

Territorial Disparities in Tuscan Industrial Assets: A Method to Assess Average Firm-Size Spatial Distribution

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Abstract. In economics, firm-size can is an important marker for economic activities' dynamism. It indicates the scale of operation and conditions regarding production and profitability, hence, the overall economic soundness of a sector or industry. Several variables can be employed for assessing firm-size, categorized in input factors – capital, labour, net-worth and total assets; output factors – volume of production, value added; and factors related to space, such as market size and presence of transportation. From a spatial perspective, addressing firm-size remains a challenge, as in-detail surveys of these variables are difficult due to the limited breakdown of economic data. However, regional characteristics of firm-size distribution can reveal several logics about territorial disparities, that ought to be considered in policies for economic recovery. This paper objective is to propose a method to estimate average firm-size throughout the Tuscany region territory, based on the variables of number of local units (firms) and number of employees, and evaluate its spatial distribution evolution between two periods of time Industrial Census data will be compared to industrial assets locational data to individuate production-oriented – spaces dedicated to manufacture – and administrative-oriented areas in the Tuscany Region. Organized in a GIS-based environment, the results assessment provides an in-detail view of spatial information regarding territorial disparities in industrial distribution, which can be compared to other territorial endowments that exist within the region, thus, being a complementary analysis for urban and regional planning.

Keywords: Firm-size · Regional planning · Tuscany

1 Introduction

Firm-size has been an extensively discussed topic in economics' theory of firm since its introduction as a rationale by Ronald Coase in the late 1930's [1]. Albeit thought by Coase as being derived from the quantity of internal and external *contractual relations* that a corporation had [1], firm-size matured as a measure which, in nowadays, encompass several aspects about the economic activities' scale. Its evaluation allows to assess firms' organizational characteristics, their financial soundness, their productivity along the

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overall dynamism of the sector. When related to space, it reveals aspects about firms' spatial distribution patterns along attributes regarding countries and regions economic structures [2, 3]. Nevertheless, the discussion of what are the factors that can indeed determine firm-size, is still a point of debate among economists.

Coase's interpretation of firm-size was established as part of the analysis regarding the nature of *transaction costs*. In this context, it was thought that firms that are better equipped to handle those costs would be able to have more trade contracts in the market, therefore diminishing their production costs through outsourced inputs; hence the number of contracts a firm has will be proportional to their operation size [1]. While influential, this analysis was limited by its scope, not considering other aspects that may inform firm-size. Lucas [4], in his neoclassical firm model, addressed several absent points, and introduced capital and labour as determinants of size. For Lucas, *managerial talent* is unevenly distributed among agents, so firms must reach an equilibrium ratio of managers and employees in their organizational structure. As a firm increases its capital, this cause changes in the managers-employees equilibrium ratio, that leads to alterations in total firm-size [4]; in this aspect, while capital intensive firms tend to be larger, it can be stated that the number of employees is a fundamental determinant of size. Labour (number of employees) and capital (machinery) are often referred in economics as *input factors* – being in close relation with production – and were the main elements used to assess operations' scale until the late 1990's [2, 4].

It was not until the maturation of organizational theories in the early 2000's that *output factors* were considered as determinants of firm-size [3]. *Outputs*, in economics, are interpreted as production results, such as productivity, added value, sales and profits, and can inform aspects that, when compared amid firms, cam be indicative of their relative scale and size. Other factors – some also related to spatial or territorial endowments – can also influence in the maximum firm-sizes, such as R&D intensity, sector and market size, and the presence of utilities and transportation networks [3].

Despite the remarkable advances in the theoretical comprehension of what are the determinants of firm-size, problems remain on how to address them from a spatial perspective. The limited breakdown of economic data – as surveys are often available just at national, or at best, at regional scales – creates several issues for an in-detail evaluation of territorial disparities in the firms' operation sizes. In turn, the absence of such spatial data may hinder the effectiveness of economic recovery policies, as no clear picture of the regional industrial assets location and dimensions is readily available. With these issues in consideration, this paper objective is to propose a method to assess the average firm-size distribution within the Tuscany region – as well as understand the data limitations in this assessment. Organized in a GIS-based environment, average firm-sizes are estimated based on input variables of number of local units (firms) and number of employees, available in the Italian Industrial and Services Census for two periods of time (2001 and 2011), that are spatialized according to survey (census) zones to reveal their territorial density. Data is also compared to the location of the industrial assets – built-structures dedicated to manufacture – hence, individuating where *productive* and *administrative-oriented* territories are predominant in Tuscany. The spatial information

results from this assessment can be further compared to other territorial endowments of the region, thus, being, beyond an economic analysis, a source of complementary data for urban and regional planning policies.

2 Datasets Construction and Methods

Datasets used to assess industrial distribution territorial disparities within Tuscany are obtained from the 8th and 9th Italian Industrial and Services Census (*Censimenti ISTAT dell'industria e servizi*) [5, 6]. This database describes the total number of local units (firms) and the number of employees in the industrial and service sectors for a determined census zone, being periodic, as spans from 2001 to 2011, and methodologically homogeneous, hence allowing comparisons between periods [7]. Since the data tables (.csv) and their spatial data counterparts (.xls) are placed in different files, a spatial join is performed in QGIS [8] using the *section* variable to assemble the table datum to its respective spatial position, allowing variables' spatialization and categorization.

