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The long-term fortunes of territories as a route for agri-food policies: evidence from Geographical Indications

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Abstract. Once the EU has perceived the strategic importance of local peculiarities to support rural development and high-quality productions, it has emphasized the need for more place-sensitive agri-food policies. The importance of socio-economic, historical and cultural factors as transfers of intangible value-added is particularly evident in the agri-food sector. Place-blind and sectorial-oriented approaches have indeed not succeeded in dealing with the territorial heterogeneity of agri-food systems. By delving into the longstanding debate on the conceptualizations of territory and focusing on the territories of origin of the most economically performant Italian Protected Designation of Origins (PDOs), this paper empirically investigates what are the contextual conditions that have mainly contributed in the economic success of local productions. Drawing on an original geo-referenced database, the analysis is conducted on a panel of Italian municipalities and exploits non-linear dynamic panel models. Findings point out the heterogeneity of affecting territorial factors. Imbalances come from both socio-economic conditions (food PDOs) and socio-cultural knowledge (wine PDOs). This paper informs the evidence-based debate on the relevance of territorially-sensitive interventions for the future of EU agri-food and rural development policies. In the case of GIs, it should consider being more place-sensitive as well as more integrated with other agricultural and regional policies to meet the EU's socio-economic objectives.

Keywords: local development, geographical indications, rural development policy, agri-food policy, Italy, panel data.
JEL Codes: O130, P250, Q180, C230, O200

INTRODUCTION

In the conventional framework of economic competitiveness, the importance of territorial factors for socio-economic development and policy effectiveness has been subject to competing claims in academic debates. Two main different approaches can be identified (Crescenzi and Rodriguez-Pose, 2011): a territorially-blind and a territorially-sensitive standpoint. The former approach considers economic activities, at least in principle, reproducible everywhere as devoid of any territorial dimension and the maximization of

factor endowments as a fundamental condition for economic growth. The latter advocates for the active role of territories for economic activities (Pike et al., 2017): contextual specificities help in understanding local production systems, economic growth and development performances and opportunities (Markus et al., 2018; Farole et al., 2011; Scott and Storper, 2003).

The importance of socio-economic, historical and cultural factors as transfers of intangible value-added is particularly evident in the agri-food sector, where productions are deeply rooted in their place-of-origin. To preserve high-quality and traditional products, as well as to support rural development, in 1992 the EU established the Quality scheme for Geographical Indications (GIs) (EEC No 1992/2081). [1] GIs are often framed as levers of economic value-added. However, the economic returns differ radically among GIs. Most of the economic power, in terms of revenues, competitiveness, internationalization and so on, tends to remain spatial and sectorial concentrated. The GIs market is led by products that were well-know also before they got the designation (Qualivita, 2019). As a result, while GIs may stimulate the local economy, they may also cause market inefficiencies and rent-seeking. Among territories, impacts on local development depend on the extent to which local actors succeed in appropriating the rent with respect to actors located outside the region of origin. Within the region of origin, the positive effects of GIs on local development are instead dependent on an inclusive organization that ensures the participation of local actors and equitable distribution of such rent. The main risk is potentially exclusionary effects: the largest agribusiness capture GIs rents without any benefits flowing to smaller (Bramley et al., 2009).

This paper investigates what are the contextual conditions that have mainly contributed in the economic success of local agri-food productions by delving into the longstanding debate on the conceptualizations of territory and focusing on the territories of origin of the most economically performant (in terms of production value) Italian Protected Designation of Origins (PDOs). We start from the hypothesis that the economic benefits of adopting the GIs scheme are biased by contextual conditions. In this way, more developed and productive areas should be likely to persist as leaders in the monopolistic competition.

We develop a novel geo-referenced dataset, use non-linear spatial dynamic panel models, and the analysis is conducted for food and wine PDOs separately.

Findings show that food-PDOs localized in less-developed regions struggle to achieve the highest GIs market shares. Local instability, defined as socio-economic vulnerability in municipalities and their neighbouring areas, has a negative effect on the success of PDO local market. However, the economic returns of PDO wines seem not to be affected by socio-economic development pre-conditions, but presumably by social and historical factors, such as cultural heritage. This discrepancy suggests that to avoid counterfactual effects the territorial dimension of GIs should not be overlooked. Although we cannot exclude that small producers and less known products have benefited from this scheme, evidence suggests that it might not succeed in dealing with growing market competition (EC, 2020). Better policy results could have been achieved, if the GIs European legal framework taped into both territorial and sectorial heterogeneity of agri-food systems.

The results contribute to better understanding why some territories fail while others thrive in converting local food systems in levers of local economy.

