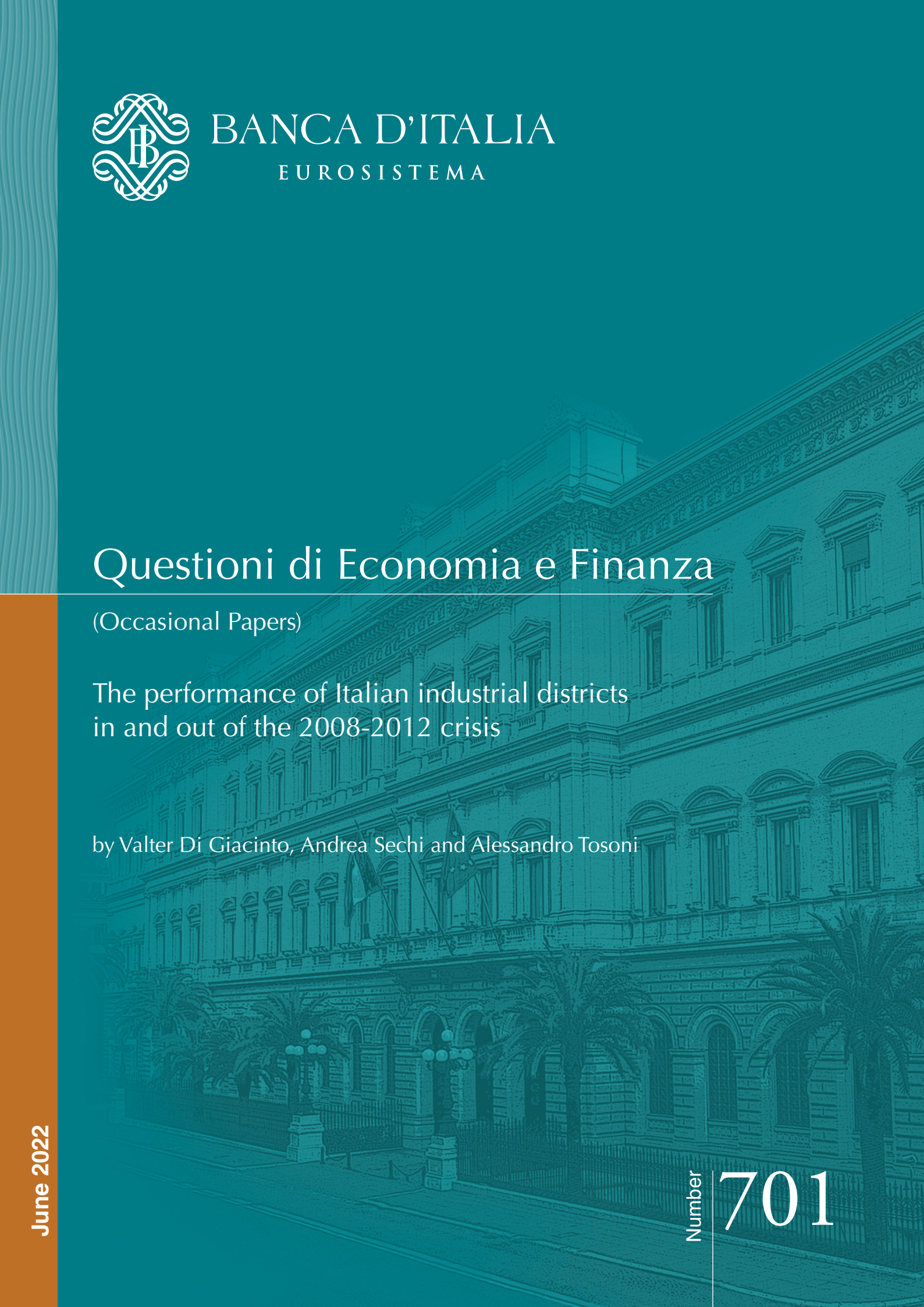
BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

The performance of Italian industrial districts in and out of the 2008-2012 crisis

by Valter Di Giacinto, Andrea Sechi and Alessandro Tosoni



June 2022

Number 701

BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

The performance of Italian industrial districts in and out of the 2008-2012 crisis

by Valter Di Giacinto, Andrea Sechi and Alessandro Tosoni

Number 701 – June 2022

The series Occasional Papers *presents studies and documents on issues pertaining to the institutional tasks of the Bank of Italy and the Eurosystem. The* Occasional Papers *appear alongside the* Working Papers *series which are specifically aimed at providing original contributions to economic research.*

The Occasional Papers *include studies conducted within the Bank of Italy, sometimes in cooperation with the Eurosystem or other institutions. The views expressed in the studies are those of the authors and do not involve the responsibility of the institutions to which they belong.*

The series is available online at www.bancaditalia.it .

ISSN 1972-6627 (print)
ISSN 1972-6643 (online)

Printed by the Printing and Publishing Division of the Bank of Italy

THE PERFORMANCE OF ITALIAN INDUSTRIAL DISTRICTS IN AND OUT OF THE 2008-2012 CRISIS

by Valter Di Giacinto*, Andrea Sechi** and Alessandro Tosoni*

Abstract

By exploiting firm level balance sheet data from the Cerved database and employment data from the INPS database, we provide a detailed description of the productivity performance of Italian industrial districts firms over the 2003-2017 period. The main structural features of industrial districts are first compared with those of the other types of local labour market areas. The performance of district firms is subsequently analysed both overall and separately for the firms belonging to the core district industry and the remaining companies. We find evidence of a positive and sizeable district productivity premium, increasing over the period of analysis. However, in order to consolidate their performance, industrial districts had to undergo significant structural changes. Medium-sized and large firms have grown in importance, also through a process of capital deepening that involved both tangible and intangible fixed assets. At the same time, structural adaptation involved the acquisition of a more significant role by firms not operating in the main district industry.

JEL Classification: L25, L60, R11.
Keywords: industrial districts, agglomeration economies, structural adaptation.
DOI: 10.32057/0.QEF.2022.0701

Contents

* Bank of Italy, L'Aquila Branch. ** Bank of Italy, Cagliari Branch.

1. Introduction[1]

A great amount of literature has highlighted the role of the spatial clustering of firms and workers as a source of agglomeration economies that may boost local productivity levels (see Glaeser, 2010, for a review). In Italy, the clustering of small and medium size manufacturing enterprises has received particular attention and a "district effect" on firm performance has been documented, among others, by Becattini and Musotti (2003) and Signorini (1994 and 2000). The findings of more recent studies, however, have provided evidence of a weakening of the district performance, starting from the years 2000's, in conjunction with the entry of China and emerging economies into global markets and with the IT technological revolution (Di Giacinto et al., 2014, Iuzzolino and Menon, 2011, Iuzzolino, 2013).

The weakening of the "district effect" is linked to the relevant structural adjustments experienced by the Italian manufacturing sector in the 1990s and 2000s. The heightened global competitive pressures supported a significant reallocation of resources to the best performers; the long recession that followed the global financial crisis triggered further improvements in allocative efficiency, the entry of more selected firms and an increase in R&D intensity (Bugamelli et al., 2018). As a result, productivity in the manufacturing sector, that had been stagnant for a long time in Italy, has picked up starting from 2003, displaying, since 2010, higher growth than in France and Spain.

Italian industrial districts (IDs) have equally undergone important structural transformations, that may have possibly favored a resurgence of the district effect (e.g., Cutrini et al. 2013, Foresti et al., 2014, Cucculelli and Storai, 2018, Dei Ottati, 2018;). One of the main changes emphasized by the researchers lies in the relocation of market shares between districtual firms of different size, with an increasing role of medium and large enterprises, which succeeded also in increasing their internationalization through an enhanced participation in global value chains (GVCs; Accetturo et al., 2011; Giuliani and Rabellotti, 2017; Sopranzetti, 2018)[2]. Recent literature has indeed shown how the opportunities and threats stemming from the globalization process may have forced IDs to evolve from a system of local business relations to a more international one,

[1] We would like to thank Antonio Accetturo, Giovanni Iuzzolino, Marcello Pagnini and Luigi Federico Signorini for helpful comments and suggestions. The views expressed are those of the authors and do not necessarily reflect those of the Bank of Italy.

[2] From a theoretical standpoint, there are several ways GVCs can affect productivity: specialization, by focusing on the activities in which the firm is relatively more efficient, access to a larger variety of inputs, knowledge spillovers generated by the interactions between domestic and multinational firms. Moreover, as in the case of international trade, due to larger markets and increased competition, GVCs can speed up the exit of the least productive firms and facilitate the relocation of market shares to the most productive units. Finally, Grossman and Rossi-Hansberg (2008) find that off-shoring and GVCs generate productivity gains also through a finer international division of labor, acting as factor-augmenting technical change.

determining the evolution to what some called *glocal value chains*[3], where traditional features linked with physical proximity, as knowledge spillovers and cooperation among firms, take place along with higher international projection regarding destination markets and input suppliers.

In this paper, we aim at assessing to what extent ID firms were able to keep up with the aggregate productivity revival documented by Bugamelli et al. (2018) for the overall Italian manufacturing sector over the last two decades. Considering that the literature on Italian IDs has highlighted an increasing heterogeneity in firm performance both within and between IDs, we also decompose the district productivity differential along various dimensions, in order to uncover the contributions of firms of different size and with different sectoral specialization to the aggregate district productivity. Moreover, by comparing the relative performance of firms operating in the core district industry to that of firms operating in non-core manufacturing sectors, we finally aim at gathering some updated evidence on the role of MAR (Marshall-Arrow-Romer) specialization economies, a driver of productivity advantages in IDs traditionally underlined in the district literature.

Our empirical analysis is rooted on the territorial framework provided by the partition of the Italian territory in Local Labour Markets Areas (LLMAs), as defined by Istat according to the results of the 2011 population Census. Following Di Giacinto et al. (2014), we split the set of LLMAs in three non-overlapping groups: IDs, as identified by the Istat's algorithm, metropolitan areas (defined as the LLMAs with more than 500.000 inhabitants) and the other LLMAs, where the latter act as the reference group. By excluding metropolitan areas out of the reference group, as in Di Giacinto et al. (2014), we aim at measuring the relative performance of IDs with respect to a set of LLMAs of comparable size and with broadly similar structural features. In fact, large metropolitan areas, as documented in Di Giacinto et al. (2014) and confirmed here in Section 2, display structural features that are profoundly different with respect to both IDs and to the remaining set of small and medium-sized LLMAs. On the whole, ID and non-ID LLMAs accounted for about ¾ of total manufacturing employment in the 2011 Census.

Covering the entire 2003-2017 period, our study extends over three distinct cyclical phases: the years of tenuous growth immediately preceding the global financial crisis, the subsequent double-dip recession and the following rather sluggish recovery. We provide separate estimates of the district productivity differentials for the three periods, in order to uncover the dynamics of IDs firm performance in quite different macroeconomic contexts. The empirical analysis was conducted on a large panel of Italian manufacturing companies, for which we have access to balance sheet data from the Cerved database and

[3] See for example De Marchi and Grandinetti (2016) or Aureli S., Ciambotti M., Salvatori F. (2010). Andersson et al. (2013) provide similar evidence for small firms located in the Rhône-Alpes medical technology regional cluster.

to employment data (average number and qualification) from the INPS database, both at the firm and not at the individual establishment level.

Following a rather common approach in the literature, we gauge firm performance by referring to labour productivity, measured by real value added per employee. We choose not to present evidences on total factor productivity, mainly due to the well-known measurement issues affecting both the physical and human capital inputs, that are magnified in IDs, where the vast majority of firms are small sized.