ISTAT data tables have local units and employees' variables described as absolute values, with any mention to their territorial area dimension being absent. The same occurs for the census zones' data as, despite being a localized spatial dataset, no variable for area is present [7]. With this in consideration, area values are independently processed in QGIS [8] for each census zone. Once calculated and converted from m^2 to km^2, those areas divide their respective variables for number of local units and employees' that results in their average density (Eq. 1 and 2). When spatialized, their distribution patterns can be visualised across the Tuscan territory.

$$D_{localunits} = \frac{N_{localunits}}{A_{censuszone}} \tag{1}$$

$$D_{employees} = \frac{N_{employees}}{A_{censuszone}} \tag{2}$$

The spatial dataset construction follows the same rules and principles applied in the *Censimento ISTAT della Popolazione e dell'industria anni 2001–2011,* a QGIS project elaborated by the *Regione Toscana* [9] with the same ISTAT dataset. Still, the analysis dataset fundamentally differs from the *Regione's* construction in two points: the numerical ranges that established for each variable in categorization – which are standardized between the different periods of time; and the presence of a categorization, that specifies, for each census zone, the density degree of each variable, that can range from *very low* to *very high; no data* encompasses "0" and Null values (Table 1).

Table 1. Local units and employees data distribution according to density for 2001 and 2011

		Local units		Employees	
Ranges	Values	2001	2011	2001	2011
Very high density	>1,000	4,108	3,566	7,678	6,724
High density	<= 1,000 > 500	2,601	2,484	3,032	2,755
Medium density	<= 500 > 100	8,094	7,488	6,104	5,983
Low density	<= 100 > 20	3,886	4,188	2,243	2,739
Very low density	<= 20 > 0	3,476	3,730	3,088	3,255
No data	0 or Null	6,808	7,378	6,808	7,378
Total census zones		28,953	28,834	28,953	28,834

The average firm-size density in a census zone is then calculated through the ratio between the density of employees and the density of local units [3] (Eq. 3).

$$D_{firmsize} = \frac{D_{employees}}{D_{localunits}} \tag{3}$$

While this variable represents the ratio between the average number of employees and the average number of local units (firms), thus, informing the average operation size of an area, it provides no distinction regarding which kind of activity is present, nor where *productive spaces* and *administrative spaces* are prevalent within the territory. ISTAT local units' data does not contain countable information about function that allows these precise assessments [7]. With this issue in consideration, it is proposed the inclusion of another dataset that can partially address these absences: the Tuscany Region built-structures data (*Edificato 2k,10k 1988–2013*) [10]. This dataset outlines the location of all built-structures within the Tuscan territory, represented by volumetric units (polygons), and categorized according to their main urban function. For this analysis, only production-oriented buildings are considered, as services often are located on mixed-use structures, which are not individuated on the dataset. Hence, the data extraction encompasses solely the built-structures that are categorized under "Industrial" (*Industriale*) or "Technological Plant" (*Impianto Tecnologico*).

Since volumetric units can overlap two census zones, the built-structures centroids – the polygon central point – are extracted. Being punctual elements, it is assured that centroids lie within a sole census zone. For each of these areas, the data regarding the total number of production-oriented buildings is joined to the average firm-size dataset (Fig. 1a, 1b), in order to assess if productive or administrative areas are predominant, as well as their distribution across the territory.

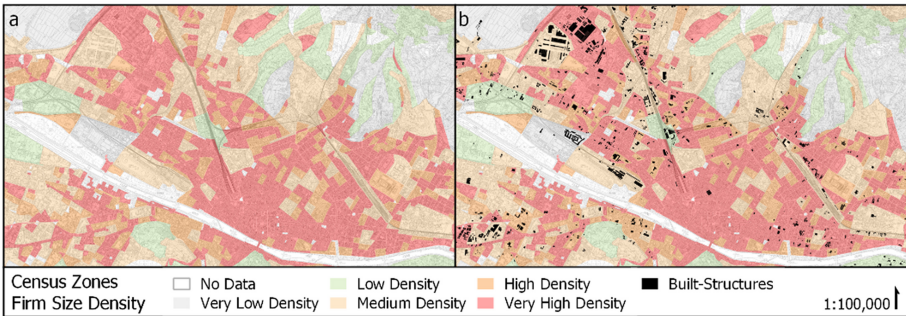


Fig. 1. Datasets of average firm-size (a) and industrial built structures (b) superimposition; data are joined for the *administrative* and *productive* areas distribution assessment.

The relation between firm-size density and presence of built-structures with industrial function can indicate if the area is predominantly oriented to the industrial sector manufacture activities – due to a significant presence of industrial plants; to the industrial firms' administrative activities or to services – if no industrial plants are present; or if the area has no defined orientation, as plants may be present but in no significant quantities when compared to the number of firms, hence limiting the possibilities of a detailed assessment that distinguish *administrative/services* and *productive* activities. This constructed dataset is spatialized to depict the differences between administrative and manufacture areas' distribution within the Tuscan Territory.