Economic literature has highlighted as place-blind approaches are ill-adapted to address the heterogeneity of agri-food production systems and regional inequalities and advocated in favour of more place and community-sensitive interventions (e.g., De Schutter et al., 2020; OECD, 2016). In the case of the Common Agricultural Policy (CAP), changes in the socio-economic context have shed light on the inadequacy of place-neutral sectorial quantity-oriented interventions to deal with the structural weaknesses of agricultural and rural areas. With the Rural Development Policy introduced by the Agenda2000 reform, context-specific interventions became crucial to promote rural endogenous development (Henke et al., 2018; Dax and Fisher, 2018; Corsinovi and Gaeta, 2019). Not surprisingly, the public buzz for territorial brands, like GIs, increases in parallel with the shift in the paradigms of EU policies towards a more place-based and bottom-up approach (Iammarino et al., 2019).[2] While there is scepticism about promoting innovation and productivity-oriented place-based strategies at the local level (Rodriguez-Pose and Wilkie, 2019), recently agricultural economists have recalled the importance of territorial factors as transfers of intangible value-added

[1] Legal documents available at: https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained/regulations-food-and-agricultural-products_en; https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained/regulations-wine_en

[2] Spatially-targeted and bottom-up are not synonymous. The term spatially-targeted refers to the fact that policies are targeted at specific regions/cities/areas. Conversely, the term refers to the fact that the design of interventions is based on the involvement of local actors and the identification of their needs.

in the light of the European efforts towards more inclusive and sustainable agri-food policies (e.g., Farm to Fork strategy) (EC, 2019). there is a growing concern about the effectiveness of investing in a series of coordinated and wide-ranging interventions targeting local productions to meet those goals. Notwithstanding this progress, interventions have mainly remained locked into territorial-blind approaches without synergies.

This paper proceeds with the introduction of the analytical and theoretical framework underpinning this study (section 1 and 2). The empirical analysis is discussed in section 3, while section 4 presents the results and the composition analysis. Lastly, concluding remarks are provided.

1. UNDERSTANDING TERRITORY: REGIONAL AND AGRICULTURAL ECONOMICS PERSPECTIVES

To what extents territory matters for socio-economic activities has long been disputed among economists, who have examined the different factors in search of answers (Friedman, 2005).

The territory concept has been neglected by neoclassical (Solow, 1957) and endogenous growth theories (e.g., Romer, 1986 and 1994) as well as by the New Economic Geography literature (Ottaviano and Puga, 1998; Krugman, 1991). Understanding how territorial features mediate policy effects and what are the main affecting factors is, however, essential to building coherent and efficient policies (Capello, 2009). Since the early 2000s, the socially constructed nature of regions has been highlighted. Territorial factors have been considered as endogenous resources to blame for socio-economic development (Pike et al., 2017). The concept of space has been progressively replaced by the multidimensional (i.e. diversified-relational) notion of territory. Space and territory are, in fact, not interchangeable terms; territory is not a fixed entity; its evolves and changes in time and space. Territory can be assumed as the combination of coexisting exogenous and endogenous context-specific factors (Paasi, 2010; OECD, 2009; Camagni, 2009). Besides conventional spatial elements like administrative units and geographical boundaries, territory compasses of several human and environmental dimensions influencing each other, e.g., altitude, natural habitats, citizenship, networks, capabilities, ethnicity, and culture (Storper, 2013; Paasi, 2011). Nowadays, the predominant declination of territory refers to a territorial identity: the feelings of belonging to a group not only rooted in common socio-cultural and political values but also in the socio-economic advantages that a system of common competencies and local relationships generate (Zimmerbauer, 2011; Savage et al., 2005). In this perspective, development depends on endogenous factors and amenities; local factors are recognized as drivers of the local long-term development and territorial competitiveness. Path-dependence frictions can arise in socio-economic systems leaving behind less-development regions.

A consensus on what are the structural, physical and socio-cultural characteristics of territories that have a significant impact on local development and firms' choices is, however, still lacking (ESPON, 2017; Barca et al., 2012). Over the years, literature has pointed out the key role of education (Harrison and Turok, 2017), institutions (Rodriguez-Pose, 2020), the quality of governments (Ezcurra and Rios, 2019; Rodriguez-Pose and Garcilazo, 2015; Charron et al., 2014) as well as foreign investments (Crescenzi et al., 2016). Spatial contiguity and accessibility (World Bank, 2009; Boschma, 2005), innovation (Crescenzi and Jaax, 2017; Rodriguez-Pose, 1999), and historical traditions (Cortinovis et al., 2017; Scott, 2004) have also been considered key issues in defining territories.

Albeit with lower emphasis, the importance of territorial peculiarities has been stated also by agricultural economists.

From the supply-chains perspective (Carbone, 2017), territory acquires a distributional-positional meaning, and the geography of agri-food productions is set up in response to market challenges and obstacles, such as land availability, expiry dates and market access.