However, we do take into account capital deepening issues. In particular, we present a novel analysis of human capital endowments in Italian district firms, average worker qualification being proxied by the white-collar share of total employment. While De Blasio and Di Addario (2005) already focused on the issue of human capital in IDs, documenting how working in ID firms reduces the returns to education, to the best of our knowledge we are the first to provide a comprehensive comparative assessment of the relative human capital endowments of district firms. In addition, we analyze differences between firms located in IDs and in other LLMAs with respect to the relative endowments of fixed capital assets per employee, analyzing separately tangible and intangible assets.

The main results conveyed by our estimates indicate an interruption of the declining trend in the productivity premium attained by IDs, starting from the years of the great recession. A pickup of the positive productivity differential is actually observed during the recovery following the double-dip recession of 2009-13. The latter mainly reflects the improvement of the relative performance of medium and large size firms operating in non-core ID sectors, providing evidence that the structural factors underpinning the competitive advantages of IDs are evolving over time. Nonetheless, the productivity premium achieved by small firms operating in the sector of district specialization remains strong in traditional industries like food and beverages and textile and clothing, confirming the relevance of MAR-type externalities in these specific industries.

The remainder of the paper is organized as follows. In Section 2 we briefly describe the features of 2011 IDs map and give some aggregate statistics on the weight of IDs on the overall Italian manufacturing and on the main sectors in which IDs specialize. We also provide a comparison of structural features across different classes of LLMAs and identify the reference group for the analysis of ID performance. In Section 3 we describe the firm-level panel dataset utilized in the analysis a give some preliminary descriptive statistics. Section 4 provides detailed econometric results on the size and dynamics of the district labour productivity differentials. Section 5 reports the results of the robustness checks. Section 6 documents the trends in relative human and fixed capital endowments in IDs. Section 7 summarizes and concludes outlining some issues for future research.

2. The geography of local labour market areas and industrial districts

2.1 The classification of local labour market areas

The analysis contained in this Section is based on a comparison of the socio-economic features of the Italian local labour market areas (LLMAs) and of the industrial districts (IDs), that represent a subset of the LLMAs, as defined by Istat according to the results of the *Censimento della popolazione 2011*.

A LLMA is a partition of the national territory aggregating multiple municipalities in a way that the bulk of the local labour force lives and works within the area, where establishments can find the largest amount of the labour force necessary to occupy the offered jobs. LLMAs are hence defined on a functional basis, the key criterion being the proportion of commuters who cross their boundaries on their way to work. In concomitance with the release their latest map, Istat classified the individual LLMAs according to the relevance of the manufacturing sector and to the employment share of large firms (those employing at least 250 workers).

In order to identify industrial districts (IDs), we rely on the Istat's definition. According to this classification IDs are those LLMAs for which the following assumptions hold (see Di Giacinto et al. 2014):

i. specialization in the manufacturing sector, i.e. $m_x = \frac{(e_{xm}/e_{x.})}{(e_{.m}/e_{..})} > 1$, where e_{xm} denotes the number of manufacturing employees in LLMA x, $e_{x.}$ denotes the local employees in all sectors (including services and construction industries) and $e_{.m}$, $e_{..}$ are the corresponding figures at national level;

ii. prevalence of small and medium-sized enterprises (SMEs), i.e. $s_x = \frac{(e_{xm}^{small}/e_{xm})}{(e_{.m}^{small}/e_{.m})} > 1$, where the upper index 'small' indicates the number of employees in SMEs;

iii. let $l_{xs} = \frac{(e_{xs}/e_{xm})}{(e_{.s}/e_{.m})}$, where s refers to a specific manufacturing sector and the dominant sector d is the one for which l_{xd} >1 and number level of employment is maximum among the local specialized industries, the following condition must hold: $l_{xd} = (e_{xd}^{small}/e_{xd}) > 0.5$;

iv. finally, where there is only one medium-sized enterprise in an LLMA, small enterprises' employment share must exceed by half that of the medium-sized firm.

Whenever the first condition holds, we have a manufacturing oriented LLMA; otherwise the area will be classified as non-manufacturing oriented.

2.2 The Italian geography of LLMAs and IDs

The map of Italian LLMAs, and consequently that of IDs, has profoundly changed between the 2001 and 2011 Censuses. During this decade, the number of LLMAs decreases from 683 to 611, and similar dynamics are observed for the number of IDs, which decreased from 181 to 141 units (Table 1). The geography of local labour markets changed mainly in relation to demographic dynamics, driven by the increasing share of population living in larger urban areas, that have widened their boundaries acquiring portions of the adjacent territory (Figure 1).

As can be immediately gathered by the visual inspection of the maps, on 2001 industrial districts were predominantly located in the Northern areas of Italy and notably in the North East. This feature remained essentially unchanged over the following decade and is in line with the strong concentration of manufacturing activities in this area of the country, as also highlighted by the higher incidence of non-district manufacturing oriented LLMAs (Table 2).

While reduced in number, in 2011, industrial districts accounted for about a quarter of the total national workforce, a figure very close to what emerged from the previous Census and slightly higher than the corresponding population share (Table 3). In connection with the presence of a larger number of districts, the proportion of workers employed in IDs is significantly higher in the Northern area of the country, with a maximum level of more than 38 per cent in the North-Eastern region. A slightly lower share is observed in the Centre while the diffusion of IDs remains modest in the Southern partition, where only 6.7 per cent of the total workforce was employed in industrial districts in 2001. In 2011 the figures remained almost unchanged, both at national level and in the territorial distribution.

Among the 141 industrial districts identified in 2011, about two-thirds referred to three specialization areas (Istat, 2015). The most widespread specialization was in the mechanical industry, which represented the core sector in 38 IDs and was particularly relevant in Veneto and Lombardia; the second most represented sector was textiles and clothing, while the third one was home goods, mainly located in Veneto. The incidence is even greater in terms of total employees: more than three-quarters of the workers employed in industrial districts pertained to IDs with the aforesaid specializations, with a prominent share for the mechanical industry districts and, to a lesser extent, the textile and clothing and the household goods districts. A similar sectoral pattern is observed for manufacturing employment (Table 4).

Within the set of the non-ID manufacturing oriented LLMAs, Istat singled out a subset of areas that do not qualify immediately as IDs, because they fail to meet the requirement of the prevalence of SMEs, but that share with IDs the requisite that their main sector of

specialization consists mostly of production units of small and medium size. A total of 28 of these large-firm LLMAs with district characteristics were identified by Istat in 2011.

2.3 Some structural features of IDs and other LLMAs

Italian LLMAs display different structural features, either for the type of the prevailing economic activity (manufacturing or non-manufacturing) or in relation to other structural factors. Using the classifications introduced in paragraph 2.1, we present below some evidence related to population size, labour market conditions and firm structural characteristics in the different subsets of the Italian LLMAs.

Within the subgroup of non-manufacturing oriented LLMAs, we now also distinguish the 12 largest urban areas, defined as the LLMAs with more than 500.000 residents, from the remaining LLMAs in this group, considering that metropolitan areas are clearly expected to display rather different structural features.

As to the population size, IDs had on average about 95.000 residents in 2011, a value very close to the one observed for the remaining manufacturing oriented LLMAs, although slightly lower than the level prevailing in the group of non-manufacturing oriented LLMAs (see Table 5). However, if the metropolitan areas are removed from the latter group, the average population size drops down to a level comparable with the one observed in IDs. Large-firm districtual LLMAs display slightly higher average population counts compared to IDs.

For given city size, local labour market thickness can be captured by the employment rate. In 2011, IDs featured a significantly higher employment rate compared to the average of the other LLMAs. Within the latter, large-firm LLMAs with district features attained values close to those observed in IDs.

Another important feature of the local productive structure is the relative importance of large firms. A lower share of employment in large size productive units in manufacturing is expected for IDs by construction and in this case the differential between IDs and other LLMAs is indeed wider, especially with respect to the other manufacturing oriented LLMAs. On average, the overall employment share of large plants[4], at 5 percentage points, is only slightly smaller in IDs compared to the other LLMAs. A higher share, at about 10 percentage points, is observed for the other manufacturing oriented LLMAs, while the incidence of large establishments is lower for the subset of non-manufacturing oriented LLMAs, with the noticeable exception of the metropolitan areas, where the share attains a value three times larger than the average of all LLMAs.

[4] Large establishments here are those with more than 250 employees.

As regards the local supply of qualified labour, measured by the percentage of the resident population with tertiary education level, IDs display a value only slightly below the average of the other LLMAs. The biggest cities, being particularly attractive for people with an academic degree, appear to stand out with respect to this specific indicator, attaining a value about 50 per cent higher than the average. In close connection, we also find a much higher specialization in *knowledge intensive business services* (KIBS) in metropolitan areas, while IDs attain values not much smaller than the average of the remaining LLMAs. Large-firm districtual LLMAs display values very close to those of IDs according to this indicator, while a slightly larger incidence of the graduated population is observed.

To summarize, apart from the feature actually identifying industrial districts, namely the relatively larger weight of small and medium firms in manufacturing, if we set aside the large metropolitan areas, the structural features of IDs and of the remaining LLMAs do not appear to differ considerably according to the set of indicators here reviewed. The latter appear thus to be well qualified to represent a proper reference area in order to provide a term of comparison when assessing the economic performance of IDs.

Large-firm districtual LLMAs, apart from the share of employment in large plants, appear to display structural features rather close to those of IDs. Considering that the focus of our analysis is on the manufacturing sector and given that, by definition, these LLMAs possess clear district features in their main manufacturing industry, we choose to pool the 28 large-firm LLMAs with district features together with the 141 IDs in our analysis, although we verify the robustness of our main findings to this assumption in the robustness checks.

Having excluded the largest urban areas, the reference group finally consists of 379 non-manufacturing oriented LMAs, that include most of the Italian provincial capitals, 41 large-firm manufacturing oriented LLMAs and 10 small and medium-firm manufacturing oriented LLMAs, that do not qualify as IDs because they do not possess a strong specialization in a given manufacturing industry.

3 The firm panel data: summary statistics

The firm-level data on which we base our empirical analyses come mainly from the Cerved company accounts database, which covers essentially the entire population of Italian corporate enterprises. The Cerved yearly balance sheet data covering the 2003-2017 period and the manufacturing sector were merged at firm level with the INPS database, in order to get information on the number and on the classification of the firm employees.

On the basis of the analysis of LLMAs structural features detailed in Section 2.3, firms located in the 12 large metropolitan areas were excluded from the analysis[5]. As the main focus of the study is on labour productivity, to prevent outliers form corrupting statistical and econometric results, we preliminary trimmed the data, dropping from the sample observations referring to firms with productivity levels below the 1st or above the 99th percentile of the productivity distribution.[6] The resulting panel dataset is thus finally composed of about 55.000 corporations, of which about 34.000 are located in IDs[7].

In Table 6 a set of descriptive statistics is given for the sample of ID firms and, separately, for the two subsets of firms operating in the core and non-core district industries. Statistics for the sample of firms located in the reference areas are also given, both for the entire group and separately for the manufacturing oriented and non-manufacturing oriented LLMAs. Three sub-periods are considered: a pre-crisis phase, ranging from 2003 to 2008, the crisis period (2009-2012)[8] and the subsequent recovery (2013-2017).