3 Results and Discussion

Spatial data distribution for average local units and employees' densities, both in 2001 and 2011, follows the same general territorial patterns depicted in the spatialization of average firm-size (2011 – Fig. 2). It can be observed that densities degrees tend to be higher near Tuscany's main urban centres, as it would be expected. However, it is also verified a clear pattern of *high* and *medium* densities alongside the main regional highways that establish the linkages between major cities. This suggests that the relationship amid economic activities location and road-circulation network *preferential routes*, addressed in previous studies [11], can be also associated to firm-size.

Although the spatialization implies territorial relations amid firms' placement and the road-infrastructure, the patterns are, nonetheless, distinctive to septentrional and, to a lesser degree, central Tuscany. Their diminished occurrence in meridional Tuscany can be explained by two reasons: its sparser road-circulation network – and consequently its lower overall regional hierarchy when compared to northern Tuscany [12]; and the lack of larger urban settlements near the highways (Fig. 2). Both characteristics aid to describe another noticeable distinction amid north and south, that concerns the firms' presence in hinterlands. Northern Tuscany has a greater number of hinterlands zones with *very low* average firm-sizes (thus, at least one local unit and employee), whereas in the south, several hinterland zones have no firm presence whatsoever *(no data)*. This is a distinguishable feature in the *Maremma* area, in-between the cities of *Siena* and *Grosseto*, which is focused primarily on agricultural activities (Fig. 2).

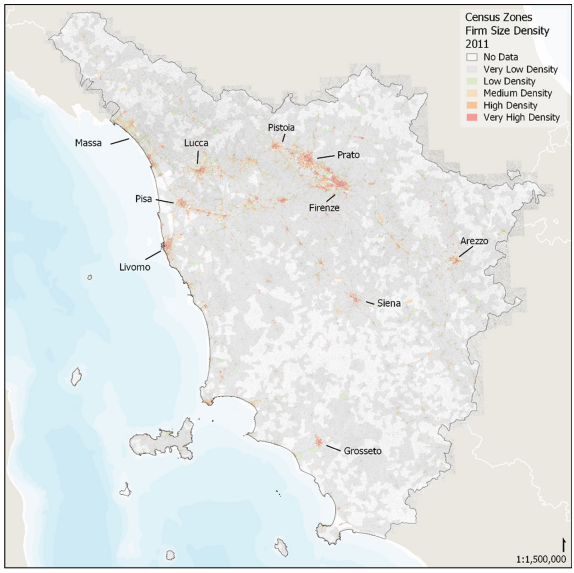


Fig. 2. Spatial distribution of average firm-size in Tuscany (2011).

From a regional standpoint, even though overall territorial patterns are maintained, the distribution of average local units and employees' densities across census zones, for certain ranges, presents significant changes between 2001 and 2011 (Table 2).

Table 2. Census zones' average local units and employees' densities variation - 2001 to 2011

	Local units			Employees		
	2001	2011	Δ%	2001	2011	Δ%
Very high density	4,108	3,566	−13.19	7,678	6,724	−12.42
High density	2,601	2,484	−4.50	3,032	2,755	−9.13
Medium density	8,094	7,488	−7.48	6,104	5,983	−1.98
Low density	3,886	4,188	7.71	2,243	2,739	22.11
Very low density	3,476	3,730	7.30	3,088	3,255	5.40

The data overview demonstrates that, in 2001–2011 interval, there was a decrease in the number of census zones categorized under *medium, high* and *very high* density ranges, accompanied by an increase in *low* and *very low* ranges, a trend noted for both variables. Sizeable variations are observed in the *very high* range, as decrements of 13.19% and 12.42% happen for, respectively, average local units and employees'; and

in the *low* range, that, despite a comparably smaller increase on average local units (7.71%), presents a significative increase on the average employees (22.11%).

A similar behaviour is observed for average firm-size, as significative changes in census zones quantities are also verified for the same ranges (Table 3).

Table 3. Census zones' average firm-size variation - 2001 to 2011

Ranges	Values	Firm-size		
		2001	2011	Δ%
Very high density	>100	8,282	7,000	−15.48
High density	<= 100 > 50	3,599	3,516	−2.30
Medium density	<= 50 > 10	6,297	6,601	4.83
Low density	<= 10 > 5	883	1,039	17.67
Very low density	<= 5 > 0	3,084	3,300	7.00

In the interval of 2001 to 2011, average firm-size maintains variation arrangements similar to those observed in the previous variables, as there are decreases in the number of census zones within the *very high* (15.48%) and *high* (2.30%) ranges, while increments are verified for the *low* (17.67%) and *very low* (7.00%) ranges. However, when the number of census zones categorized as *medium* is considered, it is verified instead a slight increase, an opposite trend when compared to both average local units and average number of employees (Table 2).

Observed under a same context, these results suggest that several territorial shifts occurred in the Tuscan economic structure during the period 2001–2011, which ought to be reflected in changes on the spatial patterns of these variables. Tabular data demonstrates that average firm-sizes tend to decrease, as there are less census zones within *very high* and *high* ranges (Table 3). Still, no alterations can be seen in the overall distribution patterns, as *very high* and *high* ranges are still concentrated in the same places: the main urban settlements (Fig. 2). Given this unchanged distribution at regional scale, and with the increases in *medium, low* and *very low* density ranges in consideration, this suggests that firms are not being displaced to different areas in the regional space – as would be inferred from tabular data – but towards the fringes or hinterlands near the main urban centres or to areas that already possess significative densities, thus increasing the overall firm-size in the urban settlements boundaries.

