representative of three phenomena: 'distance and social capital', 'human capital' and 'credit from the public administration'. Including both levels and squares, we find that these components have a non-linear effect on export performances, mainly confirming our baseline results on local context. By including principal components in levels, we find that 'distance and social capital' is the one that matters for both margins of trade. However, as far as the first component is concerned, we find a *U*-shaped relationship with export performance, significant for low levels of the component. For human capital, we find that only firms in well-endowed provinces receive a positive effect on the decision of export. Finally, the relationship with credit toward the public administration is inverse *U*-shaped and significant for both low and very high levels of the component. In the second check, we adopt different cut-offs to define exporting firms. These are based on the share of export sales: 10%, 20% and 30%. We find that for exporting firms with an export intensity higher than 30% the distance to foreign markets does not matter anymore, whereas human and social capital and efficiency of the public administration are still significant factors affecting export decision. On export intensity, no matter how exporting firms are defined, significant coefficients are found for the efficiency of public administration only. Results are available on request.

[24] These results are robust to the inclusion of other firm-level characteristics, such as its legal status. Results (unreported) are available on request.

export performance since environmental characteristics are likely to also influence other firm characteristics, such as size and productivity, which have a positive effect on export performance.

5.3.2 Additional controls

In addition to the baseline specification we have also considered the role of innovation. However, caution is required in comparing these results with those of the baseline specification since the number of observations drops dramatically when the new control variables are introduced.

Tables 7 and 8 report the results of estimates that include input and output innovation measures in regressions estimating the margins of trade. Almost all the regressions reveal that innovation is positively and significantly related to the probability of exporting, consistent with most of the empirical literature. The dummy for R&D investment over the period 2009-2011 has positive and statistically significant coefficients (1.136 and 0.069, respectively, for the extensive and intensive margin), whereas R&D intensity only has a statistically significant impact on the intensive margin (with a coefficient of 0.5). Considering the propensity of firms to register patents over the period 2009-2011, we find a positive and highly significant impact on export performance (coefficients of 1.680 and 0.051). As to product and process innovations, we find a positive impact on the probability of exporting (respectively, 0.740 and 0.389) as well as on the export share (0.043 and 0.036, respectively). This means that Italian firms are able to reduce production costs and to introduce new products, which increases their competitiveness in foreign markets. In other words, Italian firms have a higher return on their product and process innovations in foreign as compared with domestic markets. When a firm is headquartered in a province belonging to a technological district it is more likely to export, but its share of exports is not affected.

Including innovative activity in the regressions affects our main results on the extensive margin in terms of the significance of province-level characteristics. Reassuringly, results obtained on the intensive margin confirm the positive impact of the efficiency of the public administration in almost all specifications.

Table 7 – The impact of innovation indicators on the extensive margin of exports

	Coefficients					
	(1)	(2)	(3)	(4)	(5)	(6)
size (log)	0.335***	0.517***	0.306*	0.458***	0.459***	0.459***
	(0.12)	(0.09)	(0.17)	(0.11)	(0.11)	(0.07)
age (log 1+)	0.232*	0.218*	0.238	0.189	0.224	0.277***
	(0.14)	(0.11)	(0.18)	(0.14)	(0.14)	(0.10)
labor productivity (log 1+)	0.319**	0.540***	0.489**	0.352**	0.394***	0.464***
	(0.14)	(0.11)	(0.21)	(0.14)	(0.15)	(0.10)
capital intensity (log)	0.308**	0.156**	0.497***	0.297**	0.262**	0.223***
	(0.13)	(0.07)	(0.17)	(0.12)	(0.12)	(0.07)
white_blue	-0.008	-0.011	-0.016	-0.014**	-0.014**	-0.001
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.00)
du1_distance	-0.870*	-0.612	-1.689*	-1.100**	-0.998**	-0.439
	(0.49)	(0.45)	(0.94)	(0.51)	(0.49)	(0.34)
du2_distance	-1.426**	-1.291***	-2.461**	-1.939***	-1.803***	-1.121***
	(0.59)	(0.47)	(0.99)	(0.59)	(0.57)	(0.37)
du1_humsoc_capital	-0.174	-0.665**	0.126	-0.006	-0.195	-0.574**
	(0.34)	(0.30)	(0.41)	(0.34)	(0.32)	(0.26)
du1_pa_efficiency	-0.520	-0.258	-0.246	-0.460	-0.442	-0.305
	(0.33)	(0.22)	(0.43)	(0.33)	(0.30)	(0.23)
R&D	1.136***					
	(0.22)					
R&D intensity (log 1+)		4.936				
		(5.87)				
patents			1.680***			
			(0.49)			
product innovation				0.740***		
				(0.18)		
process innovation					0.389**	
					(0.19)	
technological district						1.181***
						(0.45)
Observations	2,081	3,393	1,105	2,106	2,099	3,654
R^2	0.28	0.24	0.28	0.27	0.26	0.25

Next, we take into account the financial variables affecting a firm's decision to export (Table 9). In Columns 1-4 we report the baseline estimates on the extensive and intensive margins augmented by two financial constraints variables: *denied loans (f.i.)* and *denied loans* (others). In our sample, we do not find evidence of credit constraints affecting exports. As far as the extensive margin is considered, our results are consistent with those of Paravisini et al. (2015).