The average size of manufacturing firms in the ID sample is a bit larger compared to firms in the reference LLMAs (30.1 employees, compared to 27.5, on the average of entire sample period). Firm size is marginally higher for the enterprises operating in the specialization sector of the district. As expected, in the reference areas, compared to IDs, average firm size is higher in manufacturing oriented LLMAs, while a lower value is observed for the subset of non-manufacturing oriented LLMAs. The share of workers employed by small enterprises (firms with less than 50 employees) is very close in IDs and in other LLMAs (at about 40 per cent). Sample statistics appear thus to confirm that IDs and reference LLMAs possess very close structural features.

On the basis of sample averages, the labour productivity level, measured by the log of real value added per employee and computed net of time, area, sector and firm size composition effects, is positive for district firms and higher for those operating in the sector of specialization of the ID; a symmetric productivity gap emerges for the other LLMAs, especially for the subset of non-manufacturing oriented systems. Both the district surplus and the deficit of the other LLMAs appear to be increasing in the recovery period (2013-2017) compared to the pre-crisis period (2003-2008).

[5] All the 12 large cities are classified by Istat as non-manufacturing oriented LLMAs, with the exception of Bergamo, that is classified as an ID. The latter was also dropped from the analysis for consistency reasons.
[6] Distinct percentiles were computed for each year-sector stratum in the dataset and separately for firms located in IDs and in the remaining LLMAs.
[7] In what follows we denote as IDs the set including both the LLMAs classified by Istat as Industrial distrincts and the LLMAs classified as Large-firm manufacturing oriented systems with district characteristics.
[8] We chose to restrict the crisis period to the years when the double-dip recession was more marked. Nonetheless, extending the crisis period to include the two turning point years (2008 and 2013) does not alter the empirical findings presented in the paper in a significant way.

As regards gross revenues growth, net of composition effects only minor differences are observed between firms located in IDs and in the reference LLMAs on the average of the entire sample period. However, a negative differential is observed for IDs in the pre-crisis period, that subsequently turns positive during the crisis, while it is essentially negligible in the recovery years. The revenue dynamics are slightly better in the core ID industry, starting from the crisis period.

Gross profitability, measured by the ratio of EBITDA to total assets, is slightly above the sample mean in IDs, while a negative differential is observed, in particular, for the non-manufacturing oriented LLMAs.

4 Productivity dynamics: regression results

4.1 Baseline results

A firm-level regression analysis of productivity differentials was subsequently carried out in order to provide both a formal tests of the statistical significance of the descriptive evidence documented in the previous Section and to produce some additional results, by partitioning the sample of ID firms along different dimensions.

We maintained the subdivision of the sample period in three sub-periods: a pre-crisis period, from 2003 to 2008, that serves as the reference basis, the crisis period, ranging from 2009 to 2012, and the recovery from 2013 to 2017.

The following baseline estimating equation was considered:

$$Y_{it} = Constant + \alpha\, District + X'\beta + u_{it} \qquad (1)$$

where Y_{it} is the log of real value added per employee[9] and *i* and *t* respectively denote firm and year. *District* is binary dummy variables denoting firms located within IDs, the vector *X* includes a set of fixed effects and u_{it} is random residual term, possibly heteroskedastic and serially correlated. Fixed effects include year, area, sector and size dummies and the interaction of the latter with time dummies, in order to allow for area, sector and size specific time trends. Sector and size dummies are also interacted with each other, to let sectoral effects possibly differ according to firm size.

Sectoral dummies are defined on the basis of the 2 digit NACE Rev. 2 classification and three classes (up to 49 employees, from 50 to 249 employees, 250 employees and above) were considered for firm size dummies. Finally, geographical dummies for the four major Italian areas (North West, North East, Centre, South and Islands) were introduced. While a finer spatial partition, corresponding to the 20 Italian administrative regions, could have

[9] Industry-level price indexes at the 5 digit NACE Rev. 2 breakdown level were employed to deflate the nominal value added figures.

been adopted in order to control for geographical unobserved heterogeneity, this choice raises critical identification issues, because the spatial diffusion of IDs in Italy is strongly concentrated in a few regions and in some cases (Veneto, Tuscany and Marche) IDs account for the vast majority of the local manufacturing activity. At the same time, in Valle d'Aosta and in four Southern regions (Basilicata, Calabria, Molise and Sicily) IDs are entirely absent, making completely unidentified the district productivity differential within these areas. Measuring the productivity performance of IDs within individual regions is thus highly questionable for a substantial fraction of our sample, due to the lack of common support between IDs and the reference LLMAs. Consequently, we chose to rely on geographical controls at the macro-region level for our baseline estimates and to refer to regional controls only in the robustness analysis.

When estimating equation (1), we choose to weight observations by firm size, gauged by the number of employees, in order to let the performance of medium and large size enterprises to stand out properly in the estimate of the aggregate productivity differential between firms located in IDs and in the reference group of LLMAs. Otherwise, in case a unit weight is placed on each observation, the aggregate productivity differential estimated for IDs would be dominated by the relative performance of small sized firms, that largely outnumber the medium and large size enterprises in the panel.

Differently from Di Giacinto et al. (2014), we maintain in the estimation panel also the very small firms, i.e. those with less than 5 employees, essentially because dropping these firms may result in loosing information on the performance of local specialized suppliers and of start-ups, that typically both employ a very small number of workers. At the same time, by focusing on labour instead of total factor productivity, we face less severe measurement issues in the case of very small firms. Finally, weighting observations by firm size also reduces the influence on aggregate estimates of measurement errors incurred in the case of smaller enterprises.

Equation (1) was initially estimated by pooling together all firms located within IDs. Subsequently, in order to uncover possible heterogeneities within districts, the pool of ID firms was divided in the groups of core and non-core industries. A second distinction singled out the small (those with less than 50 employees) and the medium-large size firms.

In this way, we are able to assess whether productivity advantages within IDs are strictly confined to the main sector or they also extend to other manufacturing industries. At the same time, given the prominent role that medium and large enterprises are expected to play in the aggregate performance of the local manufacturing sector, by producing separate estimates according to firm size we can assess to what extent any productivity premium observed within IDs pertain not only to very small enterprises, but also to firms of larger size.

The baseline estimation results are detailed in Table 7 and are displayed in Figure 2, where the estimated value of the aggregate productivity differential is plotted jointly for the three sub-periods and the different sub-groups of ID firms.

The estimated coefficient of the *District* dummy is equal to 0.045 in the pre-crisis period, a value somewhat larger than the one reported in Di Giacinto et al. (2014)[10], a discrepancy that can be related to the different empirical specifications employed in the two studies[11] and the different time period considered (2003-2007, instead of 2001-2006). Overall, this estimate implies a productivity premium slightly above 4 percentage points. The estimated amount of the premium is about double in the core ID industry compared to non-core industries (about 6 and 3 percentage points, respectively; see panel *a* of Fig. 4.1), thus signaling that specialization externalities may be a relevant factor underlying the productivity performance of manufacturing firms located within IDs. Nonetheless, the differential recorded in non-core sectors is also positive, significant and sizeable, providing evidence of the possible existence of agglomeration externalities that go beyond the boundaries of the main sector of district specialization. The results obtained by dividing the sample according to firm size show how productivity advantages in the pre-crisis period were much larger in the case of small firms, although a positive and significant estimate is also observed for medium-large firms.

In panel *b* of Figure 2 we display the results separately yielded by subdividing the sample of ID firms in four groups according to both specialization and size. In the pre-crisis period the highest level of the productivity premium is estimated for the subset of small firms belonging to the core ID industry (about 9 percentage points), while the lowest value is observed for medium-large firms operating in non-core industries (only slightly above 2 points).

During the years marked by the Great recession, the overall district productivity premium shows only a marginal, not statistically significant[12], increase compared to the pre-crisis period. However, this evidence masks considerable heterogeneity within the panel of ID firms. While the productivity differential drops considerably for small firms, both in the core an in the non-core industries, a substantial increase is recorded for medium and large size firms, more pronounced for those operating in sectors other than the core ID industry. As a consequence, the productivity premium recorded for firms with more than 50 employees increases above the level observed for small firms. A reshuffling of the overall

[10] Equal to 0.025, as given in Table 12, Model II.
[11] A different map of IDs is utilized, labour productivity is considered instead of TFP, regression results are weighted by employment and firms with less than 5 five employees are included in the sample.
[12] The statistical significance of the changes in the productivity differentials between periods was assessed by running a pooled regression over the entire 2003-2017 period and interacting the district dummies with separate dummies for the crisis and the recovery periods. In this specification, the coefficients of the interaction terms measure the change of the district productivity differential with respect to the level obtained in pre-crisis period and their statistical significance can be assessed by means of the usual *t*-test statistics. Results are given in Table 8.

productivity advantage within IDs from smaller to larger enterprises within IDs appears thus to be an indirect consequence of the impact of the severe and prolonged crisis on the overall performance of district firms.

In the recovery stage, the average productivity advantage of ID firms shows a further increase, to about 6 percentage points, an amount that is significantly higher compared to the pre-crisis level. With respect to the crisis period, productivity picks up both in the core industry and in non-core sectors. Small ID firms recover entirely the relative productivity loss incurred during the crisis and medium-large enterprises attain a further slight increase. The same level of the productivity differential is now found out on average for both small and medium-large district firms, an occurrence that is observed both in the core and in non-core industry.

The increase of the productivity differential observed with respect to the pre-crisis period is, consequently, pertaining entirely to the performance of medium and large firms, both in the sector of ID specialization and in other sectors. In the case of small firms no significant productivity increase is observed in the post-crisis period, a tendency that is common to ID firms operating inside and outside the core district sector, although the robust initial surplus is entirely maintained.

On the whole, the relative productivity dynamics show how, in comparison to manufacturing firms located in the reference LLMAs, firms operating in industrial districts have succeeded in facing more resiliently the economic disruption brought by Great recession and have been more able to benefit from the subsequent recovery. However, this outcome required a process of structural adaptation, as documented by the stronger role played medium-large enterprises and by firms operating outside the traditional sector if district specialization. As a consequence, productivity advantages that before the crisis appeared to be confined in the sub-population of small firms operating in the core industry, afterwards are found out to be more equally spread across all the manufacturing firms located within IDs.

4.2 Results for individual macro-sectors of ID specialization

In this Section we better qualify the baseline findings outlined in Section 4.1 by providing some additional empirical evidence on which sectors have most contributed to the productivity dynamics observed in IDs over the estimation period. To this purpose, we split the sample into a few non-overlapping macro-sectors of economic activity and ran separate regressions for each sector. Five macro-sectors were considered, by pooling the 11 sectors of district specialization identified by Istat (2015) into five groups: Fashion and luxury goods, Furniture and home goods, Food and beverages, Machinery, equipment and metals, Chemical and paper products.

On the basis of estimation results, given in Table 9, a substantial heterogeneity of the district productivity differential across sectors of ID specialization is uncovered.

In the Fashion and luxury industries, the productivity premium is about twice larger than the average, and is essentially stable over the three estimation periods. The district productivity premium originates mainly from IDs specialized in this sector, where it amounted to about 20 percentage points in the pre-crisis period for small firms, and about 10 points for medium-large firms. In subsequent periods the productivity premium is found out to decrease slightly for small firms, while increasing for larger firms, essentially eliminating the difference between the two groups in terms of productivity. When we consider district firms that produce fashion and luxury goods by being located in IDs with a different specialization, we still observe a positive productivity differential, although of significantly smaller size and significant over the different periods only in the case of small firms.

A different picture arises for the Furniture and home appliances sector. In this case, the overall productivity differential is never statistically significant. A productivity gap was actually estimated in the pre-crisis period for the subset of district firms operating in IDs specialized in this sector. However, the gap halves in the recovery stage for small firms and turns into a productivity surplus in the case of medium-large firms. The productivity differential is never statistically different from zero when furniture and home appliances production is carried out as a non-core district activity.