To explore this assumption, an in-depth analysis of the spatial structure of the areas with higher densities is needed, since are these local shifts in distribution patterns that can reveal additional information about the evolution dynamics in Tuscan economic structures. In this aspect, evaluating changes in the area that concentrate most census zones with ranges between *low*, *medium, high* and *very high*, given that the regional scale distribution patterns are assumed to remain similar, yields a clearer explanation about how these tendencies repeat across other urban settlements within the region.

Located throughout the provinces of *Pisa, Lucca, Pistoia, Prato* and *Firenze*, the highlighted area, henceforth referred as *Valdarno* (Fig. 3), encompasses:

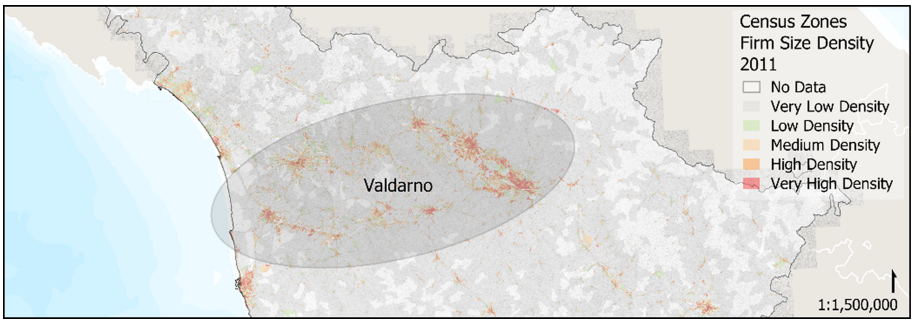


Fig. 3. Position and extents of the *Valdarno* area relative to the Tuscany Region.

- 51.24% (2001) and 50.21% (2011) of the average number of local units;
- 51.12% (2001) and 50.38% (2011) of the average number of employees;
- 51.02% (2001) and 50.36% (2011) of the average firm-size total number of census zones within ranges between *low* and *very high.*

The evolution of the average local units' densities patterns in the period 2001–2011 in the *Valdarno* area (Fig. 4) reveals several assumed particularities of the economic structures territorial shift. In the spatialization it is possible to highlight that several census zones in the boundaries of *Firenze* that in 2001 are categorized in the *very low* range (grey) become, in 2011, areas within the *low* range (green), thus an indicative of a firm presence increase. The same spatial behaviour can be observed in some areas once categorized as *no data*, which in 2011 appear instead in the *very low* range.

Even though those shifts in distribution patterns are more distinguishable around *Firenze*, due to their greater occurrence, they are not particular to it. Similar patterns can be also verified around smaller urban areas such as *Empoli*, or throughout the conurbations within *Pisa*, *Lucca* and *Prato* areas. This redistribution is also not exclusive to the lesser density ranges, as territorial distribution shifts may be observed, as well, for the *high* and *very high* categories, especially around *Prato* and *Pistoia.*

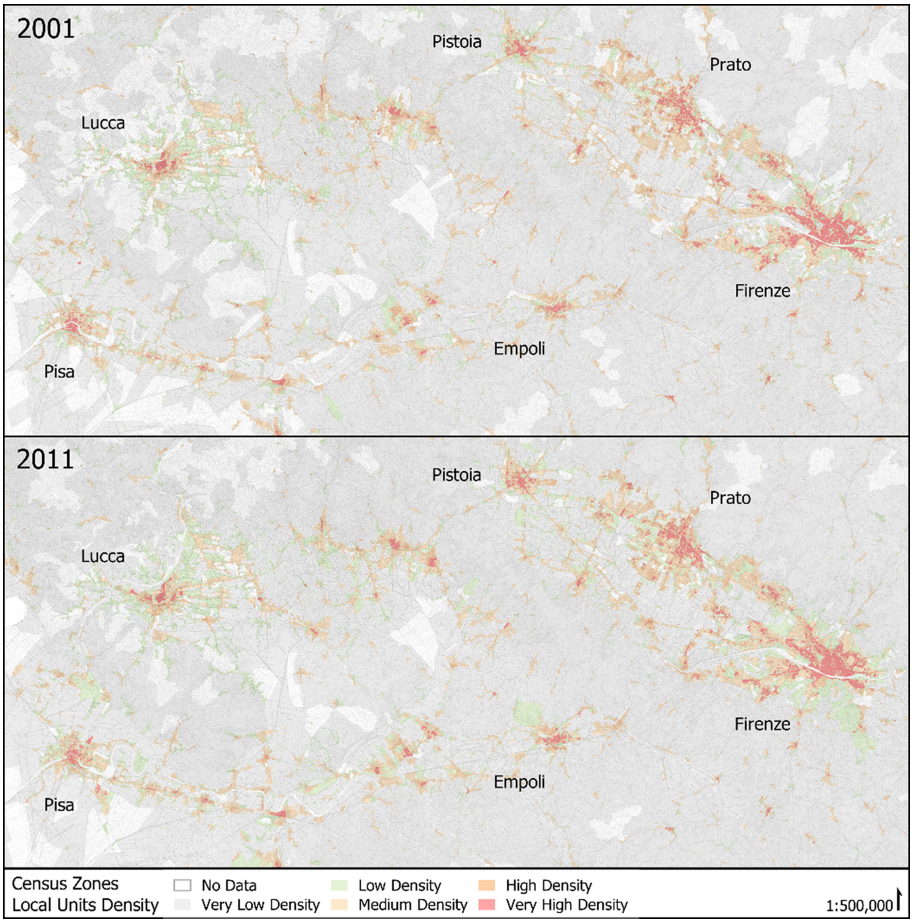


Fig. 4. Average local units' densities – census zones territorial distribution shifts in the period between 2001 and 2010 within the *Valdarno* area. (Color figure online)