Table 8 – The impact of innovation indicators on the intensive margin of exports

	Coefficients					
	(1)	(2)	(3)	(4)	(5)	(6)
size (log)	0.038***	0.053***	0.042***	0.048***	0.047***	0.049***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
age (log 1+)	0.005	-0.004	0.004	0.006	0.007	0.002
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
labor productivity (log 1+)	0.011	0.031***	0.027**	0.020*	0.022**	0.022***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
capital intensity (log)	0.020**	0.013**	0.018*	0.015*	0.013	0.017***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
white_blue	0.000	-0.001	-0.004***	-0.001	-0.001	-0.001**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
du1_distance	-0.015	-0.019	-0.003	-0.015	-0.014	0.009
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
du2_distance	-0.050	-0.078***	-0.038	-0.065**	-0.063**	-0.038
	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)	(0.02)
du1_humsoc_capital	0.010	0.009	0.008	0.017	0.011	-0.015
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)
du1_pa_efficiency	-0.077***	-0.066***	-0.094***	-0.071***	-0.073***	-0.057***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)
R&D	0.069***					
	(0.01)					
R&D intensity (log 1+)		0.500**				
		(0.21)				
patents			0.051***			
			(0.02)			
product innovation				0.043***		
				(0.01)		
process innovation					0.036***	
					(0.01)	
technological district						0.07
						(0.04)
Observations	0.29	0.28	0.32	0.30	0.29	0.27
R^2	2,218	3,393	1,257	2,189	2,180	3,708

However, in Column 5 we estimate the effect of a dummy variable, indicating whether firm *i* wanted to increase its debt with banks or other financial intermediaries on the extensive margin of trade. We find that these firms increased their probability of exporting (coefficient equal to 0.277). In Column 6 we include a dummy for those firms that were willing to accept more stringent loan terms in order to increase their debt. This effect is estimated on the intensive margin and is positive (0.021). The coefficient and significance of our variables of interest remain almost unchanged. The efficiency of the public

administration does not seem to matter when financial variables are included to explain the extensive margin. By contrast, human and social capital, in addition to efficiency, becomes significant in estimating the intensive margin of trade.

Table 9 – Financial variables and exports

	Coefficients					
	(1)	(2)	(3)	(4)	(5)	(6)
size (log)	0.348***	0.352***	0.047***	0.048***	0.477***	0.046***
	(0.12)	(0.12)	(0.01)	(0.01)	(0.07)	(0.01)
age (log 1+)	0.309*	0.305*	0.005	0.005	0.235**	0.004
	(0.16)	(0.16)	(0.01)	(0.01)	(0.11)	(0.01)
labor productivity (log1+)	0.285*	0.287*	0.020*	0.020*	0.532***	0.022**
	(0.16)	(0.16)	(0.01)	(0.01)	(0.09)	(0.01)
capital intensity (log)	0.288***	0.287***	0.015**	0.015**	0.197***	0.015**
	(0.10)	(0.10)	(0.01)	(0.01)	(0.07)	(0.01)
white_blue	-0.017*	-0.017*	-0.003***	-0.003***	-0.008**	-0.002**
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
du1_distance	-1.097	-1.096	-0.020	-0.021	-0.725*	-0.020
	(0.86)	(0.86)	(0.02)	(0.02)	(0.41)	(0.02)
du2_distance	-1.840**	-1.805**	-0.078***	-0.078***	-1.385***	-0.075***
	(0.91)	(0.90)	(0.03)	(0.03)	(0.43)	(0.02)
du1_humsoc_capital	-0.507	-0.512	0.005	0.006	-0.713**	0.004
	(0.43)	(0.44)	(0.02)	(0.02)	(0.28)	(0.02)
du1_pa_efficiency	-0.299	-0.327	-0.069***	-0.070***	-0.231	-0.074***
	(0.30)	(0.29)	(0.02)	(0.02)	(0.19)	(0.02)
denied loans (f.i.)	0.045		-0.002			
	(0.19)		(0.02)			
denied loans (others)		-0.022		0.032		
		(0.29)		(0.03)		
increase debts					0.277**	
					(0.11)	
stringent loan terms						0.021**
						(0.01)
Observations	1,804	1,804	1,872	1,872	3,659	1,977
R^2	0.22	0.22	0.25	0.26	0.25	0.28