In marketing and food-label studies, territorial features are strategical assets with the evocative power of creating a perception of exclusiveness and uniqueness (Pike, 2011). Territory works as a catalysator of value-added inferred from reputation and diversification strategies (Newton et al. 2015; San Eugenio-Vela and Barniol-Carcasona, 2015; Shapiro, 1993).

A conceptualization of territory linked to social collectively is emphasised by the last group of economists concerned with how territories instil their peculiarities to agri-food productions (e.g, Rivera et al., 2019; Cross et al., 2011). In their perspective, territorial peculiarities become conditioning factors for the agri-food systems (Sforzi and Mancini, 2012). They represent "an inherent quality system located in a place" (Muchnik, 2009, p. 9) that evokes a special link between the unique quality of agri-food productions and the inimitable peculiarities endowed with local history and culture, tacit knowledge, institutional and social connections, like in the French notion of terroir (Cross et al., 2011; Josling, 2006).[3] These

[3] We can define terroir as a territory endowed with a strong identity characterized by a set of physical-environmental (e.g. soil and climate), social and cultural constructed local resources.

territories are anchored into their socio-economic structures. Among regions specialised in agri-food productions, they are a minority.

Territories specialised in agri-food productions can be classified in areas devoted to standardized and local productions. While standardized systems are reproducible everywhere as unrelated to the contextual features, local systems are linked with their place of origin. Among local agri-food systems characterised by alternative localized distribution schemes (e.g., Km0 farmers' markets), drawing a direct link between producers and consumers (Pretty et al., 2005) must be distinguished from local embedded ones (Bowen and Mutersbaugh, 2014). The latter refers to local production systems entirely connected, and affected, by socio-economic, historical, institutional, natural, and cultural environments. GIs belong to this group.

Dealing with the heterogeneous, unmeasurable and sometimes unobservable dimensions of territory is a very demanding task. To date, a wide set of complementary rather than substitute, methodologies has been used. Qualitative approaches, such as surveys, focus groups, ethnography experiences or thematic analysis, are the most exploited (Lourenco-Gomes et al., 2015; Dedeurwaerdere et al., 2015; Tregear et al., 2007). For instance, Haeck et al. (2019) has recently conducted a qualitative analysis to reconstruct the evolution of four of the most famous European wine terroirs, namely Port, Chianti, Champagne and Burgundy from historical documents.

Econometric and quantitative investigations are scanter, also due to methodological-statistical complexity (Kelly, 2020). Recently, OECD (2019) has formalised quasi-experimental (i.e. counterfactual) analyses as efficient methodologies to evaluate how effects of agricultural and rural policies interventions may vary across space, confirming the validity of what a great number of empirical studies have done (e.g., Dinkelman, 2011). These techniques capture territorial elements by estimating the difference between treated and non-treated observations given that only one group of observations is treated (Bondonio and Greenbauman, 2018; Daunfeldt et al., 2017). In utility and agent-based models, it is conceived as an element beyond the actors' making processes (Kremmydas et al., 2018; Altomonte et al., 2016; Brady et al., 2012). Spatial analyses are the most used as they are able to consider where the phenomenon takes place and capture the presence of spatial spillover effects and the potential geographical endogeneity (e.g., Wicht et al., 2019; Crescenzi and Giua, 2016; Henderson et al., 2012).

This paper leverages on the latter approach and uses the Italian PDOs in order to identify which are the territorial features that mainly support the economic performant of local agri-food systems.

2. GEOGRAPHICAL INDICATIONS: A CONFLICTING TERRITORIALLY-BASED APPROACH

Over the last decades in Europe, agri-food products deeply-rooted in their place-of-origin are marked by Geographical Indications. This sign identifies the product as legally tied to a specific production area where micro-climatic conditions, informal traditions, entrepreneurial practices and channels of collaboration were consolidated over time.

GIs comprise of Protected Designation of Origin (PDO) and Protected Geographical Indications (PGI).[4] The differences between PDO and PGI are linked primarily to how much of the product's raw materials must come from the area or how much of the production process has to take place within the specific region. In the case of PDOs, every part of the production, processing and preparation process must take place in the specific region. For wines, grapes have to come exclusively from the geographical area where the wine is made. PGIs requires that at least one of the stages of production, processing or preparation takes place in the region. At least 85% of the grapes used have to come exclusively from the geographical area where the wine is actually made.