Although the average number of employees' densities possess a broader territorial distribution within the *Valdarno* area when compared to the average local units, its spatialization identifies several similarities in the economic structures' territorial shift tendencies (Fig. 5). For the interval between 2001 and 2011, it is observed that certain areas – throughout the *Firenze* metropolitan region and around *Empoli* urban area – present a slight decrease in the number of census zones with *high* and *very high* densities (Fig. 5 – 2001), in accordance with the verified in the regional data (Table 2). In the same manner, the number of census zones categorized as *very low*, but, above all, in the *low* density range, demonstrate a relevant increase across the cities' boundaries (Fig. 5 – 2011). Still, *low* density shifts are also verified, as some areas in the borders of *Pisa* metropolitan area transition from *low* to *very low*. Overall, these results, once again, corroborate with the assumption of the firm displacement trend, as movements from consolidated centres towards the urban fringes are observed during the period.

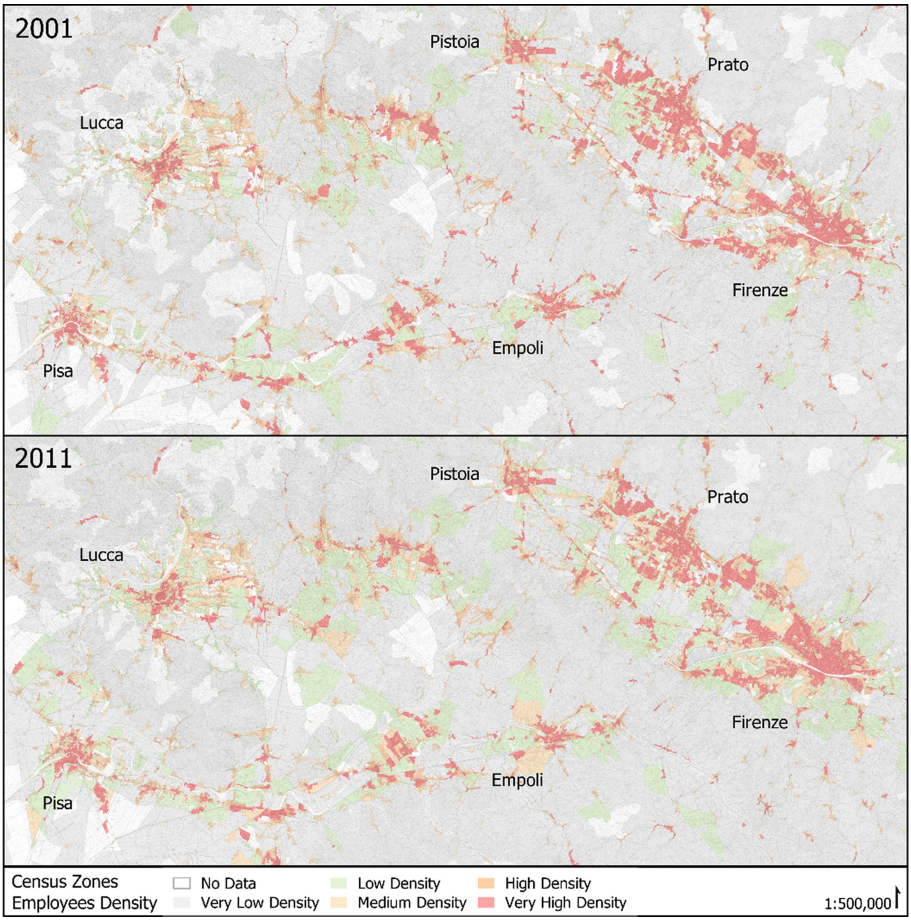


Fig. 5. Average number of employees' densities – census zones territorial distribution shifts in the period between 2001 and 2010 within the *Valdarno* area. (Color figure online)

Another distinguishable pattern highlighted in the average number of employees spatialization, regards the increases in the number of census zones categorized in the *low* density range. Those are not restricted to the urban areas' boundaries, but also can be seen around hinterland areas that already exhibited *low* densities (Fig. 5 – 2011). Associated to these increases, several areas categorized in 2001 as *low*, had their values shifted to *medium* density ranges in 2011, as observed around *Empoli* and *Lucca* urban areas. Nevertheless, these increases in employees are not always accompanied by an equivalent growth in the average number of local unts (Fig. 4 – 2011), as observed in *Empoli* (Fig. 4, Fig. 5 – 2011), which suggest that although the overall operations' size in those census zones is increasing, no additional firms are being placed in the area, therefore, not resulting in the average firm-size density increase.