5.3.3 Indirect effects of local context characteristics

As we have already argued above, the local context in which firms operate has an impact on characteristics such as their size, their productivity and their capital intensity; in turn, this may indirectly affect their export performance. Although such indirect effect is already accounted for in our baseline framework where we control for firm characteristics, it is nonetheless interesting to test whether its impact is economically and statistically

significant. To this end, we have estimated a two-stage regression model in which firm-level characteristics are instrumented using the characteristics of the local context. As argued, for example, by Kashyap et al. (2002), in such a framework the second-stage regression coefficients provide a measure of the indirect impact of the local context on internationalization taking place through the effect that local features exert on firm characteristics. Table 10 presents the results of the first- and second-stage estimates of the extensive margin, whereas Table 11 presents similar results on the intensive margin of exports.[25]

Table 10 – IV estimates of the indirect effect of the local context on the extensive margin of exports

First stage					*Second stage*	
	size (log)	age (log 1+)	labor productivity (log 1+)	capital intensity (log)		du_exp
Dependent variable	(1)	(2)	(3)	(4)	Dependent variable	(5)
du1_distance	-0.099**	-0.113***	0.063**	-0.082*	size (log)	-0.604
	(0.04)	(0.03)	(0.03)	(0.05)		(1.66)
du2_distance	-0.343***	-0.299***	-0.113***	-0.157**	age (log 1+)	-0.488
	(0.07)	(0.04)	(0.04)	(0.07)		(2.98)
du1_humsoc_capital	-0.236***	-0.049*	-0.032	-0.071	labor productivity (log 1+)	1.003
	(0.05)	(0.03)	(0.03)	(0.05)		(2.69)
du1_pa_efficiency	-0.328***	-0.150***	-0.230***	-0.038	capital intensity (log)	2.342
	(0.05)	(0.03)	(0.03)	(0.06)		(6.69)
Observations	4,373	4,373	4,373	4,373		4,373
Second-stage *F* test (p-value)						0.00

Notes: IV estimates conducted on Invind data averaged over the period 2000-2013. Panels (1)-(4) present the results of the first-stage regressions of firm-level characteristics on local context variables. Panel (5) presents the results of the second-stage regression of the predicted firm-level characteristics on each firm's export propensity. Robust standard errors, corrected for provincial clusters, are reported in parentheses. Industry dummies are included in all specifications. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level. See Table 1 for variable definitions.

Clearly, the local context has a significant effect on firms' size, age, productivity and labor intensity. However, the results of the second-stage regressions show that such effect does not have a significant impact on firms' export propensity and intensity: although they all have the expected sign, none of the coefficients of the firm-level characteristics is

[25] For the extensive margin, the two-step model has been estimated using a linear probability specification, because the probit specification failed to achieve convergence.

significantly different from zero. We therefore conclude that most of the positive effect of the local context on internationalization is the direct outcome of the more favorable environment towards exports, and not an indirect effect thorough its impact on firm characteristics.

Table 11 – IV estimates of the indirect effect of the local context on the intensive margin of exports

First stage					*Second stage*	
	size (log)	age (log 1+)	labor productivity (log 1+)	capital intensity (log)		exp_int
Dependent variable	(1)	(2)	(3)	(4)	Dependent variable	(5)
du1_distance	-0.098**	-0.112***	0.065**	-0.083*	size (log)	0.020
	(0.04)	(0.03)	(0.03)	(0.05)		(0.28)
du2_distance	-0.345***	-0.302***	-0.122***	-0.152**	age (log 1+)	0.155
	(0.07)	(0.04)	(0.04)	(0.07)		(0.44)
du1_humsoc_capital	-0.237***	-0.048*	-0.030	-0.072	labor productivity (log 1+)	0.203
	(0.05)	(0.03)	(0.03)	(0.05)		(0.43)
du1_pa_efficiency	-0.327***	-0.147***	-0.222***	-0.044	capital intensity (log)	0.049
	(0.19)	(0.03)	(0.03)	(0.06)		(1.08)
Observations	4,373	4,373	4,373	4,373		4,373
Second-stage *F* test (p-value)						0.00

Notes: IV estimates conducted on Invind data averaged over the period 2000-2013. Panels (1)-(4) present the results of the first-stage regressions of firm-level characteristics on local context variables. Panel (5) presents the results of the second-stage regression of the predicted firm-level characteristics on each firm's export intensity. Robust standard errors, corrected for provincial clusters, are reported in parentheses. Industry dummies are included in all specifications. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level. See Table 1 for variable definitions.

5.4 Robustness checks

In addition to the baseline econometric specifications, we also conducted a number of robustness checks. First, we take into account that the distribution of the intensive margin is truncated, in the sense that it is observed only for values greater than zero. *Exp-int* is the percentage of exports over total sales, whose minimum value is one and whose maximum is 100, or 100%. The analysis is then conducted using a truncated regression model (Tobit). This allows us to accommodate censoring in the dependent variable and to overcome the bias associated with assuming a linear functional form in the presence of such censoring (D'Angelo, 2012). Nevertheless, export intensity could be high for small firms, mainly oriented towards foreign markets, and low in large firms that produce for both domestic and

foreign markets, but are equally competitive in foreign markets. To deal with this issue, we use as a dependent variable exports in levels and we control for total sales to rule out a simple scale effect. These results are reported in Table 12. Both methods confirm that firms located in less efficient provinces export a lower share of sales (coefficients equal to -0.061 and -0.242, respectively).