GIs offer worldwide recognition and protection through the specific property right scheme, which identifies and endorses local forms of production on a global scale (Reg. EU No.2012/1151; Reg. EU No.2013/1308). At the world level, more than 200 bilateral and multilateral WIPO and WTO agreements exist defining GIs regulations.[5]

However, GI regime goes father becoming the institutional formalization of localized agri-food systems (Liu et al., 2016; Menapace et al., 2012). Indeed, for GIs, tacit knowledge, informal institutions, historical traditions and cultural habits are important as much as environmental factors, or even more (e.g., Van Leeuwen and

[4] The European quality scheme for agri-food products preserves also Traditional speciality guaranteed (TSG). TSG highlights the way the product is made or its composition, without being related to a specific geographical area. The name of a product being registered as a TSG protects it against falsification and misuse.

[5] The WTO TRIPS Agreements (1994), the WIPO Madrid Protocol, the WIPO Lisbon Agreement on Appellations of Origin and their international registration (1958), the WIPO Geneva Act of the Lisbon Agreement on Appellations of Origin and Geographical Indications (2015). In addition, the enforcement of GIs is carried out thanks to bilateral agreements between EU and trading partners, such as South-Korea, Japan and CETA. More information available at https://www.wipo.int/geo_indications/en/.

Seguin, 2006).[6] The quality expressed by the GIs is a fundamental territorial asset (Ditter and Brouard, 2014), expression of the cross-fertilization of specific contextual conditions.

The literature on GIs is quite vast, due to the great EU efforts on supporting this scheme. A bourgeoning group of studies has attempted to evaluate the ex-post impacts of GIs on premium pricing and economic value (Costanigro et al., 2019; Cacchiarelli et al., 2014), market access (Prescot et al., 2020; Altomonte et al., 2016), exports (Agostino and Trivieri, 2014), value distribution (Belletti and Marescotti, 2011) or local development (FAO, 2018). The chain of causality might be, however, ambiguous as GIs and socio-economic developed conditions strengthen each other.

A second group of contributions have investigated what factors encourage producers to obtain institutional acknowledgement. Favourable institutional context, local actors' engagement and co-operation have been highlighted among others (Meloni and Swinnen, 2018; Charters and Spielmann, 2014). Despite the common regulatory framework, GIs located in regions with similar environmental and natural elements, differ in the capacity of creating economic value due to other territorial conditions (e.g., socio-economic and cultural) (Haeck et al., 2019).

GIs are increasingly valued for their endogenous development potential (Gangjee, 2017). It aims to support long-run development by strengthening the endogenous local assets (Marsden, 2003). The establishment of a GI system can stimulate rural development, but previous structural bottlenecks of the region of origins are likely to impact on the whole local economy, and, in turn, GIs can also be negatively affected.

Although there is not enough empirical evidence of this link to date, the uneven spatial distribution of GIs across countries and regions may be a first wake-up call. If we look at the most important (in terms of revenues) PDOs in Italy, they are spatially concentrated in the North-Central Italy (Fig. 1),[7] which are the most developed ones (Fig. A1, A2 and A3).[8] According to the 2019 Qualivita report, Emilia Romagna is the first region in terms of the territorial economic impact

Figure 1. Most important PDOs in Italy (production value) (Source: Author's elaboration on data collected from PDO codes of practice).

of GIs food, around 3 million euros. In the same way, PDO wines predominate in the North, while the South has the large majority of generic wines. The Northern regions account for the largest share of vineyard area for PDO wines and the highest number of farms producing PDO vines (ISTAT, 2010). The hypothesis that less developed regions struggle to convert GIs in levers of development, cannot be thus excluded a-priori. It is not just about identifying traditional products; the success of GIs lies also on the socio-economic and institutional context. Several studies have confirmed the relevance of institutional context (Giovannucci et al., 2009), cooperation along the supply-chain and local actors engagement (Bowen, 2010) as well as the fact that lagging areas are beset by problems of institutional sclerosis (Farole et al., 2014).

Even if the success of these GIs is likely to be determined by the territorial-specific factors of the region of origin, the European regulation on GIs seems to not concerned explicitly the interaction between a single unitary EU framework and the heterogeneity diversified territorial conditions of the regions of origin. Moreover, there is a lack of a sort of policy package within existing EU policies (i.e. CAP and Cohesion Policy) supporting quality schemes and the synergies with other agricultural and regional policy mix used by the EU is weak.

[6] According to the European regulation, the decision of designating an agri-food product as GIs is based on three main points: (1) the specific nature of local resources used in the production process, (2) the application of traditional production techniques and (3) the presence of local identity.

[7] Parmigiano Reggiano PDO, Grana Padano PDO, Prosciutto di Parma PDO, Prosecco PDO, Mozzarella di Bufala Campana PDO, Gorgonzola PDO, Prosciutto di San Daniele PDO, Conegliano Valdobbiadene – Prosecco PDO, Pecorino Romano PDO and Asti PDO (Qualivita, 2018).

[8] A vibrant literature employs population, employment and income data as a measure of economic development.