The spatialization of average firm-sizes densities for the *Valdarno* area (Fig. 6) can precise where the less evident shifts in distribution patterns occur, therefore informing about the firms' disposition and economic structure evolution in the period.

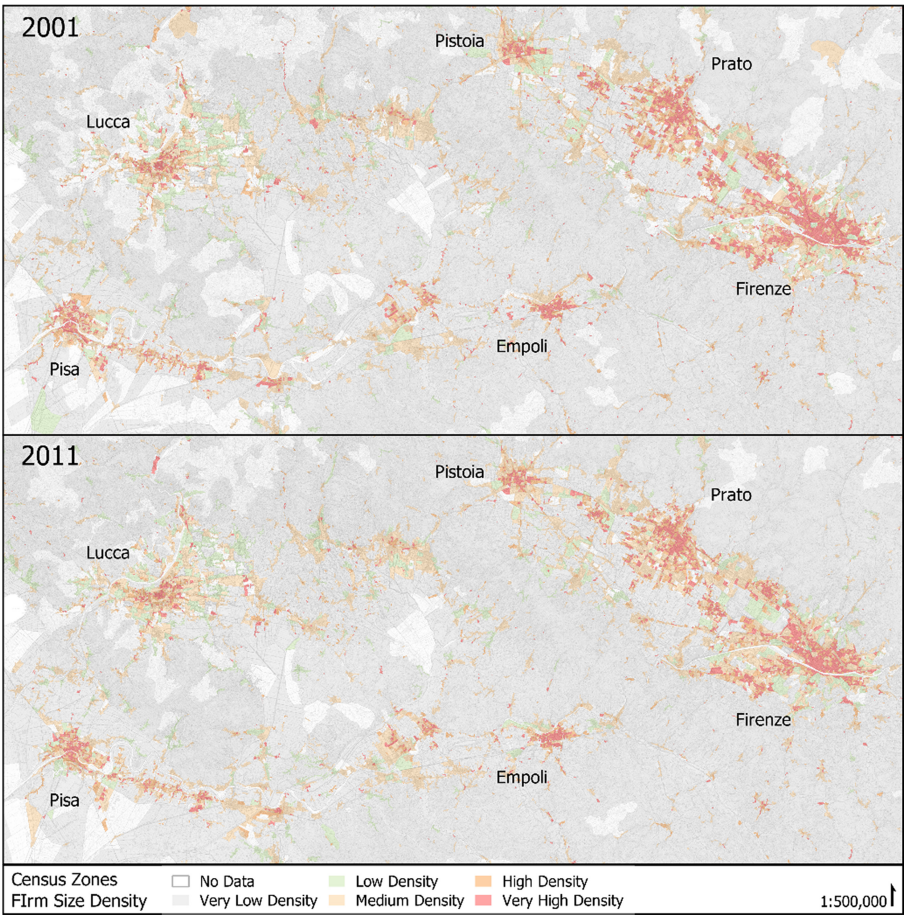


Fig. 6. Average firm-size densities – census zones ranges territorial distribution shifts in the period between 2001 and 2010 within the *Valdarno* area. (Color figure online)

Since average firm-size density (Fig. 6) is a ratio between the average number of employees (Fig. 5) and the average number of local units (Fig. 4) densities, alterations will occur only if proportional shifts take place in both variables, a situation that does not happen in the aforementioned areas around *Empoli* (Fig. 4, Fig. 5 – 2011). Still, the average form-size allows to identify spaces where an overall growth or shrinking of the productive sector happen. This may be observed, once again, in the shifts in density around the urban centres' boundaries. Taking the case of *Firenze*, it is noticeable that these areas verified an increase in the number of census zones categorized as *low* density. Another distinctive trend is the slight decrease in the number of *high* and *very high* density

areas within the urban centre – given the patterns verified for local units and employees – that gave place to areas with *medium* average firm-size densities, in accordance to the verified data (Tables 2 and 3). This dynamic of decrease on concentrations can also be identified throughout smaller urban settlements in-between *Lucca* and *Pistoia*, as well as in some census zones in the hinterlands, that were categorized as *medium* in 2001, but appear in the *low* or *very low* ranges in 2011 (Fig. 6), which corroborates with the overall shift in the regional economic structure, perhaps an aftereffect of the 2008 economic crisis. Slight increases in the number of census zones within the *medium* density range are verified on the fringe areas of the *Firenze* and *Prato* provinces, but, above all, along the highways that connect *Pisa, Empoli* e *Firenze*. Being also an indicative of the firms' relocation dynamic within the area.

Even though evaluating the average firm-sizes changes allows to observe significative changes in the Tuscan economic structure, it does not reveal the shifts in the disposition of areas dedicated to the production, since ISTAT data does not provide in-detail spatial information [5, 6]. Apposing the average firm size densities to the industrial built-structures [9] allows address this issue and distinguish which census zones have a predominance of industrial sector *productive* activities – possessing a significant presence of industrial plants alongside a minimal number of firms; and which areas have a predominance of firms dedicated to industrial administrative activities or services – since no industrial plants are present.