Table 12 – Robustness checks on the intensive margin of exports

	Coefficients	
	Tobit	Exports (log)
	(1)	(2)
total sales		0.506*
		(0.30)
size (log)	0.051***	0.716**
	(0.01)	(0.30)
age (log 1+)	0.000	-0.063
	(0.01)	(0.04)
labor productivity (log 1+)	0.033***	0.437
	(0.01)	(0.29)
capital intensity (log)	0.023***	0.076**
	(0.01)	(0.03)
white_blu	-0.001*	-0.004**
	(0.00)	(0.00)
du1_distance	-0.008	-0.036
	(0.02)	(0.09)
du2_distance	-0.090***	-0.255**
	(0.03)	(0.12)
du1_humsoc_capital	-0.011	(0.06)
	(0.02)	(0.07)
du1_pa_efficiency	-0.061***	-0.242***
	(0.02)	(0.07)
Observations	4,373	3,882
Adjusted R2	0.43	0.62

Notes: Column 1 reports Tobit estimates for Exp_int, conducted using Invind data averaged over the period 2000-2013. Columns 2 report OLS estimates for Exp_int (in ln), conducted using Invind data averaged over the period 2000-2013. Robust standard errors, corrected for provincial clusters, are reported in parentheses. Industry dummies are included in all specifications. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level. See Table 1 for variable definitions.

In a second set of regressions, we exploit the panel dimension of our firm-level data to account for the dynamic aspect of the internationalization process (Majocchi et al., 2005), despite the fact that our context-level dummies are not time varying. Following the literature on firm-level panel data (Greenaway et al., 2007; Berman and Héricourt, 2010), we estimate

equation (1) with the pooled logit estimator.[26] Then, we take into account that unobserved firm-level characteristics might affect export performance through product attributes, managerial ability and foreign experience (Bernard and Jensen, 2004; Greenaway et al., 2007). Therefore, we estimate a random effect model on our intensive margin, which controls for the unobserved heterogeneity.[27]

Table 13 – Robustness checks: panel estimates

	Coefficients		GMM
	Pooled logit	Random effect	
size (log)	0.483***	0.040***	0.010***
	(0.06)	(0.00)	(0.00)
age (log 1+)	0.216***	0.002	-0.009***
	(0.07)	(0.00)	(0.00)
labor productivity (log 1+)	0.492***	0.013***	0.008***
	(0.07)	(0.00)	(0.00)
capital intensity (log)	0.084***	0.002***	0.001
	(0.02)	(0.00)	(0.00)
white_blu	0	0	-0.000***
	(0.00)	(0.00)	(0.00)
du1_distance	-0.307	-0.002	-0.004
	(0.19)	(0.01)	(0.00)
du2_distance	-0.805***	-0.057***	-0.017***
	(0.24)	(0.02)	(0.01)
du1_humsoc_capital	-0.507**	-0.014	-0.003
	(0.25)	(0.01)	(0.00)
du1_pa_efficiency	-0.527**	-0.057***	-0.026***
	(0.23)	(0.01)	(0.00)
exports (lag)			0.731***
			(0.01)
Observations	21,855	21,865	21,828
Adjusted R2	0.26	0.25	
Sargan test (p-value)			1249.02 (0.000)
Hansen test (p-value)			569.68 (0.039)

Notes: Column 1 reports pooled logit estimates over the sample period (2000-2013). Column 2 reports random effects estimates. Column 3 reports GMM estimates, where GMM-type instruments are all lagged values of the dependent variable and of all regressors. IV-type instruments are time and industry dummies and provincial clusters indicators.

[26] In general, logit and probit models give similar estimates, except in cases with an extremely large number of observations and a heavy concentration of the observations in the tails of the distribution (Nassimbeni, 2001). Since our observations are concentrated on the right side of the distribution, we use the more appropriate logit model. Results (unreported) obtained using a probit model are similar.

[27] Since our sample generally contains a high percentage of continuous exporters and continuous non-exporters firms, we do not report estimates obtained using the fixed-effect logit estimator (Chamberlain, 1980). This estimator would indeed exclude from the estimations of these firms, leaving us with about 5,000 observations.

In Column 1 robust standard errors, corrected for provincial clusters, are reported in parentheses. Time dummies and industry dummies are included in all specifications. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level. See Table 1 for variable definitions.

Third, to account for the hysteresis in exports documented by many previous studies (Bernard and Jensen, 2004; Roberts and Tybout, 1997), we augment equation (2) by introducing the lagged dependent variable and estimating the model using a system GMM estimator (Arellano and Bover, 1995; Bluendell and Bond, 1998). Export performance is indeed not only volatile, but also depends on past behavior (Majocchi et al., 2005).