This scenario may pave the way to path-dependence frictions in the economic returns of local agri-food of less-developed regions and less-renewed products. Understanding which, and to what extent, territorial conditions have been more relevant is challenging, but there is a need to investigate it. Otherwise, practical caveats on how to operationalise these tools to the benefit of agri-food systems cannot be drawn. The next sections provide robust evidence in this direction.

3. METHODOLOGY AND EMPIRICAL APPLICATION

The aim of the analysis is to assess the importance of territorial features by using the most economically performant (in terms of revenues) PDOs in Italy as a case study. We use the official national ranking provided by the 2018 annual report of ISMEA-Qualivita. They account for just over a third of the Italian GIs market production value by themselves (36 per cent).[9] Among them, Parmigiano Reggiano PDO shows the highest value (€1,343 m), followed by Grana Padano PDO (€1,293 m) and Prosciutto di Parma PDO (€850 m). The leader of PDO wines is the Prosecco-system: Prosecco PDO (€631 m - bulk) and Conegliano Valdobbiadene Prosecco PDO (€184 m - bulk).

The analysis is conducted at the municipality level on a panel of 7,755 Italian municipalities observed from 1991 to 2011.[10] Since the 1992 European Regulation, the number of municipalities included in PDO areas increases over time. In 2011, 60 per cent of sample municipalities are included within the production area of one of the PDOs under analysis. In the case of wine, first GIs was assigned in 1962, and therefore already existed in 1991: in 1991, 2.5 per cent of sample municipalities were producing the most performant PDO wines, and they reached 11 per cent in 2011. PDOs came to be recognized during the sample period justifing the use of a panel.

Municipalities are the most appropriate observation to conduct the analysis due to the fact that the GIs regulation (especially for the wine sector) is established at that level. We know that the designated areas are not always defined on administrative boundaries and that for some PDOs the spatial scale can exceed the municipality level. However if we had conducted the analysis at a more aggregate level, for the majority of PDOs the result would have co-mingled PDO and non-PDO municipalities, resulting in a lower level of precision and constant contextual factors (Ashley and Maxwell, 2001). Considering the exact production areas would improve the explanatory power of the analysis, but contextual indicators do not exist. Conversely, if we consider more aggregated administrative units (i.e. provinces or regions), we will include areas where the product is not produced and contextual factors will become constant for all products. As a result, the municipality level is the most appropriate one for this study.

We rely on an original geo-referenced database arranged by digitalizing all the GIs product specifications and collecting data from national censuses and remote sensing sources. Existing literature, indeed, have extensively applied panel data models and spatial econometrics to control for omitted variable bias, measurements errors and endogeneity issues (Hsiao, 2007). The validity of adopting a spatial specification has been properly tested (Elhorst, 2014). The Moran's test has been performed to check for spatial autocorrelation, which has been also ruled out by the spatially lagged variable.

We adopt a binary choice model to estimate the probability that a municipality is included in the production area of PDOs under analysis.[11] We exploit the following spatial dynamic logit-panel models with fixed effects, according to Hausman's test:[12]

$$Y_{i,t} = \alpha + \beta_1 LocalAgriculture_{i,t} + \beta_2 LocalContext_{i.,t} + - \beta_3 LocalEconomy_{i,t} + \beta_4 m(LocalEconomy, s)_{i,t} + \quad (1)$$
$$+ \beta_5 m(z,s)_{i,t} + \beta_6 RegAg_{i,t} + \delta i + \delta t + \varepsilon_{it}$$

[9] PDO-food: Parmigiano Reggiano PDO, Grana Padano PDO, Prosciutto di Parma PDO, Mozzarella di Bufala Campana PDO, Gorgonzola PDO, Prosciutto di San Daniele PDO, Pecorino Romano PDO, Asiago PDO, Mela della Val di Non PDO. PDO-wine: Prosecco PDO, Conegliano-Valdobbiadene Prosecco PDO, Asti PDO, Amarone della Valpolicella PDO, Alto Adige PDO, Chianti Classico PDO, Barolo PDO, Valpolicella Ripasso PDO, Chianti PDO.

[10] We restrict our sample to those municipalities whose administrative borders have been never changed since 1951. Although several high-performing PDO-wines existed already long before 1991, the analysis starts in 1991 due to the fact that the first PDO-foods were registered in 1996 by the EU. The analysis stops in 2011 due to census data availability.

[11] Although territories "do not take decisions" and using agents' micro-data are more adequate for choice models, they can be used also to estimate the probability of a certain class or event existing, regardless of the fact that the outcome depends on agents' choices. In this perspective, we consider the probability that a municipality is included in the production area, which can be at least partially assumed due to the choices of agents working in this context.