In the Food and beverages sector, in the pre-crisis period the estimated productivity differential is shown to attain the highest level among all the five industry groups. A moderate reduction of productivity advantages is observed in the recovery period, brought by the decrease observed for medium-large firms operating in the core ID district. At the same time, an increase is observed for small firms belonging to this sector and located in ID specializing in different sectors.

In the Machinery and metallurgy sector the productivity differential is positive, significant and very close to the overall district average in the pre-crisis period. The differential becomes non significant during the crisis, but subsequently regains the initial level all along the recovery. While only small firms contributed to the aggregate sector productivity surplus prior to the crisis, in the recovery period also medium-large firms contribute, but only those operating outside of the core ID industry, where a significant increase of the differential is observed.

The fifth sector, Chemicals and paper products, is a rather less important one, as a very limited number of IDs are specialized in these industries. In this case estimation results show a mild and barely significant productivity premium in the pre-crisis period, stemming entirely from the subset of small firms, both those located in IDs specialized in these industries and those operating in IDs with a different core-industry. A positive

differential is also estimated for medium-large firms when they operate in the core ID industry that however is not statistically significant.

Taken together, the above findings show how district productivity advantages are very strong in the traditional sectors of Foods and beverages and Fashion and luxury goods, essentially negligible in Furniture and home goods and Chemicals and paper products and close to the average in Machinery, equipment and metals. Firms operating in the latter macro-sector, but located in IDs with a different core specialization, are the only significant contributors to the pick-up of the productivity differential of medium-large firms operating in non-core ID industries documented in Section 4.1. On the contrary, the increase of the productivity premium of larger firms operating in the core ID industry is due to the productivity dynamics observed in the Fashion and luxury and in the Furniture and home goods sectors.

5 Robustness checks

In this Section we aim at documenting to what extent our baseline results are affected by some of the underlying specification issues, in order to check their robustness to possible alternative choices.

Considering that we base our analysis on labour productivity, instead of total factor productivity, as a first check we test if the estimates of the district productivity differential are affected when we control for capital endowments per worker. We do so by augmenting model equation (1) through the inclusion of measures of human capital, proxied by the white-collar employment share, and fixed capital, considering separately tangible and intangible assets. The results are given in panel *a* of Table 10 and display a slight decrease of the district premium in the pre-crisis period (albeit not statistically significant) and negligible differences in the subsequent periods compared to the corresponding estimates given in Table 7. Capital endowments, hence, do not appear to explain neither the level nor the dynamics of the estimated district labour productivity premium.

As a second check, we excluded the large-firm districtual LLMAs from the set of IDs, thus returning to the strict definition of industrial district as provided by Istat, but maintaining the same definition for the reference areas. Also in this case, estimation results display only minor changes compared to the baseline (see panel *b* of Table 10), showing how the latter are not driven by our adoption of a broader definition if IDs.

To provide a further robustness check on the definition of the spatial map of industrial districts, we subsequently considered the set of districts whose boundaries are identified by Istat according to the 2001 LLMAs map. In order to maintain a common reference group with the one considered in our baseline estimates, also in this case we exclude firms

located in the large-firm districtual LLMAs from the sample. The estimation results, given in panel *c* of Table 10, do not report the distinction between core and non-core industries, due to the difficulties in reconstructing the 2011 set of district specializations utilizing the NACE classification employed for coding the 2001 census data. Also in this case, both the overall estimates of the district productivity premia and the breakdown by size show only minor discrepancies with respect to our baseline results, confirming the robustness of the results with respect to alternative ways of partitioning the Italian territory in district and non-district LLMAs.

While we choose to maintain very small enterprises in the sample, for the reasons discussed in Section 4.1, in order to check to what extent this choice affects our baseline findings, we computed additional estimates of model equation (1) removing firms with less than 5 employees from the sample. Panel *d* of Table 10 shows how restricting the sample according to this procedure has negligible effects on the overall district productivity differential. A slight reduction of the productivity premium is observed for the subset of small firms, but it is mostly confined to the pre-crisis period and leaves the overall qualitative findings unaffected.

Although we argued that including spatial fixed effects at the smaller scale of the 20 administrative regions might hinder parameter identification when bringing equation (1) to the data, we provide these results here as an additional robustness check. The estimation results, detailed in panel *e* of Table 10, show how the level and dynamics of district productivity differential remain essentially unchanged – also in the breakdown according to firm size and specialization – apart from a slight reduction of the premium in the pre-crisis period.

Having prior assessed the robustness of our baseline empirical findings with respect to alternative definitions of the spatial map of IDs, we finally conducted some additional regressions utilizing some alternative, more restrictive, definitions of the pool of LLMAs included in the reference set. In the first exercise, we drop from the reference pool firms located in LLMAs that are not manufacturing oriented, yielding a group of locations that more closely resemble the features of IDs, i.e. local labour market areas with a prominent role of the manufacturing sector. In this case, a smaller productivity premium is estimated for IDs in the pre-crisis and especially during the crisis period, when it becomes not statistically significant (see panel *f* of Table 10). However, during the recovery stage the estimated district premium attains the same level as estimated in the baseline results. Also the productivity dynamics broken down by firm size and specialization are in line with the baseline, showing a significant pick-up of the productivity differential in the period following the Great recession for the subset of medium-large firms, both in the core ID industry and in non-core sectors. The existence of a positive and sizeable district productivity premium, increasing over the estimation period, appears hence to be

confirmed even when the comparison is conducted with reference to LLMAs with a similar importance of the manufacturing sector.

In order to provide an additional result, rather than a proper robustness check, we restricted further the reference set of spatial locations, by including only the large-firm manufacturing oriented LLMAs in the pool of reference areas. Although with some caveats, considering that this case the reference sample becomes rather thin[13], we report in panel *g* of Table 10 the estimation results obtained assuming this spatial partition of the sample. In this case, both prior and during the crisis the aggregate productivity advantages of IDs, while being positive and sizeable, is not statistically significant. However, in the recovery period the estimated differential more than doubles, and becomes now highly significant. This aggregate pattern mainly reflects the productivity dynamics of medium and large district firms. In the case of small firms, on the contrary, a positive and significant productivity premium, essentially stable over time, is estimated, especially for those belonging to the core ID sector. Quite interestingly, while IDs are by definition LLMAs where SMEs play a leading role in manufacturing, not only no productivity gap is observed for medium-large firms located in IDs with respect to firms of similar size located in LLMAs where large enterprises account for the bulk of local manufacturing, but actually a productivity surplus emerges after the Great recession.

We have motivated in Section 2.3 our choice of excluding large urban areas, that were shown to possess largely different structural features compared to IDs, from the reference pool of LLMAs. While we defend this assumption as the most proper setup in order to gauge the relative performance of IDs firms, as a robustness check we re-estimated productivity differentials including also metropolitan LLMAs in the reference set. The results, displayed in panel *h* of Table 10., show how the estimated IDs productivity premium remains positive but is not significant in the pre-crisis period. However, also in this case a productivity pick-up is observed during and after the Great recession, when the productivity surplus rises to about 2.5 p.p.. The ID advantage, in this spatial setup, is only significant in the case of small firms, especially those operating in the core district industry, where the productivity doubles to more than 6 p.p. during the recovery period. Nonetheless, no negative productivity differential is observed for medium and large ID firms compared to areas where large-size firms play a stronger role in the manufacturing sector.

As a final check of the robustness of our baseline results, we estimated a model utilizing wages, measured by unit labour costs, instead of productivity as the dependent variable, considering that both variables have been used in the literature in order to gauge agglomeration economies (see, e.g., Glaeser and Mare, 2001; Yankow, 2006). Given that higher wages can also reflect better worker qualifications, we included the human capital

[13] We have about 30,000 observations in the reference set in each period.

proxy as a further control in the regression. First of all, the estimation results (see panel *i* of Table 10) show how the human capital proxy given by the white-collar share of firm employees is strongly associated with average wages. At the same time, a positive and significant differential is estimated for IDs, although smaller compared to the productivity differential. In line with productivity dynamics, the wage premium is found to be increasing in the recovery stage. The premium is particularly strong in the case of small firms and in the sector of ID specialization. However, as already documented for productivity, a pick-up of the wage differential in the recovery stage is observed also for the subset of the medium-large firms operating in non-core ID industries. Our baseline qualitative findings regarding the level and the evolution of the district productivity premium is hence fully confirmed by the analysis of wage dynamics.

6 Trends in relative capital endowments

In this Section, we implement to capital endowments, separately for human capital and fixed capital, the same econometric setup used above for the analysis of labour productivity dynamics. We conduct this analysis mainly in order to assess if there is some evidence of any structural changes in the intensity with which district firms have employed these individual factors in the production processes over the sample period, while checking if any similarities arise with the dynamic productivity patterns documented in the previous Section.

The estimation results on human capital endowments, measured by the share of white-collar workers, are given in Table 11. In this case the coefficients measuring the differential between IDs and the reference areas are never statistically different from zero, both for district firms as a whole and for the single sub-groups. Controlling for firm characteristics, the demand for qualified labour in the manufacturing sector, hence, does not appear to diverge in any direction in IDs compared to LLMAs of similar size and structure.

In order to check the robustness of these findings, we considered a more formal assessment of the comparative human capital endowments of manufacturing workers employed in IDs and in other LLMAs, by exploiting the information on the individual educational attainments coming from the Bank of Italy Survey of households income and wealth (IBF). The IBF survey is conducted on a biennial basis on a sample of Italian households covering the entire national territory and, for each household member, contains information on the municipality of residence, employment status, sector of employment (although with no further breakdown within the industry sector) and level of formal education received. Utilizing the information on the worker's place of residence, we matched the IBF sample data to IDs and the reference LLMAs. Subsequently, in order to assess whether the percentage of manufacturing workers with a higher education level

(college degree or higher) employed in IDs is different from the reference areas, we estimated a simple linear probability model where the dependent variable, a binary dummy identifying workers with at least a college degree, was regressed on our usual District dummy and on macroarea dummies (since we lack information on the employer characteristics, in this case we cannot control for the firm's size and sector of activity).

Data from the IBF waves from 2002 to 2016 were pooled together, in order to gain degrees of freedom for estimation, yielding a total of about 12,000 observations, of which about 40 per cent referred to workers residing in IDs. The estimation results, shown in Table 12, provide evidence of a slightly lower probability of being a college graduate worker in IDs when pooling data for the whole 2002-2016 period. However, splitting the sample period in the sub-periods 2002-2008 and 2010-2016 shows how the education gap is only significant in the first period, when the estimated share of higher educated workers is about 2.5 points lower in IDs compared to the reference LLMAs. No significant differential, on the contrary, is estimated for the 2010-2016 period.

Overall, these findings appear to confirm the previous evidence, based on the white-collar share of firm employees, of the absence of a significant differential in human capital endowments between IDs and other LLMAs in the more recent period. However, the IBF data show a catching-up of educational levels that we do not observe when we consider the data on the number of white-collar employees. At least to some extent, this difference can be reconciled considering that it might reflect the influence of firm characteristics, namely firm size, for which we cannot control when we base our regressions on the IBF data alone.