In a regional overview (Table 4), results indicate that 45.93% (2001) and 43.82% of the total number of census zones are *administrative*-oriented areas, therefore, having no industrial plants within their confines. 16.86% (2001) and 16.49% (2011) of the census zones are *productive*-oriented areas, thus, possessing a significative number of firms and industrial structures.

Table 4. Distribution and variation of the number of census zones categorized as administrative-oriented, production-oriented and with no defined orientation - 2001–2011

	2001	2011	Δ%
Administrative-oriented	13,297	12,437	−6.46%
Production-oriented	4,881	4,680	−4.11%
No defined orientation	3,967	3,889	−1.96%
No data	6,808	7,378	8.37%

Nevertheless, in terms of absolute numbers, both administrative and productive-oriented areas have a decrease between 2001 and 2011, decurrent of the increase in the number census zones with *no data* (0 or Null), informing a general decrease in activities and corroborating the supposition that average firm-size decreases are related with the 2008 economic crisis. Regarding the number of areas with no defined orientation – identified as so, since the presence of firms and structures presents no sufficient proportion to precisely define an orientation – albeit also experiencing an absolute decrease, has maintained its proportion (13.70%) in the 2001–2011 interval.

Data spatialization reveals an important distributional pattern distinction regarding *aministrative*-oriented and *productive* oriented areas (Fig. 7). *Administrative*-oriented is predominantly located in urban centres, while *productive*-oriented areas are mainly located in urban fringes, or, along the road-infrastructure throughout the hinterlands (Fig. 7), supporting the relationship between road-network and industrial location.

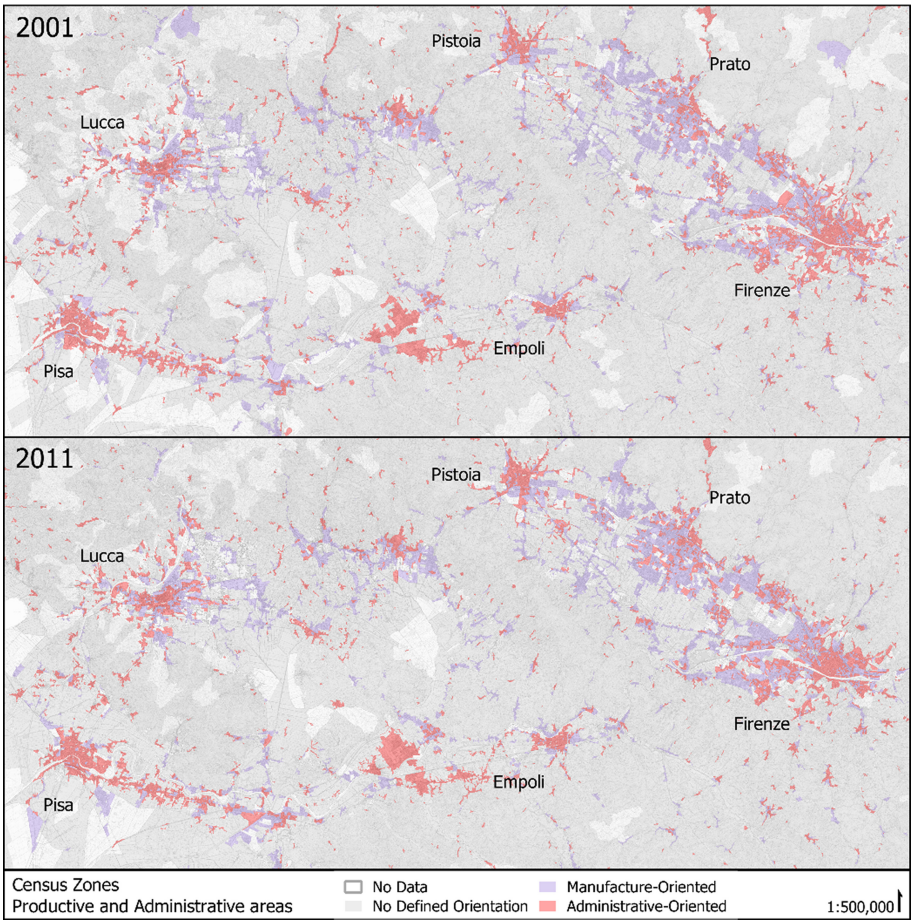


Fig. 7. Comparison between *administrative* and *productive-oriented* areas – census zones territorial distribution shifts in the period between 2001 and 2010 within the *Valdarno* area. (Color figure online)

Comparing the disposition of *administrative* and *productive-oriented* spaces (Fig. 7) and the average firm-size densities spatialization (Fig. 6), it can be observed that most of the census zones that in 2001 were marked as *no definite orientation* due to a very low average firm-size density, in 2011, now categorized under *medium* densities (Fig. 6 – 2001, 2011), turned out to be predominantly *productive-oriented* areas (Fig. 7). Therefore, it can be stated that the increments on firm-size, for the *Valdarno*

area, are mostly related to an increase in Tuscany *productive-oriented* areas, while *administrative-oriented* areas are those subjected to greater decreases in firm-size.

4 Concluding Remarks

Firm-size is an important indicator of the economic activities scale and dynamism, above all, regarding the industrial sector. Even though the proposed analysis is limited one dimension – labour – of the many possible approaches to assess firm-size, it revealed, when spatialized, several territorial disparities patterns within the Tuscany region. Beyond that, accompanied by an evolution assessment that considered two distinct periods, the spatial analysis unveiled subtle changes in the regional economic structure, that would be interpreted in a different and limited manner, or not perceived at all, through a usual tabular analysis.