[12] The choice of a fixed-effects approach is justified on both conceptual and empirical grounds. From the conceptual point of view, the municipalities included in the dataset cannot be considered as a 'random sample' of the Italian municipalities. Moreover, fixed-effects make it possible to control for all the geographical variables fixed over time (e.g., altitude, remoteness and soil texture) and partially for unobserved time-invariant factors. Since regional characteristics accounted for the unobserved specific components are likely to be correlated with other geographical aspects, fixed effects are preferable (Rodriguez-Pose and Fratesi, 2004). From the empirical standpoint, we the Hausman's test confirms that fixed-effects estimation has to be preferred over random effects.

where $Y_{i,t}$ is a binary variable taking value 1 if the municipality *i* is within the PDO area at the census year *t* (0 otherwise). We estimate the model twice: (i) $Y_{i,t}$ refers to the production areas of the most relevant food PDOs and (ii) $Y_{i,t}$ refers to the production areas of the most relevant PDO wines. The wine sector is very different in international reach, history and organization, and thereby needs to be investigate separately.

Being a PDO area is regressed on independent variables referring to the agricultural sector (*LocalAgriculture)* and the socio-economic context of municipalities (*LocalContext)*. The economic prosperity and the well-being conditions are captured by an economic and social vulnerability index provided by the Italian Statistic Institute (ISTAT) (*LocalEconomy*). This index summarises the socio-economic condition of each municipality related to some principal components, such as education, income, employment and housing. The spatial lagged value of this index is also included, *m(LocalEconomy)*, as well as other spatially lagged territorial characteristics *m(z,s)*.[13] In all specifications, we control for the regional output of the agricultural sector (*RegAg*), municipality (δi) and time (δt) fixed-effects. $\varepsilon_{i,t}$ is the idiosyncratic error. Variables are described in details in Table A1 of the Appendix, while Table A2 shows their descriptive statistics.

Potential concerns can regard the outcome selection, as the choice of PDOs could seem to be almost tautological.

First of all, as sometimes PGIs outweigh the production value of PDOs. However, PDOs are the only ones that allow us to properly capture the product-territory nexus given the rules of GIs assignment. They have the strongest links to the place where they are produced as every part of the production, processing and preparation processes must take place in the same region. Conversely, in the case of PGIs only one of the stages of production, processing or preparation has to take place in the area. In this sense, we have however to highlight the fact that the products specifications of some of these PDOs are "unconventional", as they allow raw materials to come from areas not included in the designed production area. Prosciutto di Parma is one of them.[14] Although the non-coincidence could have some endogeneity implications for the study, we minimise it by considering only the municipalities where the production process takes place (areas from where raw materials can come from have been excluded). In this way, we are more confident that the model estimates the effect on the delimited areas whose traditional production techniques have been recognized and codified. The geographical, historical and cultural origin added-value regard, in fact, the production areas, and not the other regions outside of this space-bounded context.

Secondly, because of the threshold in the number of PDOs. If we had considered all the PDOs, in fact, the majority of Italian municipalities would have become treated, and there would have not been enough spatial heterogeneity for the analysis. Lastly, we consider the status of being a PDO area without differentiation (e.g., an ascending ranking classification) as it allows us to compare the status – being a PDO area – regardless of the structural differences between productions.

Reverse causality may affect the estimates yet. The main concern regards the possibility that some explanatory variables might be affected by the achievement of PDOs certification. In this direction, the use of long term variables, which are territorial factors that cannot be influenced in the short-run by the achievement of PDOs, such as population density or education level, reduce the probability of this reverse causality. The fact that PDOs follow a common European acknowledgement and scheme rules potential endogeneity bias out. Endogeneity is also minimized by controlling for long-term territorial characteristics.

4. RESULTS

Regression analysis provides an in-depth insight into the relevance and the nature of territorial features. Agri-food sector characteristics are entered as the first block of explanatory variables (column 1), followed by demographic and contextual predictors (column 2), employment controls (column 3) and economic vulnerability index (column 4). Conscious that estimations do not represent causal mechanism, in the interpretation, we focus on the comprehensive significance of both signs and coefficients. [15]

Estimations in Table 1 suggest that the Italian food PDOs with highest revenues come from municipali-

[13] Spatial lags have been measured through the nearest neighbour approach.

[14] According to the product specification, the raw materials originate from a larger geographical area than the production area [Province of Parma] that corresponds to the following regions: Emilia-Romagna, Veneto, Lombardy, Piedmont, Molise, Umbria, Tuscany, Marche, Abruzzi, Lazio. This exception has been justified from the producers' perspective to ensure consistent and adequate supplies of raw materials.