As regards the level of tangible fixed assets per employee, the estimations results uncover some noteworthy dynamics over the three periods considered in the analysis (see Table 13). In the years preceding the crisis, a positive though not significant differential is found out. A positive and significant surplus is observed for the subset of district medium-large sized firms operating outside the core ID industry. During the crisis the positive differential in tangible assets endowments increases substantially (from about 5 to more than 8 percentage points) and becomes statistically significant. The increase was driven by the rise of the positive differential observed for medium and large firms, especially those operating in the main sector of district specialization. No significant differences emerge at this stage for the smaller district firms. The tendency consolidates further in the recovery phase, when a positive and significant surplus appears also for the smaller ID firms, but limitedly to those operating in the core ID industry.

The empirical findings regarding the relative endowments of intangible assets are displayed in Table 14 and show how in the pre-crisis period district firms on average held significantly larger amount of this immaterial capital compared to firms located in the reference areas. This evidence is confirmed and consolidated over the crisis and the recovery stages. The sample breakdown shows that a similar surplus is observed both in

the core and in on-core ID industries and, in both cases pertains only to medium-large enterprises, as non significant differential is estimated for the smaller firms.

On the whole, the above documented trends provide evidence that a process of capital deepening has come together with the rise of the productivity differential observed in IDs during and after the crisis, in particular for district firms of medium and large size.

7 Summary and directions for future research

The results of the 2011 Business and Population Censuses marked the persisting relevance of industrial districts in the context of the Italian manufacturing sector, a tendency somewhat contrasting with the empirical evidences of a fading magnitude of the so-called "district effect" over the previous decade.

Updating and extending earlier econometric findings on manufacturing productivity levels in the framework of the Italian local labour market areas, we studied productivity dynamics in IDs over three different cyclical conditions: the years of stagnating growth preceding the global financial crisis, the Great recession and the following mild recovery. Estimation results documented a positive, sizeable and significant differential in favour of IDs firms in the pre-crisis period. However, these aggregate results mask considerable heterogeneity across firms: notably a substantially higher productivity premium was estimated for firms belonging to the sector of specialization of the ID and for small enterprises, both in the core and in non-core industries. Specialization economies, stemming from the spatial concentration of a large number of small and medium enterprises operating in the same industry, appear hence to qualify as one of the main drivers of district productivity advantages in the years preceding the global financial crisis.

During the following severe and prolonged recession, the overall district productivity premium was shown to remain essentially unchanged, while the heterogeneity within districts decreased significantly.

In the recovery stage following the Great recession two major findings appear to stand out: a significant increase of the district premium compared to the pre-crisis level and a further reduction of the heterogeneity of productivity differentials between the different sub-groups of ID firms. While small firms recovered entirely the level of the productivity premium attained prior to the crisis, the overall increase of the productivity differential reflects the robust pick-up observed for medium and large enterprises, a tendency that is especially marked for those operating outside the core district industry. For the subset of medium-large ID enterprises, after the crisis specialization no longer represented a relevant factor in order to differentiate firm performance, although it remained important for smaller firms. On the whole, these findings are in line with the literature that has

recently emphasized the increased role of medium and large size firms in Italian industrial districts, although, according to our estimation results, also the small IDs enterprises have maintained substantial productivity advantages compared to firms of similar size.

While the heterogeneity of firm performance according to size and specialization declined considerably over our estimation period, sizeable differences were shown to remain across the individual sectors of district specialization. For the subset of ID firms operating in the core industry, productivity premia are much higher than the overall ID average in the Food and beverages and in the Fashion and luxury goods sectors – two traditional Made in Italy sectors – while values close to the district mean were found out in Machinery, equipment and metal products and almost no productivity premium is found out in the production of Furniture and home goods and of chemical and paper products. Not surprisingly, the sectors where district productivity advantages are higher are exactly those in which the vast majority of IDs were specialized according to the 2011 Census data.

The sectoral analysis also showed how the catching up of productivity observed for the subset of medium-large firms operating in non-core IDs sectors is mainly related to the dynamics observed for firms producing Machinery, equipment and metal products and located in IDs with a different specialization. This pattern may be consistent with two alternative hypotheses: 1) IDs have progressively acquired a secondary specialization in the mechanical industry, unrelated to the activities of the core ID sector; 2) part of the district firms have moved upstream along the supply chain, starting to produce machinery and equipment to be employed by firms operating in the core ID industry. At this stage, we have no evidence allowing us to discriminate between these two hypotheses and leave this issue for future research.

An extensive set of robustness checks was performed and essentially confirm the baseline estimation results, showing how IDs have succeeded in maintaining a substantial productivity advantage also with respect to the subset of the reference LLMAs with a manufacture-oriented economic structure. In addition, it was shown how the dynamics of wage differentials, estimated controlling for workers qualification, have closely mirrored the productivity dynamics.

The analysis of relative human and fixed capital endowments showed no major structural changes over the period considered in the analysis, when the average qualification of employees is gauged by the white-collar share. In this case ID firms appear to have constantly employed a share of qualified labour force not statistically different from the average observed for firms located in the reference areas. However, when we focus on the share of manufacturing workers with higher educational attainments (college degree), we observe a gap for workers residing in IDs in the first half of our sample period, that is subsequently closed in the second half, showing a catching-up of human capital endowments in IDs. At the same time, ID firms have slightly increased their relative

endowments of both tangible and intangible fixed assets, starting from the crisis period. In line with the productivity trends, the capital deepening process is mainly observed for medium-large firms, operating both inside and outside the core ID industry.

On the whole, the empirical evidence gathered in the paper shows how, when compared to LLMAs of similar size and structural features, industrial districts have succeeded to catch-up with the recent positive trend in productivity observed for the overall Italian manufacturing, even increasing their productivity advantage. At least part of this productivity surplus is then distributed to workers, which were shown to earn higher wages in ID firms, not matched by correspondingly higher employee qualifications. The productivity surplus, at the same time, allowed ID firms to attain also higher gross profitability levels, measured by the incidence of EBITDA on total assets.

In order to maintain and consolidate their performance, industrial districts had to undergo significant structural changes. Medium and large firms have gained relevance, also through a process of capital deepening that involved both tangible and intangible assets. At the same time, structural adaptation involved the acquisition of a more significant role by firms not operating in the main district industry, although not associated with a decline of the advantages in the traditional sectors of district specialization.

As regards this process of structural transformation, the recent literature reviewed in the paper has highlighted how it implied a departure from some of the features of the classical Marshallian model that characterized Italian IDs for a long time and that relied strongly on strictly local supply chains. On the contrary, in a world economy that became ever more interconnected, being part of an international network has proved to be crucial in settling the destiny of a businesses also in IDs. On this respect, some authors have already documented an increased inclusion of Italian IDs firms in global value chains, possibly giving rise to a new district model, that was referred to as *glocal*, given that it appears to mix an increased role of global linkages on the input and output markets with the traditional emphasis on the processes of local accumulation and transmission of knowledge in specific industries. In future analyses, by exploiting survey data on the business relations entertained by manufacturing firms, we aim at investigating to what extent the productivity pickup that we documented in the paper might have been actually related to the development of new and more internationally-oriented commercial relations, either on the client or on the supplier side.

At the same time, we acknowledge that distinguishing the relative importance of selection and agglomeration effects in determining the dynamics of the average ID productivity differential, along the lines of Combes et al. (2012) and Accetturo et al. (2018), would be also of clear interest to the researcher. However, no proper theoretical foundations can be envisaged at the moment supporting the hypothesis of stronger selection effects in IDs due to increased competition on the output markets, considering that firms located in IDs and in the reference LLMAs face essentially the same market conditions. Competition on

the local inputs market, along the lines set forth in Arimoto et al. (2014), may provide a possible alternative theoretical explanation for selection effects in IDs and represent a research path that we equally aim at pursuing in future analyses.

Tables and figures

Table 1
LLMAs' distribution
(Units)

TYPE OF LLMA	2001	2011
Industrial districts	181	141
Other LLMAs	502	470
Manufacturing oriented	88	79
of which: *Large-firm districtual areas*	*29*	*28*
Non-manufacturing oriented	414	391
of which: *Large metropolitan areas* (1)	*12*	*12*
Total	**683**	**611**

(1) LLMAs with more than 500.000 residents.

Table 2
Italian local labour market areas in 2011
(Units and shares)

TYPE OF LLMAS	North West		North East		Centre		South and islands	
	Units	Share %	Units	Share %	Units	Share %	Units	Share %
Industrial districts	37	34,9	45	37,8	38	36,2	21	7,5
Other manufacturing oriented LLMAs	34	32,1	30	25,2	30	28,6	45	16,0
Non-manufacturing oriented LLMAs	35	33,0	44	37,0	37	35,2	215	76,5
Total	**106**	**100,0**	**119**	**100,0**	**105**	**100,0**	**281**	**100,0**

Table 3
Relevance of Industrial Districts in Italy
(shares)

AREA	District employees		IDs' residents	
	2001	2011	2001	2011
North West	31,3	28,9	31,9	30,7
North East	36,7	38,5	37,4	40,0
Centre	22,6	22,9	21,2	22,6
South	6,5	6,7	5,9	6,2
Total	**24,7**	**24,5**	**21,5**	**22,4**

Table 4
IDs' industries in 2011
(Units and shares)

SPECIALIZATIONS	Units	Share of IDs employees	Share of IDs manufacturing employees
Furniture and home goods	24	11.3	11.9
Jewelery, goldsmithing, musical instruments. etc.	4	4.3	4.2
Chemical, petrochemical, rubber prod. and plastics	5	3.2	3.0
Mechanic industry	38	38.5	38.0
Metallurgical industry	4	1.2	1.5
Food industries	15	5.0	4.2
Paper and printing industries	2	1.6	1.4
Leather clothing and footwear	17	8.8	10.0
Textile and clothing	32	26.1	25.7
Total	**141**	**100.0**	**100.0**

Table 5

LLMAs' structural characteristics in 2011

(Units and percentage points)

TYPE OF LLMAs	Average population	Employ-ment rate	Large companies employ-ment	Large companies manufactu-ring employ-ment	Graduate share on total population	Specializa-tion in KIBS industries
Industrial districts	94,513	47.8	5.0	6.9	8.6	0.67
Other LLMAs	98,101	40.7	6.3	8.5	8.9	0.76
Manufacturing oriented	95,943	43.9	9.9	19.6	9.1	0.70
of which: Large-firm districtual areas	*121,794*	*49.1*	*7.9*	*43.3*	*10.1*	*0.65*
Non-manufacturing oriented	99,007	39.3	4.8	3.8	8.9	0.78
of which: Large metropolitan areas (1)	*1,502,271*	*42.9*	*18.4*	*20.0*	*13.3*	*1.19*
Total	**97,273**	**42.0**	**6.0**	**8.1**	**8.9**	**0.74**

(1) LLMAs with more than 500.000 residents.