The pooled logit results are reported in Column (1) of Table 13. The number of observations increases to 21,855 observations. Consistent with previous results, we confirm that larger, older, more productive and more capital intensive firms are on average more likely to export than other firms. All provincial cluster indicators remain negative and statistically different, except for *du2_distance*. In Column 2 of Table 13 we report the results of estimating the baseline regression (2) using the random effects estimator. Also in this case the main results remain roughly unchanged, both in terms of sign and significance of the coefficients. Reassuringly, introducing interaction terms *sector*time*, in unreported regressions, to take into account contingent industry shocks, does not influence the sign and significance of the estimated coefficients of our variables of interest.

Since the random effect model does not take into account the effect of hysteresis in export decisions, as argued in several studies, and potential endogeneity problems, in Column 3 we report the estimates obtained using the system GMM estimator, where we use GMM-type instruments for the lagged values of the dependent variable and all lagged values of regressors, and as IV-type instruments, time and industry dummies and provincial clusters indicators. We confirm again the main findings on firm-level characteristics. As expected, the coefficient on the level of exports in the previous year is positive and highly significant, although significantly smaller than one (0.731), meaning that firms exporting in the previous year are more likely to continue to export in the following year. Reassuringly, we find that with this specification, too, provincial characteristics positively influence the export decision of firms, even after controlling for firm-level characteristics and for the lagged level of exports.

In general terms, robustness checks show that our main results on the extensive margin obtained on a cross-section with a logit estimator and those on the intensive margin obtained with the OLS estimator are confirmed using different estimators and panel data.

6. Concluding remarks

This paper has analysed the factors influencing export performance for a sample of more than 4,300 Italian manufacturing firms drawn from the Bank of Italy Survey of Industrial and Service Firms (Invind) over the period 2000-2013. In addition to standard firm-specific characteristics (such as: size, age, productivity, capital intensity), the economic and social characteristics of the provinces in which firms operate are taken into account (distance to foreign markets, human and social capital and efficiency of the public administration).

The main contribution of the paper is to test the additional explanatory power of context characteristics at the province level of the different export performances of firms, controlling for firm-level characteristics as well. The empirical estimates reveal that, even after controlling for specific firm characteristics, a large part of the heterogeneity in export behavior is explained by the context in which they operate. Our results confirm the hypothesis of better geographic location favoring contacts with foreign countries. The role of human and social capital is also confirmed for Italian firms, as well as that of the efficiency of the public administration.

As far as firm-level characteristics are concerned, the results of the analysis confirm the main hypotheses on firm heterogeneity and export performance. Binomial estimates reveal that size, experience in business, labor productivity and capital intensity positively impact the decision of firms to export and the exports ratio. Moreover, these estimates also confirm the hypothesis that innovation helps to improve product quality and the production process, thus allowing firms to increase their competitiveness in foreign markets as well as the probability and the level of exports.

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Appendices

Appendix 1

	Coefficients	
	Logit	OLS
	(1)	(2)
size (log)	0.534***	0.028***
	(0.09)	(0.01)
age (log 1+)	0.176***	0.015***
	(0.06)	(0.01)
labor productivity (log 1+)	0	-0.001*
	(0.00)	(0.00)
capital intensity (log)	-3.748***	-0.579***
	(1.17)	(0.12)
white_blu	0.003	0
	(1.17)	(0.00)
distance	0.012	-0.002
	(1.17)	(0.00)
donation	-0.055*	0.001
	(0.03)	(0.00)
invalsi	-0.068	-0.004
	(0.05)	(0.01)
population age	-3.021*	0.111
	(5.36)	(0.33)
opportunism	-0.001	0
	(0.00)	(0.00)
process duration	1.848*	0.017
	(1.11)	(0.08)
trade credit PA	1.385	0.022
	(0.99)	(0.09)
recycling	-0.072	-0.023
	(0.21)	(0.03)
education	4,373	4,373
	0.24	0.25
child and health care	0.534***	0.028***
	(0.09)	(0.01)
Observations	0.176***	0.015***
Adjusted R2	(0.06)	(0.01)

Appendix 2 (continued)