[15] As a robustness check, we investigate what will happen if we consider the presence of one of these PDOs as a driver of local development, rather than the result. In practice, we use the dummy accounting for the presence of PDOs no longer as the outcome variable, but as an explanatory one (i.e. 1 for those municipalities included in PDO areas, 0 otherwise). The outcome variable refers to local development in terms of population growth and employment rate. The test is conducted over the same 1991-2011. Results are available upon request.

ties with better socio-economic conditions, a diversified economy and a competitive agri-food sector. This is particularly relevant given that a handful of large-scale actors still access and monopolise these markets and some scepticism persists about the viability and rigidity of this regime (Meloni and Swinnen, 2013; EU, 2010). This is the case of some Italian Central and Northern regions, such as Emilia Romagna region, where the geographical concentration of farming activities and local know-how have promoted the shift towards an outstanding agri-food sector (INEA, 2012).

Economically performant PDOs are positively correlated with the share of commercial farms and the productivity rate of agricultural areas, but negatively with the absolute amount of UAA. GIs economic returns are indeed unrelated not only with the agricultural sector, for which can become even counterproductive in terms of productivity and land exploitation but also with the whole economic system of the place-of-origin.

A positive correlation emerges in the case of lower illiteracy rates, lower vulnerability index and the presence of diversified and interconnected economies. The vulnerability index of neighbourhood municipalities is also negatively correlated suggesting that indirect spatial effects exist. In the case of the most economic performant Italian PDOs, the establishment of a successful GIs would seem to be brought forward from the presence of thriving socio-economic preconditions and higher value-added economies, which have been considered an expression of economic growth for years. The regional output of the agricultural sector has been positive and statistically significant since the first specification. However, it does not reduce or undo, the significance of the territorial variables.

However, results are not univocal and there is not a one-size-fits-all solution to territorial dynamics. Estimations point out a different story when we performed the same set of analysis on the PDO wines with the highest revenues (Table 2): the socio-economic predictors are no longer statistically significant. The only exceptions are agricultural intensity and illiteracy rate, but they are not enough to conclude that there is an overall effect of ex-ante development condition on leading PDO wine market. Other contextual factors hidden behind would seem to be responsible for the success of the high segment of PDO wines market (e.g., relational and social assets).

Vitivinicultural activity has contributed for the success of the European agri-food sector and the maintaining of adequate socio-economic conditions in some lagging regions for decades. In Italy, local winegrowers have continued their activity over the decades preserving an outstanding capillary spatial distribution and different varietals (Corsi et al., 2019). Vine-growing shifts from the popular viticulture that characterized the Roman Empire, to the viticulture managed by churches and monasteries during the Middle Ages to the low-quality wines of local farmers during the XVI and XVII centuries. The unification of Italy in 1861 paved the way to some specific policy interventions with high-quality orientation. After the Second World War, when Italy had to decide if importing French grapes or recovering the Italian historical ones, the latter strategy was followed. As a result, most of the current PDO-wines are rooted in their historical presence and family businesses. This does not mean that they have been well-known wines since the beginning, but that their grapes have a century-old history that cut across time hiding the presence of common habits, informal institutions and cultural proximity. The history of *Brunello di Montalcino* is an evocative example.[16] A productive and high-quality vineyard is a long-time investment strongly hard to replicate either elsewhere or in a short time (Carbone et al., 2019).[17] During that time, vineyards are certainly affected by the geographical and pedological factors of the region, such as minerals, organic matters and micronutrients, but they are also embedded in cultural habits, tacit knowledge and historical traditions of local communities (i.e. terroir). Cultural traditions, community-based expertise and local identity seem to be thus decisive. From a theoretical perspective, these results are consistent with the integrated territorial approach literature that advocates for the relevance of considering the heterogeneity of all exogenous and endogenous features.

In sum, findings suggest that not only economic returns but also affecting territorial factors are highly heterogeneous across PDOs. While in the food sector the higher production value of the most relevant Italian PDOs seems to be explained by an ex-ante socio-economic development and a vibrant agri-food system, in the case of PDO wines it depends on other contextual factors.

These adverse socio-economic influences should be taken into account when projecting the future returns and effectiveness of agri-food policies targeting local

[16] The product specification tells the history of the *Brunello di Montalcino* and reveals that it has achieved its fame thanks to a few local farmers who had been continuing the production over the two World Wars. After the Second World War, when historical grapes were reintroduced to restart to produce typical wines, the *Brunello di Montalcino* was selected and became one of the most renewed Italian wine worldwide. It was one of the first Italian wines to receive the DOC certification, in 1966, and to be recognized as DOCG, in 1980.

[17] Vineyards are permanent crops that occupy the yielding for centuries, do not grow in rotation and their effective production starts years after vines have been planted.

Table 1. Effects of contextual factors on PDO-food.