Table 6
Sample statistics

Time period	Industrial districts			Other LLMAs (1)		
		Of which: core ID industry	Of which: Non-core ID industries		Of which: Other manufacturing LLMAs	Of which: Non manufacturing LLMAs
	Number of firms in the sample (units) (2)					
2003-2008	33,834	12,644	21,190	19,447	4,806	14,641
2009-2012	37,007	13,320	23,687	22,580	5,461	17,119
2013-2017	32,617	11,738	20,879	19,474	4,786	14,688
2003-2017	34,274	12,522	21,752	20,291	4,974	15,317
	Firm size (units) (3)					
2003-2008	31,7	32,4	31,3	29,9	41,1	26,2
2009-2012	27,8	28,8	27,3	24,9	35,1	21,7
2013-2017	30,1	31,5	29,2	27,0	38,7	23,2
2003-2017	30,1	31,1	29,5	27,5	38,6	23,9
	Small firms employment share (percentage points)					
2003-2008	38,7	38,3	39,0	38,2	30,0	42,4
2009-2012	41,6	40,5	42,3	43,0	33,3	48,0
2013-2017	39,1	37,8	39,9	39,2	29,6	44,4
2003-2017	39,5	38,7	40,2	39,8	30,8	44,5
	Labour productivity (log of value added per employee) (4)					
2003-2008	0,014	0,031	0,003	-0,033	-0,024	-0,038
2009-2012	0,015	0,019	0,013	-0,044	-0,022	-0,056
2013-2017	0,022	0,028	0,019	-0,045	-0.036	-0,050
2003-2017	0,017	0,027	0,011	-0,040	-0,027	-0,046
	Revenues growth (percentage points) (4)(5)					
2003-2008	-0,31	-0,45	-0,22	0,58	0,99	0,36
2009-2012	0,12	0,19	0,07	-0,22	-0,12	-0,27
2013-2017	0,01	0,08	-0,02	-0,03	-0,22	0,08
2003-2017	-0,08	-0,09	-0,07	0,14	0,26	0,08
	Gross profitability (EBITDA/Total Assets; percentage points) (4)(5)					
2003-2008	0,10	-0,05	0,20	-0,19	-0,12	-0,23
2009-2012	0,05	0,00	0,07	-0,09	0,30	-0,29
2013-2017	0,19	0,15	0,21	-0,35	-0,02	-0,53
2003-2017	0,12	0,03	0,17	-0,21	0,02	-0,34

(1) The LLMAs with more than 500.000 residents are not considered. (2) Average number of firms in the sample in each period. (3) Average number of firm employees. (4) The variables are measured net of year, area, sector and firm size effects, by taking the residuals of the regression of each indicator on fixed year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size group (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions and sector is also interacted with firm size, in order to allow for size-specific sectoral effects. All the reported sample statistics are employment-weighted averages. (5) To remove outliers, the distribution of each indicator is trimmed at the 5th and 95th percentile levels.

Table 7

The dynamics of the labour productivity differential in industrial districts

VARIABLES	(a)	(b)	(c)	(d)
		Pre-crisis period		
District	0.045***			
	[0.012]			
of which:				
Core ID industry		0.063***		
		[0.014]		
Non-core industries		0.036***		
		[0.013]		
Less than 50 empl.			0.066***	
			[0.007]	
At least 50 empl.			0.032*	
			[0.019]	
Core ID ind.- Less than 50 empl.				0.091***
				[0.008]
Core ID ind.- At least 50 empl.				0.046**
				[0.022]
Non-core ind.- Less than 50 empl.				0.054***
				[0.007]
Non-core ind.- At least 50 empl.				0.025
				[0.020]
Observations	319685	319685	319685	319685
R-squared	0.281	0.281	0.281	0.282
		Crisis period		
District	0.051***			
	[0.014]			
of which:				
Core ID industry		0.061***		
		[0.018]		
Non-core industries		0.046***		
		[0.014]		
Less than 50 empl.			0.043***	
			[0.007]	
At least 50 empl.			0.056**	
			[0.023]	
Core ID ind.- Less than 50 empl.				0.061***
				[0.008]
Core ID ind.- At least 50 empl.				0.062**
				[0.029]
Non-core ind.- Less than 50 empl.				0.035***
				[0.007]
Non-core ind.- At least 50 empl.				0.053**
				[0.023]
Observations	238345	238345	238345	238345
R-squared	0.233	0.233	0.233	0.233

Table 7 (cont.)
The dynamics of the labour productivity differential in industrial districts

	Recovery period			
District	0.065***			
	[0.012]			
of which:				
Core ID industry		0.084***		
		[0.016]		
Non-core industries		0.055***		
		[0.012]		
Less than 50 empl.			0.069***	
			[0.006]	
At least 50 empl.			0.062***	
			[0.019]	
Core ID ind.- Less than 50 empl.				0.094***
				[0.008]
Core ID ind.- At least 50 empl.				0.078***
				[0.025]
Non-core ind.- Less than 50 empl.				0.057***
				[0.007]
Non-core ind.- at least50 empl				0.054***
				[0.019]
Observations	260453	260453	260453	260453
R-squared	0.267	0.267	0.267	0.267

The dependent variable is the logarithm of real value added per employee. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 8
The dynamics of the labour productivity differential in industrial districts: pooled 2003-2017 period estimates

VARIABLES	(1)	(2)	(3)
District	0.043***		
	[0.012]		
District * Crisis	0.011		
	[0.011]		
District * Recovery	0.024*		
	[0.013]		
Core ID industry		0.060***	
		[0.014]	
Core ID industry * Crisis		0.003	
		[0.012]	
Core ID industry* Recovery		0.025	
		[0.016]	
Non-core industries		0.033***	
		[0.013]	
Non-core industries* Crisis		0.014	
		[0.011]	
Non-core industries* Recovery		0.024*	
		[0.014]	
Less than 50 empl.			0.063***
			[0.007]
Less than 50 empl* Crisis			-0.017**
			[0.007]
Less than 50 empl* Recovery			0.005
			[0.008]
At least 50 empl.			0.030
			[0.019]
At least 50 empl. * Crisis			0.028*
			[0.017]
At least 50 empl. * Recovery			0.035*
			[0.020]
Observations	818483	818483	818483
R-squared	0.272	0.272	0.272

The dependent variable is the logarithm of real value added per employee. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 9
The dynamics of the labour productivity differential in industrial districts by macro-sector of activity

VARIABLES	Pre-crisis period		Crisis period		Recovery period	
			Fashion and luxury goods			
District	0.110***		0.146***		0.118**	
	[0.026]		[0.037]		[0.046]	
of which:						
Core ID ind.- Less than 50 empl.		0.196***		0.157***		0.176***
		[0.020]		[0.021]		[0.023]
Core ID ind.- At least 50 empl.		0.096**		0.203***		0.142*
		[0.043]		[0.067]		[0.081]
Non-core ind.- Less than 50 empl.		0.092***		0.056***		0.075***
		[0.021]		[0.021]		[0.023]
Non-core ind.- at least50 empl		0.070		0.131*		0.066
		[0.048]		[0.067]		[0.074]
Observations	56899	56899	35745	35745	38063	38063
R-squared	0.203	0.206	0.197	0.201	0.216	0.220
			Furniture and home goods			
District	-0.034		-0.001		0.047	
	[0.021]		[0.026]		[0.031]	
of which:						
Core ID ind.- Less than 50 empl.		-0.076***		-0.077***		-0.038*
		[0.016]		[0.019]		[0.022]
Core ID ind.- At least 50 empl.		-0.084**		0.012		0.112*
		[0.039]		[0.051]		[0.059]
Non-core ind.- Less than 50 empl.		0.015		-0.002		0.011
		[0.013]		[0.015]		[0.019]
Non-core ind.- at least50 empl		-0.017		0.032		0.071
		[0.039]		[0.051]		[0.058]
Observations	49578	49578	36255	36255	35491	35491
R-squared	0.290	0.294	0.198	0.199	0.246	0.249

Table 9 (cont.)
The dynamics of the labour productivity differential in industrial districts by macro-sector of activity

	Food and beverages					
District	0.128**		0.134**		0.088*	
	[0.056]		[0.057]		[0.051]	
of which:						
Core ID ind.- Less than 50 empl.		0.210***		0.184***		0.243***
		[0.040]		[0.042]		[0.042]
Core ID ind.- At least 50 empl.		0.265**		0.241**		0.143
		[0.117]		[0.118]		[0.118]
Non-core ind.- Less than 50 empl.		0.054**		0.064**		0.117***
		[0.026]		[0.026]		[0.025]
Non-core ind.- at least50 empl		0.075		0.116		0.012
		[0.060]		[0.071]		[0.067]
Observations	27034	27034	22165	22165	27056	27056
R-squared	0.190	0.200	0.232	0.237	0.247	0.253
	Machinery, equipment and metals					
District	0.043***		0.023		0.057***	
	[0.016]		[0.020]		[0.016]	
of which:						
Core ID ind.- Less than 50 empl.		0.063***		0.015		0.055***
		[0.011]		[0.012]		[0.011]
Core ID ind.- At least 50 empl.		0.044		-0.008		0.036
		[0.028]		[0.041]		[0.029]
Non-core ind.- Less than 50 empl.		0.049***		0.027***		0.047***
		[0.009]		[0.009]		[0.008]
Non-core ind.- at least50 empl		0.033		0.039		0.076***
		[0.026]		[0.032]		[0.026]
Observations	133157	133157	105066	105066	116588	116588
R-squared	0.204	0.204	0.146	0.146	0.181	0.182

Table 9 (cont.)
The dynamics of the labour productivity differential in industrial districts by macro-sector of activity

	Chemical and paper products					
District	0.039		0.049		0.044*	
	[0.035]		[0.033]		[0.024]	
of which:						
Core ID ind.- Less than 50 empl.		0.150***		0.097***		0.081***
		[0.028]		[0.032]		[0.028]
Core ID ind.- At least 50 empl.		0.090		0.069		0.072
		[0.059]		[0.056]		[0.057]
Non-core ind.- Less than 50 empl.		0.063***		0.059***		0.060***
		[0.016]		[0.017]		[0.015]
Non-core ind.- at least50 empl		0.016		0.039		0.031
		[0.055]		[0.052]		[0.033]
Observations	53017	53017	39114	39114	43255	43255
R-squared	0.320	0.322	0.275	0.275	0.327	0.327

The dependent variable is the logarithm of real value added per employee. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 10
The dynamics of the labour productivity differential in industrial districts: robustness checks

VARIABLES	Pre-crisis period		Crisis period		Recovery period	
	(a) Controlling for factor endowments					
District	0.038***		0.041***		0.052***	
	[0.011]		[0.013]		[0.011]	
of which:						
Core ID ind.- Less than 50 empl.		0.082***		0.053***		0.087***
		[0.007]		[0.008]		[0.007]
Core ID ind.- At least 50 empl.		0.044**		0.056**		0.067***
		[0.019]		[0.027]		[0.022]
Non-core ind.- Less than 50 empl.		0.053***		0.029***		0.053***
		[0.006]		[0.007]		[0.006]
Non-core ind.- at least50 empl		0.014		0.039*		0.036**
		[0.018]		[0.021]		[0.017]
Human capital	0.745***	0.746***	0.644***	0.645***	0.564***	0.567***
	[0.030]	[0.030]	[0.034]	[0.034]	[0.033]	[0.032]
Fixed tangible assets per employee	0.129***	0.130***	0.115***	0.114***	0.123***	0.123***
	[0.004]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]
Fixed intangible assets per employee	-0.012***	-0.012***	-0.014***	-0.014***	-0.012***	-0.012***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.002]	[0.002]
Observations	261277	261277	187949	187949	199811	199811
R-squared	0.399	0.400	0.330	0.330	0.358	0.359
	(b) Excluding large-firm districtual LLMAs from IDs					
District	0.048***		0.049***		0.061***	
	[0.011]		[0.014]		[0.011]	
of which:						
Core ID ind.- Less than 50 empl.		0.095***		0.059***		0.096***
		[0.008]		[0.008]		[0.008]
Core ID ind.- At least 50 empl.		0.045**		0.047*		0.052**
		[0.020]		[0.028]		[0.022]
Non-core ind.- Less than 50 empl.		0.049***		0.030***		0.054***
		[0.007]		[0.007]		[0.007]
Non-core ind.- at least50 empl		0.031		0.062***		0.059***
		[0.019]		[0.024]		[0.019]
Observations	281339	281339	210198	210198	230175	230175
R-squared	0.283	0.284	0.230	0.230	0.267	0.268