Province	distance	donation	invalsi	population age	opportu-nism	education	child care and health care	process duration	total credit public sector	recycling	branches	deposits/GDP	loans/GDP	non-performing loans
Agrigento	8,398	14,849	55,787	41	0,081	0,969	0,639	172	0,005	0,035	3,861	0,425	0,340	0,172
Alessandria	8,127	38,076	69,356	47	0,087	1,027	1,026	157	0,000	0,197	6,575	0,384	0,683	0,044
Ancona	8,223	32,696	69,844	44	-0,021	1,088	1,292	274	0,001	0,118	6,600	0,331	0,794	0,026
Aosta	8,081	42,822	72,466	44	-0,945	1,092	0,718	199	0,001	0,169	7,863	0,363	0,611	0,035
Arezzo	8,211	32,742	67,734	45	-0,563	0,975	1,062	226	0,001	0,190	5,970	0,468	0,653	0,032
Ascoli Piceno	8,247	40,044	67,741	44	0,298	0,926	0,742	504	0,007	0,095	5,956	0,376	0,522	0,068
Asti	8,124	30,594	71,621	46	-0,975	1,102	0,844	100	0,000	0,159	7,008	0,504	0,537	0,050
Avellino	8,314	0,000	62,409	42	-0,625	1,027	0,505	593	0,001	0,059	2,843	0,333	0,425	0,133
Bari	8,329	2,088	65,772	40	0,427	0,941	1,010	343	0,002	0,060	3,456	0,382	0,482	0,125
Belluno	8,125	5,130	72,449	45	-1,395	0,931	0,900	406	0,000	0,254	8,542	0,299	0,456	0,027
Benevento	8,308	6,767	62,297	42	-0,775	1,060	0,582	468	0,014	0,064	2,787	0,315	0,273	0,149
Bergamo	8,109	34,753	70,628	41	-0,787	1,092	1,070	243	0,000	0,475	6,238	0,349	0,701	0,024
Biella	8,095	38,313	71,729	46	-0,819	1,080	0,892	107	0,000	0,202	6,782	0,340	0,697	0,034
Bologna	8,171	75,733	70,178	46	0,218	1,058	1,490	343	0,000	0,205	7,616	0,408	0,908	0,023
Bolzano	8,102	47,878	70,908	40	-0,294	1,073	1,123	265	0,005	0,330	8,791	0,422	0,805	0,016
Brescia	8,122	46,855	70,349	42	-0,884	1,090	1,014	346	0,001	0,293	6,927	0,377	0,996	0,018
Brindisi	8,351	12,019	64,169	41	0,889	0,969	1,168	346	0,000	0,038	2,758	0,328	0,334	0,158
Cagliari	8,315	24,100	64,245	42	0,003	0,978	1,038	411	0,001	0,026	3,420	0,278	0,456	0,109
Caltanissetta	8,397	0,000	62,136	40	1,586	1,045	1,692	346	0,000	0,017	3,248	0,393	0,326	0,147
Campobasso	8,295	16,833	66,235	43	1,866	0,923	0,598	247	0,001	0,027	4,507	0,271	0,383	0,105
Caserta	8,306	0,000	61,481	38	-0,381	0,843	0,710	576	0,002	0,032	2,216	0,337	0,302	0,100
Catania	8,405	7,346	63,485	40	1,566	0,889	0,898	321	0,004	0,027	3,290	0,311	0,383	0,190
Catanzaro	8,382	9,930	62,679	41	-0,139	0,999	0,575	334	0,004	0,051	2,679	0,246	0,342	0,161
Chieti	8,268	8,353	68,172	44	-0,301	1,051	0,774	260	0,000	0,061	3,978	0,319	0,431	0,066
Como	8,098	43,702	72,508	43	-0,377	1,063	1,111	207	0,017	0,304	5,935	0,357	0,625	0,046
Cosenza	8,370	12,416	60,325	41	-0,369	0,865	1,060	318	0,008	0,047	2,480	0,258	0,350	0,203
Cremona	8,134	52,345	71,738	44	-1,342	1,057	0,994	280	0,000	0,452	7,472	0,409	0,709	0,041
Crotone	8,382	9,930	59,150	39	-0,139	0,767	1,166	385	0,010	0,011	2,311	0,319	0,403	0,158
Cuneo	8,137	54,734	71,931	44	-1,282	1,108	0,917	152	0,001	0,184	8,125	0,415	0,551	0,030
Enna	8,397	69,255	58,928	42	-0,267	0,941	0,716	301	0,004	0,019	3,555	0,314	0,319	0,144
Ferrara	8,163	79,541	67,705	47	-0,587	1,070	1,387	213	0,000	0,241	6,012	0,353	0,541	0,045
Firenze	8,194	19,339	67,405	45	1,501	1,066	1,202	241	0,011	0,270	6,339	0,412	0,702	0,033