From a regional standpoint, the spatialization of the variables for: average number of local units' densities; average number of employees densities; and average firm-size densities, revealed that no significative shifts in territorial distribution occurred during the interval period of 2001–2011. Non significative, in the sense that general distributional patterns were maintained, as local units and employees' densities, in both periods, tend to be located and remain higher near the main urban centres. Still, the spatialization unveils several relevant locational patterns, as excluded the urban centres, the highest values for density are placed alongside the main highways that establish the linkage between those areas, thus suggesting a strong relation between the road-infrastructure importance and the industrial location. While this was explored in previous studies, the relation between road-circulation networks and firm-size is still worth of further investigation, as transportation availability is deemed as a factor that have influence in firm-size.

Even though regional scale analysis yielded very few distinguishable firm-size distribution pattern shifts, tabular data still indicated that those variations happened. For all variables, decrements in *very high* and *high* ranges were accompanied by increases in *low* and *very low* ranges, thus suggesting that alterations occurred in the economic structure. Nevertheless, those are only observable at local scale, as only certain areas within urban centres suffer only slight decreases – while the overall higher densities are maintained within the settlements. In this aspect, it can be observed that there is, as a counterpart, increases on the densities of areas located in the fringe of these same urban centres – or, in few cases, in close proximity to hinterland areas that had considerable firm-size densities. This revealed a tendency of increase in firms' and employees' presence on the boundaries of the inhabited centres, which is barely visible at a regional scale, and may be consequence of a territorial shift caused by the 2008 economic crisis. It is also observed, when comparing the *administrative* and *productive-oriented* areas disposition, that most of these fringe density increases can be attributed to industrial expansion, given that *administrative-oriented* areas tend to be located at urban centres. *Administrative-oriented* areas, nonetheless, are the ones that verify greater decrements in activities presence.

While the average firm-size densities – constructed using only labour data – can indicate a spatial dimension regarding the operation sizes, as well as the territorial disparities in this context, being limited to the simple ratio between average number of

employees and average local units limits the analysis. Labour data captures a single dimension regarding firm-size and, while it is one of the most relevant, other variables such as added value, productivity or profits can indicate other territorial disparities when considered. Here, however, the in-detail spatial-economic analysis incur in the economic data breakdown limitations, as while aggregated values may be available for regions, localizing data such as added value and profits within these regions often requires the use of classified information – addresses – that is not available in Census or surveys, but still present on governmental databases. Nevertheless, instruments exist to handle and generalize information at a spatial level – such as the categorization within average values in census zones – that are not yet commonplace in the tabular analysis focused economics and statistics. With this in consideration, further studies ought to focus on overcoming those hindrances for spatial analysis, as well as to propose a shift on how economic data is made available.

References

1. Coase, R.: The nature of the firm. Economica **4**(16), 386–405 (1937). https://doi.org/10.1111/j.1468-0335.1937.tb00002.x.
2. Bernardt, Y., Muller, R.: Determinants of firms size: a survey of literature. EIM - Small Bus.Res. Consultancy, Research Report 9913/A, 77 (2000)
3. Kumar, K., Rajan, R., Zingales, L.: What determines firm size? SSRN Electron. J. 7208 (2001). https://doi.org/10.2139/ssrn.170349
4. Lucas, R.: On the size distribution of business firms. Bell J. Econ. **9**, 508–523 (1978)
5. ISTAT, 8° Censimento ISTAT dell'industria e servizi. Istituto Nazionale di Statistica, Roma (2001). https://www.istat.it/it/archivio/104317
6. ISTAT, 9° Censimento ISTAT dell'industria e servizi. Istituto Nazionale di Statistica, Roma (2011). https://www.istat.it/it/archivio/104317
7. ISTAT, Descrizione dei dati geografici e delle variabili censuarie delle Basi territoriali per i censimenti: anni 1991, 2001, 2011. Istituto Nazionale di Statistica, Roma (2016)
8. QGIS, Hannover, version 3.16 (2020). http://www.qgis.org/en/site/index.html
9. Regione Toscana, Direzione Urbanistica e Politiche Abitative - Sistema Informativo Territoriale e Ambientale – SITA: Censimento ISTAT della popolazione e dell'industria anni 2001–2011 (2019a). http://www502.regione.toscana.it/geoscopio/cartoteca.html
10. Regione Toscana, Direzione Urbanistica e Politiche Abitative - Sistema Informativo Territoriale e Ambientale – SITA.: Edificato 2k, 10k 1988–2013. (2019b). http://www502.regione.toscana.it/geoscopio/cartoteca.html
11. Altafini, D., Braga, A., Cutini, V.: Planning sustainable urban-industrial configurations: relations among industrial complexes and the centralities of a regional continuum. Int. Plann. Stud. (2021). https://doi.org/10.1080/13563475.2021.1875810
12. Altafini, D., Cutini, V.: Homothetic behavior of betweenness centralities: a multiscale alternative approach to relate cities and large regional structures. Sustainability **12**(19), 7925 (2020). https://doi.org/10.3390/su12197925