Table 10 (cont.)
The dynamics of the labour productivity differential in industrial districts: robustness checks

	(c) IDs defined according to the 2001 Istat map					
District	0.047***		0.053***		0.064***	
	[0.010]		[0.013]		[0.011]	
of which:						
Less than 50 empl.		0.058***		0.044***		0.066***
		[0.006]		[0.006]		[0.006]
At least 50 empl.		0.039**		0.060***		0.062***
		[0.017]		[0.022]		[0.017]
Observations	281336	281336	210189	210189	230126	230126
R-squared	0.283	0.283	0.230	0.230	0.268	0.268
	(d) Excluding firms with less than 5 employees					
District	0.044***		0.050***		0.064***	
	[0.012]		[0.015]		[0.012]	
of which:						
Core ID ind.- Less than 50 empl.		0.047**		0.063**		0.079***
		[0.022]		[0.029]		[0.025]
Core ID ind.- At least 50 empl.		0.052***		0.033***		0.054***
		[0.007]		[0.007]		[0.007]
Non-core ind.- Less than 50 empl.		0.026		0.054**		0.055***
		[0.020]		[0.023]		[0.019]
Non-core ind.- at least50 empl						
Observations	249559	249559	178898	178898	198762	198762
R-squared	0.283	0.283	0.232	0.233	0.262	0.263

Table 10 (cont.)
The dynamics of the labour productivity differential in industrial districts: robustness checks

	(e) including fixed effects for the 20 administrative regions					
District	0.031**		0.045***		0.060***	
	[0.013]		[0.015]		[0.014]	
of which:						
Core ID ind.- Less than 50 empl.		0.076***		0.054***		0.086***
		[0.009]		[0.010]		[0.009]
Core ID ind.- At least 50 empl.		0.031		0.055*		0.075***
		[0.022]		[0.030]		[0.026]
Non-core ind.- Less than 50 empl.		0.038***		0.030***		0.049***
		[0.009]		[0.009]		[0.009]
Non-core ind.- at least50 empl		0.011		0.048**		0.051**
		[0.020]		[0.024]		[0.021]
Observations	319685	319685	238345	238345	260453	260453
R-squared	0.289	0.289	0.241	0.241	0.272	0.272
	(f) including only manufacturing LLMAs in the reference group					
District	0.034**		0.030		0.063***	
	[0.017]		[0.020]		[0.019]	
of which:						
Core ID ind.- Less than 50 empl.		0.073***		0.036***		0.068***
		[0.009]		[0.010]		[0.010]
Core ID ind.- At least 50 empl.		0.037		0.045		0.087***
		[0.027]		[0.037]		[0.032]
Non-core ind.- Less than 50 empl.		0.041***		0.014		0.035***
		[0.008]		[0.009]		[0.009]
Non-core ind.- at least50 empl		0.020		0.031		0.064**
		[0.025]		[0.031]		[0.028]
Observations	231838	231838	169870	169870	187014	187014
R-squared	0.268	0.268	0.234	0.234	0.249	0.250

Table 10 (cont.)
The dynamics of the labour productivity differential in industrial districts: robustness checks

	(g) including only large-firm manufacturing LLMAs in the reference group					
District	0.025		0.031		0.078***	
	[0.020]		[0.024]		[0.023]	
of which:						
Core ID ind.- Less than 50 empl.		0.070***		0.039***		0.079***
		[0.010]		[0.011]		[0.011]
Core ID ind.- At least 50 empl.		0.025		0.042		0.103***
		[0.031]		[0.042]		[0.037]
Non-core ind.- Less than 50 empl.		0.039***		0.019*		0.046***
		[0.009]		[0.010]		[0.010]
Non-core ind.- at least50 empl		0.009		0.031		0.081**
		[0.029]		[0.035]		[0.033]
Observations	225007	225007	164628	164628	180961	180961
R-squared	0.267	0.268	0.233	0.234	0.249	0.249
	(h) including metropolitan areas in the reference group of LLMAs					
District	0.012		0.024*		0.026**	
	[0.012]		[0.014]		[0.012]	
of which:						
Core ID ind.- Less than 50 empl.		0.039***		0.034***		0.064***
		[0.007]		[0.008]		[0.008]
Core ID ind.- At least 50 empl.		0.012		0.033		0.025
		[0.019]		[0.026]		[0.022]
Non-core ind.- Less than 50 empl.		0.005		0.009		0.028***
		[0.006]		[0.007]		[0.007]
Non-core ind.- at least50 empl		0.007		0.026		0.014
		[0.021]		[0.024]		[0.019]
Observations	445225	445225	324304	324304	359676	359676
R-squared	0.279	0.279	0.240	0.240	0.274	0.275

Table 10 (cont.)
The dynamics of the labour productivity differential in industrial districts: robustness checks

	(i) dependent variable: unit labour costs					
District	0.023***		0.027***		0.039***	
	[0.004]		[0.005]		[0.004]	
of which:						
Core ID ind.- Less than 50 empl.		0.064***		0.060***		0.075***
		[0.003]		[0.004]		[0.004]
Core ID ind.- At least 50 empl.		0.015**		0.021*		0.034***
		[0.007]		[0.011]		[0.008]
Non-core ind.- Less than 50 empl.		0.045***		0.041***		0.052***
		[0.003]		[0.003]		[0.003]
Non-core ind.- at least50 empl		-0.003		0.005		0.019***
		[0.007]		[0.009]		[0.007]
Human capital	0.518***	0.519***	0.462***	0.462***	0.411***	0.412***
	[0.010]	[0.010]	[0.017]	[0.017]	[0.013]	[0.013]
Observations	287068	287068	214156	214156	233636	233636
R-squared	0.610	0.612	0.532	0.534	0.542	0.543

The dependent variable is the logarithm of real value added per employee. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 11

The dynamics of the human capital endowment differential in industrial districts

VARIABLES	(a)	(b)	(c)	(d)
		Pre-crisis period		
District	0.001			
	[0.005]			
of which:				
Core ID industry		-0.003		
		[0.006]		
Non-core industries		0.003		
		[0.006]		
Less than 50 empl.			0.001	
			[0.003]	
At least 50 empl.			0.000	
			[0.008]	
Core ID ind.- Less than 50 empl.				0.002
				[0.004]
Core ID ind.- At least 50 empl.				-0.006
				[0.009]
Non-core ind.- Less than 50 empl.				0.001
				[0.003]
Non-core ind.- At least 50 empl.				0.004
				[0.009]
Observations	319445	319445	319445	319445
R-squared	0.283	0.284	0.283	0.284

Table 11 (cont.)
The dynamics of the human capital endowment differential in industrial districts

		Crisis period		
District	0.001			
	[0.006]			
of which:				
Core ID industry		-0.006		
		[0.007]		
Non-core industries		0.005		
		[0.006]		
Less than 50 empl.			-0.001	
			[0.003]	
At least 50 empl.			0.003	
			[0.010]	
Core ID ind.- Less than 50 empl.				-0.002
				[0.003]
Core ID ind.- At least 50 empl.				-0.009
				[0.011]
Non-core ind.- Less than 50 empl.				-0.001
				[0.003]
Non-core ind.- At least 50 empl.				0.010
				[0.010]
Observations	238266	238266	238266	238266
R-squared	0.270	0.270	0.270	0.270

Table 11 (cont.)
The dynamics of the human capital endowment differential in industrial districts

	Recovery period			
District	0.002			
	[0.005]			
of which:				
Core ID industry		-0.007		
		[0.006]		
Non-core industries		0.006		
		[0.006]		
Less than 50 empl.			-0.003	
			[0.003]	
At least 50 empl.			0.005	
			[0.008]	
Core ID ind.- Less than 50 empl.				-0.004
				[0.003]
Core ID ind.- At least 50 empl.				-0.009
				[0.010]
Non-core ind.- Less than 50 empl.				-0.004
				[0.003]
Non-core ind.- at least50 empl				0.013
				[0.009]
Observations	259915	259915	259915	259915
R-squared	0.269	0.270	0.270	0.271

The dependent variable is the ratio of the number of white-collar employees to the total number of firm employees. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 12
Graduate workers in IDs: estimation results from linear probability models

VARIABLES	2002-2016	2002-2008	2010-2016
District	-0.0178**	-0.0250**	-0.0087
	(0.0064)	(0.0083)	(0.0101)
Observations	11662	7162	4500
R-squared	0.0069	0.0065	0.010

The regressors include a full set of geographical area dummies. Observations are weighted by the sampling design weights. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 13
The dynamics of the tangible capital differential in industrial districts

VARIABLES	(a)	(b)	(c)	(d)
		Pre-crisis period		
District	0.051			
	[0.033]			
of which:				
Core ID industry		0.060		
		[0.040]		
Non-core industries		0.047		
		[0.032]		
Less than 50 empl.			-0.000	
			[0.019]	
At least 50 empl.			0.083*	
			[0.049]	
Core ID ind.- Less than 50 empl.				0.028
				[0.022]
Core ID ind.- At least 50 empl.				0.080
				[0.059]
Non-core ind.- Less than 50 empl.				-0.014
				[0.020]
Non-core ind.- At least 50 empl.				0.084*
				[0.048]
Observations	315787	315787	315787	315787
R-squared	0.238	0.239	0.239	0.239

Table 13 (cont.)
The dynamics of the tangible capital differential in industrial districts

			Crisis period	
District	0.084**			
	[0.036]			
of which:				
Core ID industry		0.109**		
		[0.043]		
Non-core industries		0.071**		
		[0.035]		
Less than 50 empl.			0.017	
			[0.020]	
At least 50 empl.			0.132**	
			[0.056]	
Core ID ind.- Less than 50 empl.				0.026
				[0.025]
Core ID ind.- At least 50 empl.				0.167**
				[0.067]
Non-core ind.- Less than 50 empl.				0.012
				[0.021]
Non-core ind.- At least 50 empl.				0.113**
				[0.055]
Observations	234716	234716	234716	234716
R-squared	0.219	0.219	0.219	0.220

Table 13 (cont.)
The dynamics of the tangible capital differential in industrial districts

			Recovery period	
District	0.091***			
	[0.035]			
of which:				
Core ID industry		0.123***		
		[0.040]		
Non-core industries		0.076**		
		[0.035]		
Less than 50 empl.			0.039*	
			[0.020]	
At least 50 empl.			0.124**	
			[0.052]	
Core ID ind.- Less than 50 empl.				0.052**
				[0.025]
Core ID ind.- At least 50 empl.				0.166***
				[0.059]
Non-core ind.- Less than 50 empl.				0.033
				[0.021]
Non-core ind.- at least50 empl				0.102*
				[0.053]
Observations	256164	256164	256164	256164
R-squared	0.229	0.229	0.229	0.229

The dependent variable is the logarithm of total tangible fixed assets at book value per employee. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 14
The dynamics of the intangible capital differential in industrial districts

VARIABLES	(a)	(b)	(c)	(d)
		Pre-crisis period		
District	0.134*			
	[0.076]			
of which:				
Core ID industry		0.157*		
		[0.083]		
Non-core industries		0.122		
		[0.080]		
Less than 50 empl.			-0.018	
			[0.047]	
At least 50 empl.			0.215**	
			[0.109]	
Core ID ind.- Less than 50 empl.				-0.011
				[0.051]
Core ID ind.- At least 50 empl.				0.246**
				[0.116]
Non-core ind.- Less than 50 empl.				-0.022
				[0.047]
Non-core ind.- At least 50 empl.				0.199*
				[0.117]
Observations	261496	261496	261496	261496
R-squared	0.115	0.115	0.116	0.116