Foggia	8,307	7,007	65,480	40	1,071	0,874	0,764	438	0,001	0,033	3,329	0,391	0,407	0,162
Forlì-Cesena	8,188	53,003	72,247	45	0,003	1,042	1,120	204	0,002	0,166	8,228	0,436	0,865	0,021
Frosinone	8,281	7,140	65,848	42	-0,467	0,978	0,777	427	0,000	0,047	3,384	0,241	0,328	0,148
Genova	8,149	0,000	68,936	47	0,168	1,039	1,196	296	0,012	0,122	5,489	0,382	0,523	0,042
Gorizia	8,148	1,336	73,820	46	-0,830	1,103	0,803	202	0,000	0,208	6,960	0,360	0,538	0,040
Grosseto	8,225	10,589	69,249	47	1,434	0,871	0,776	398	0,002	0,164	5,827	0,421	0,575	0,030
Imperia	8,160	9,059	68,680	47	0,016	0,850	0,708	223	0,006	0,141	5,067	0,341	0,398	0,080
Isernia	8,290	14,381	69,431	44	1,866	0,990	0,483	281	0,000	0,035	3,673	0,247	0,558	0,072
L'Aquila	8,260	15,753	67,394	44	-0,376	1,103	0,933	489	0,007	0,086	4,606	0,312	0,385	0,136
La Spezia	8,168	33,564	73,242	47	0,145	0,990	1,231	260	0,090	0,128	5,835	0,351	0,455	0,077
Latina	8,281	16,096	66,068	41	0,500	0,917	1,142	366	0,068	0,043	3,094	0,303	0,458	0,188
Lecce	8,361	21,620	65,118	42	-0,689	0,972	1,009	422	0,002	0,065	3,084	0,356	0,347	0,131
Lecco	8,100	39,225	72,295	43	-0,582	1,045	0,614	266	0,000	0,503	6,614	0,335	0,602	0,044
Livorno	8,192	18,207	70,173	46	2,302	0,984	1,084	290	0,001	0,215	5,391	0,348	0,589	0,032
Lodi	8,122	48,100	68,060	43	0,706	1,045	0,648	285	0,000	0,372	6,172	0,374	0,640	0,034
Lucca	8,184	19,147	67,906	45	0,600	1,033	0,881	337	0,006	0,285	6,313	0,415	0,760	0,039
Macerata	8,232	56,987	71,359	44	0,185	1,088	0,814	333	0,000	0,165	6,600	0,359	0,593	0,043
Mantova	8,142	52,756	71,075	44	-0,807	1,059	0,945	318	0,000	0,288	7,994	0,436	0,853	0,031
Massa-Carrara	8,163	13,767	63,908	46	1,270	1,045	0,983	479	0,000	0,237	4,806	0,405	0,584	0,062
Matera	8,338	20,332	65,528	41	-0,183	0,947	0,908	355	0,020	0,055	3,966	0,380	0,415	0,169
Messina	8,392	18,184	60,782	42	-0,105	0,901	0,557	601	0,001	0,021	3,457	0,296	0,374	0,187
Milano	8,112	48,100	69,016	43	0,706	1,033	1,731	192	0,008	0,379	6,069	0,424	1,345	0,019
Modena	8,161	51,576	69,571	44	-0,905	1,109	1,242	260	0,002	0,226	6,704	0,371	0,719	0,028
Napoli	8,325	9,038	60,583	38	1,932	0,877	1,321	546	0,014	0,049	2,507	0,439	0,456	0,103
Novara	8,107	34,976	72,151	44	-0,700	1,106	1,276	262	0,000	0,394	5,626	0,359	0,614	0,041
Nuoro	8,285	15,257	61,528	42	0,003	1,054	0,803	471	0,000	0,012	4,417	0,320	0,332	0,147
Oristano	8,292	16,309	59,205	43	0,003	1,025	0,650	542	0,000	0,016	5,357	0,382	0,414	0,145
Padova	8,146	33,715	72,664	43	-0,268	0,969	1,094	242	0,013	0,393	6,425	0,387	0,709	0,027
Palermo	8,376	5,227	62,211	40	-0,097	0,901	1,229	517	0,003	0,050	3,131	0,357	0,498	0,200
Parma	8,150	59,759	70,812	45	-0,716	1,048	1,689	194	0,002	0,198	7,660	0,392	0,905	0,031
Pavia	8,123	105,214	68,194	45	-0,937	0,862	0,953	219	0,000	0,198	6,015	0,405	0,462	0,061
Perugia	8,227	13,625	69,152	44	-0,270	0,911	1,231	332	0,003	0,136	6,304	0,364	0,631	0,050
Pesaro e Urbino	8,208	47,345	69,670	44	-0,192	1,011	1,074	229	0,001	0,108	7,374	0,367	0,707	0,037
Pescara	8,266	10,330	67,178	43	0,250	0,938	0,829	292	0,002	0,053	4,603	0,420	0,494	0,074
Piacenza	8,134	51,160	67,555	46	-0,929	1,036	0,895	292	0,004	0,272	7,428	0,429	0,578	0,059