Table 14 (cont.)
The dynamics of the intangible capital differential in industrial districts

			Crisis period	
District	0.160*			
	[0.090]			
of which:				
Core ID industry		0.111		
		[0.097]		
Non-core industries		0.185**		
		[0.095]		
Less than 50 empl.			0.003	
			[0.052]	
At least 50 empl.			0.260*	
			[0.134]	
Core ID ind.- Less than 50 empl.				-0.011
				[0.056]
Core ID ind.- At least 50 empl.				0.186
				[0.143]
Non-core ind.- Less than 50 empl.				0.009
				[0.052]
Non-core ind.- At least 50 empl.				0.298**
				[0.143]
Observations	188002	188002	188002	188002
R-squared	0.096	0.096	0.097	0.097

Table 14 (cont.)
The dynamics of the intangible capital differential in industrial districts

	Recovery period			
District	0.202**			
	[0.086]			
of which:				
Core ID industry		0.188*		
		[0.099]		
Non-core industries		0.209**		
		[0.087]		
Less than 50 empl.			-0.033	
			[0.033]	
At least 50 empl.			0.328***	
			[0.124]	
Core ID ind.- Less than 50 empl.				-0.048
				[0.039]
Core ID ind.- At least 50 empl.				0.310**
				[0.142]
Non-core ind.- Less than 50 empl.				-0.027
				[0.034]
Non-core ind.- at least50 empl				0.338***
				[0.127]
Observations	200202	200202	200202	200202
R-squared	0.083	0.083	0.085	0.085

The dependent variable is the logarithm of total intangible fixed assets at book value per employee. The regressors include fixed effects for year, sector (at the two-digit NACE rev. level of breakdown), geographical area (North West, North East, Centre and South and Islands) and firm size (less than 20, from 20 to 49, from 50 to 249, more than 250 employees). Sector, area and size effects are interacted with year effects in order to allow specific time trends along these dimensions. Sector is also interacted with firm size, in order to allow for size-specific sectoral effects. Robust standard errors, clustered at the firm level, in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Figures

Figure 1
The map of Italian local labour market areas.

a) 2001 *b*) 2011

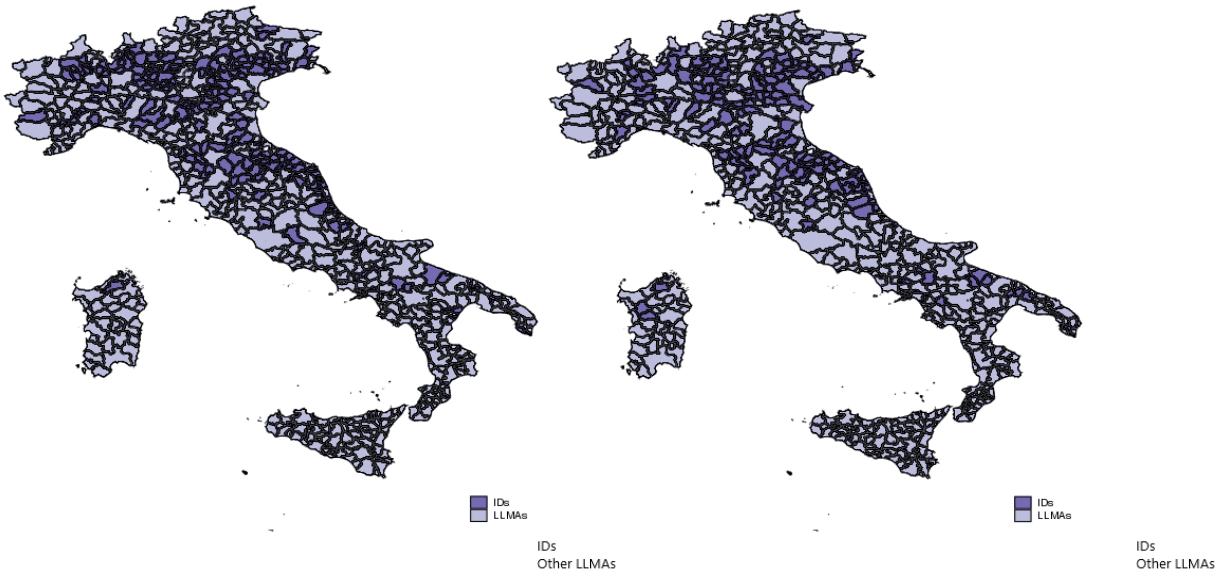
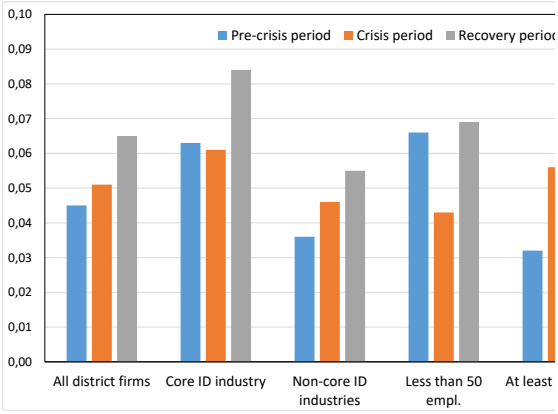
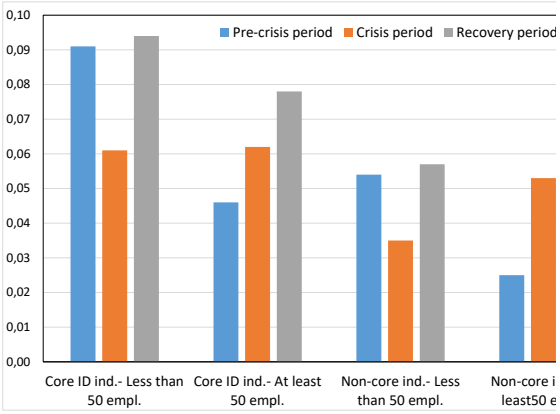


Figure 2
The estimated productivity differential (1)

(a) overall, by specialization and by firm size



(b) by specialization and firm size jointly



(1) All the reported estimates are statistically significant (see Table 7).

REFERENCES

Accetturo, A., Di Giacinto, V., Micucci, G. and Pagnini M. (2018), 'Geography, productivity and trade: does selection explain why some locations are more productive than others?', *Journal of Regional Science*, 58(5), pp. 949-979.

Accetturo. A., Giunta, A. and Rossi, S. (2011). 'The Italian Firms between Crisis and the new Globalization', *L'industria*, vol. 1, pp. 145-164.

Andersson S., Evers N., Griot C. (2013) 'Local and international networks in small firm internationalization: cases from the Rhône-Alpes medical technology regional cluster'. *Entrepreneurship & Regional Development*, 25 (9–10): 867-888.

Arimoto, Y., Nakajima, K. and Okazaki, T. (2014) 'Sources of productivity improvement in industrial clusters: The case of the prewar Japanese silk-reeling industry', *Regional Science and Urban Economics*, vol. 46, issue C, pp. 27-41.

Aureli S., Ciambotti M., Salvatori F. (2010), 'Internationalisation of italian shoemaking districts: some empirical evidence from the marche region', *Rivista Piccola Impresa/Small Business* - n. 2, pp. 97-121.

Becattini, G., Musotti, F. (2003). 'Measuring the district effect: reflection on the literature', *BNL Quarterly Review*, no. 226, pp. 259–290.

Bugamelli, M., Lotti, F. (eds.), Amici M., Ciapanna, E, Colonna, F. D'Amuri, F., Giacomelli, S., Linarello, A., Manaresi, F., Palumbo, G. Scoccianti, F. and Sette, E., (2018), "Productivity growth in Italy: a tale of a slow-motion change". Banca d'Italia, Questioni di Economia e Finanza, N. 422.

Combes, P., Duranton G., Gobillon, L., Puga, D. and Roux, S., (2012), 'The productivity advantages of large cities: Distinguishing agglomeration from firm selection', *Econometrica*, 80, pp. 2543-2594.

Cucculelli, M., Storai, D. (2018), 'Industrial districts, district effect and firm size: the Italian evidence', *Cambridge Journal of Economics*, 42, pp. 1543–1566.

Cutrini, E., Micucci, G. and Montanaro, P. (2013) 'I distretti tradizionali di fronte alla globalizzazione: il caso dell'industria calzaturiera marchigiana', L'Industria, 34(1), pp. 123-158.

De Blasio, G., Di Addario, S. (2005), 'Do Workers Benefit from Industrial Agglomeration?', *Journal of Regional Science*, 45(4), pp. 797-827.

De Marchi V., Grandinetti, R. (2016) 'Industrial districts evolving in glocal value chains: evidence from the Italian wine industry' *Piccola Impresa/Small Business, 1*.

Dei Ottati, G., (2018), 'Marshallian Industrial Districts in Italy: the end of a model or adaptation to the global economy', *Cambridge Journal of Economics*, 42, pp. 259–284.

Di Giacinto, V., Gomellini, M., Micucci, G. and Pagnini, M. (2014), 'Mapping local productivity advantages in Italy: industrial districts, cities or both?', *Journal of Economic Geography*, Vol. 14 (2), pp. 365-394.

Foresti, G., Guelpa, F. and Trenti, S. 2014. Le strategie adottate dalle imprese dei distretti industriali nel nuovo contesto competitivo, in Mazzola, F. Nusolino, M. and Provenzano, V. (eds.), *Reti, nuovi settori e sostenibilità*, pp. 52–75, Milano, Franco Angeli.

Giuliani, E. and Rabellotti, R. (2017), 'Italian industrial districts today. Between decline and openness to global value chains', in Cantwell, J., Mowery, D., De Marchi V., Di Maria, E. and Gereffi, G. (eds.), *Local Clusters in Global Value Chains. Linking Actors and Territories through Manufacturing and Innovation*, Routledge, London.

Glaeser, E. L. and Mare, D. (2001), 'Cities and skills', *Journal of Labor Economics*, 19(2), pp. 316-342.

Glaeser, E. L. (ed.), (2010), *Agglomeration Economies*, University of Chicago Press.

Istat (2015), *I distretti industriali 2011*, https://www.istat.it/it/files/2015/10/I-distretti-industriali-2011.pdf.

Grossman GM, Rossi-Hansberg E (2008), 'Trading tasks: A simple theory of offshoring', *American Economica Review,* 98(5), pp. 1978-97

Iuzzolino, G. (2013), 'Le agglomerazioni industriali italiane: storia struttura e performance', in Omiccioli, M. (ed.) *I sistemi produttivi locali. Trasformazioni tra globalizzazione e crisi*, Carocci Editore, Roma.

Iuzzolino, G., Menon, C. (2011), 'Le agglomerazioni industriali del Nord Est: segnali di discontinuità negli anni Duemila', *L'industria, Rivista di economia e politica industriale* 4/2011, pp. 615-654.

Signorini, L. F. (1994), 'Una verifica quantitativa dell'effetto distretto', *Sviluppo Locale*, vol. 1, no. 1, pp. 31–70.

Signorini, L. F. (ed.) (2000). *Lo sviluppo locale. Un'indagine della Banca d'Italia sui distretti industriali*, Corigliano Calabro, Meridiana Libri.

Sopranzetti, S. (2018), 'The Italian Districts in the Global Value Chains', *Italian Economic Journal*, 4, pp. 497–522.

Yankow, J. J. (2006), 'Why do cities pay more? An empirical examination of some competing theories of the urban wage premium', *Journal of Urban Economics*, 60(2), pp. 139-161.