Appendix 2

Province	distance	donation	invalsi	population age	opportu-nism	education	child care and health care	process duration	total credi public sector	recycling	branches	deposits/GDP	loans/GDP	non-performing loans
Pisa	8,188	30,631	68,964	45	0,976	1,057	0,951	302	0,001	0,243	6,111	0,367	0,656	0,038
Pistoia	8,186	38,078	65,836	45	0,518	1,039	1,034	275	0,007	0,197	5,847	0,417	0,686	0,035
Pordenone	8,137	2,599	73,415	43	-1,490	1,082	0,897	369	0,000	0,232	7,093	0,296	0,596	0,022
Potenza	8,331	14,340	64,813	42	-0,729	0,883	0,917	340	0,000	0,046	3,888	0,278	0,455	0,201
Prato	8,189	19,339	73,157	43	1,501	1,098	2,398	425	0,010	0,287	5,441	0,423	0,921	0,015
Ragusa	8,416	5,883	64,730	41	0,314	0,929	0,857	437	0,000	0,032	3,658	0,357	0,470	0,166
Ravenna	8,183	61,110	70,586	46	-0,498	1,005	1,026	188	0,000	0,342	8,394	0,363	0,705	0,021
Reggio Calabria	8,394	6,496	62,157	41	-0,224	0,969	0,752	406	0,018	0,013	2,375	0,265	0,282	0,198
Reggio Emilia	8,156	50,907	68,014	43	-1,396	0,895	1,330	289	0,001	0,380	7,601	0,392	0,779	0,025
Rieti	8,254	3,696	69,166	45	-0,647	1,021	0,929	278	0,000	0,044	5,359	0,353	0,370	0,093
Rimini	8,199	53,003	72,858	43	0,003	1,090	1,789	259	0,000	0,219	7,811	0,411	0,816	0,022
Roma	8,265	17,225	67,872	43	2,393	0,981	1,620	189	0,003	0,038	4,618	0,410	1,118	0,048
Rovigo	8,157	63,633	69,993	45	-1,001	1,097	0,885	238	0,000	0,231	6,679	0,378	0,520	0,049
Salerno	8,320	1,330	60,772	40	0,306	0,905	0,823	338	0,001	0,122	3,036	0,357	0,368	0,129
Sassari	8,268	25,251	65,052	42	0,006	0,856	0,779	394	0,003	0,019	4,233	0,339	0,588	0,175
Savona	8,148	21,169	69,158	47	0,011	1,070	0,931	415	0,001	0,122	6,275	0,337	0,476	0,082
Siena	8,210	34,657	66,104	46	4,079	1,070	1,003	229	0,023	0,263	7,491	0,439	0,733	0,027
Siracusa	8,417	5,053	62,635	41	1,539	0,843	0,922	251	0,000	0,019	2,979	0,304	0,595	0,123
Sondrio	8,094	52,980	71,729	43	-1,526	0,966	1,044	299	0,000	0,289	6,785	0,372	0,625	0,061
Taranto	8,349	4,329	65,363	41	2,237	0,926	1,019	373	0,005	0,034	2,639	0,339	0,343	0,153
Teramo	8,254	16,952	68,469	43	-0,273	0,947	0,940	371	0,000	0,154	5,219	0,351	0,560	0,066
Terni	8,247	32,658	69,957	46	0,689	1,085	0,878	495	0,001	0,099	5,048	0,359	0,557	0,048
Torino	8,112	38,943	69,045	44	0,236	0,996	1,756	131	0,001	0,205	4,691	0,348	0,860	0,019
Trapani	8,372	10,800	60,966	41	-0,455	0,984	0,940	277	0,001	0,038	4,140	0,305	0,433	0,208
Trento	8,114	36,234	73,276	42	-0,878	0,917	1,063	162	0,001	0,161	10,251	0,362	0,664	0,017
Treviso	8,142	43,446	72,398	42	-1,251	1,057	0,778	355	0,000	0,447	7,293	0,322	0,821	0,018
Trieste	8,160	0,116	67,044	48	-0,307	1,088	0,926	199	0,008	0,118	5,697	0,405	0,793	0,019
Udine	8,140	25,177	72,661	45	-0,240	1,054	1,090	160	0,004	0,251	8,480	0,355	0,587	0,030
Varese	8,094	61,981	69,708	43	-0,692	0,972	0,908	206	0,024	0,360	5,132	0,381	0,535	0,041
Venezia	8,151	43,446	70,222	44	0,058	1,018	0,969	316	0,000	0,270	5,595	0,335	0,621	0,026
Verb.-C.-Ossola	8,086	34,976	72,745	45	-0,700	1,134	0,590	363	0,000	0,353	5,219	0,343	0,592	0,053
Vercelli	8,109	38,313	66,177	46	-0,819	1,035	0,733	135	0,007	0,129	7,295	0,402	0,514	0,052
Verona	8,134	43,908	71,505	42	-0,604	0,947	1,219	145	0,001	0,299	6,981	0,347	0,628	0,033
Vibo Valentia	8,384	9,930	59,573	41	-0,139	0,966	0,880	616	0,000	0,017	2,401	0,254	0,246	0,198
Vicenza	8,137	50,560	70,475	41	-0,955	1,134	1,287	277	0,000	0,435	7,025	0,332	0,748	0,018
Viterbo	8,242	38,358	68,146	44	0,162	1,057	1,153	195	0,000	0,114	6,302	0,358	0,476	0,159