	(1)	(2)	(3)	(4)
Utilized Agricultural Area (UAA)	-0.003***	-0.003***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Agricultural intensity	5.633***	5.921***	4.321***	5.177***
	(0.380)	(0.504)	(0.878)	(1.317)
Big farms	37.581***	35.543***	19.581***	21.961***
	(1.760)	(1.891)	(2.595)	(3.891)
Family farms	1.712***	1.137*	0.602	-0.588
	(0.454)	(0.654)	(1.366)	(2.509)
Livestock	-4.438***	-3.757***	-2.919***	-4.085***
	(0.225)	(0.284)	(0.602)	(0.901)
Population density		0.003**	-0.001	-0.000
		(0.001)	(0.003)	(0.004)
Illiteracy rate		-2.769***	-1.567***	-1.438***
		(0.128)	(0.190)	(0.243)
Employment rate			0.046	-0.079***
			(0.055)	(0.850)
Employed people in agriculture, forestry and fishing			-0.335***	-0.394***
			(0.037)	(0.0622)
Employed people in tradable sectors			0.357***	0.342***
			(0.030)	(0.045)
Employed people in services sectors			0.153***	0.216***
			(0.039)	(0.057)
Economic vulnerability index				-0.865***
				(0.152)
Economic vulnerability index – Spatial lag				-1.765***
				(0.239)
Territorial characteristics – spatial lags		✓	✓	✓
Regional output agricultural sector	✓	✓	✓	✓
Municipalities and year FE	✓	✓	✓	✓
Observations	9,166	9,166	9,166	9,166
Municipalities	4,583	4,583	4,583	4,583
Hausman FE/RE (p>χ2)				
χ2	713.80	872.74	305.03	193.71
p-value	0.000	0.000	0.000	0.000

Notes: observations are at the municipality-year level; fixed effects estimations; standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Test for multicollinearity has been performed; estimations for the odd-ratio are coherent. We only report the preferred fixed effects results. Source: Author's elaboration.

development, like GIs, otherwise the evaluation may be biased. [18]

[18] According to the Italian Regulation (DM 14/10/2013, art.6), a sort of preventive diagnosis is already needed by Italian National Authority in the socio-economic report (i.e. one of the documents required for the application). However, the socio-economic report requires a very limited number of data: the amount of production (i.e. quantity produced over the last three years) and the number of local actors engaged (i.e. people working along the supply chain). Information on the socio-economic conditions of the area and on the other EU policies in force (e.g., Cohesion and CAP policy) is conversely not requested.

4.1 Composition analysis

After providing evidence of the long-run effect of the socio-economic contextual features in the case of PDO-food, we turn to an analysis of the potential mechanisms they operate through.

Table 2. Effects of contextual factors on PDO-wine.

	(1)	(2)	(3)	(4)
Utilized Agricultural Area (UAA)	-0.001***	-0.000	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Agricultural intensity	10.525***	8.304***	6.788*	11.091*
	(3.10)	(2.295)	(3.652)	(6.272)
Big farms	-305.76***	-54.301*	-54.772	-13.318
	(48.493)	(28.663)	(20.337)	(23.582)
Family farms	-15.470***	-13.515***	-10.044	-9.106
	(2.03)	(3.325)	(6.602)	(6.442)
Vineyards	-9.990***	-4.666	-7.169	-6.994
	(2.322)	(5.039)	(8.845)	(7.953)
Population density		0.006	-0.002	0.001
		(0.006)	(0.011)	(0.011)
Illiteracy rate		-2.765**	2.448*	4.373**
		(1.084)	(1.751)	(1.912)
Employment rate			-0.308	-0.405
			(0.340)	(0.366)
Employed people in agriculture, forestry and fishing			-0.619	-0.804
			(0.477)	(0.614)
Employed people in tradable sectors			0.319*	0.238
			(0.184)	(0.173)
Employed people in services sectors			-0.119	-0.422
			(0.261)	(0.325)
Economic vulnerability index				-1.161
				(0.978)
Economic vulnerability index – Spatial lag				0.678
				(0.802)
Territorial characteristics – spatial lags		✓	✓	✓
Regional output agricultural sector	✓	✓	✓	✓
Municipalities and year FE	✓	✓	✓	✓
Observations	1,586	1,586	1,586	1,586
Municipalities	532	532	532	532
Hausman FE/RE ($p>\chi2$)				
$\chi2$	33.27	28.85	28.26	48.14
p-value	0.000	0.000	0.013	0.000

Notes: observations are at the municipality-year level; fixed effects estimations; standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Test for multicollinearity has been performed; estimations for the odd-ratio are coherent. We only report the preferred fixed effects results. The sample is restricted to municipalities with positive vineyards UAA.
Source: Author's elaboration.

The European Commission has included among its top priorities the revitalization of rural areas (EC, 2016) and GIs are often presented as a potential strategic tool, but how do the negative effects of socio-economic vulnerability differ by level of rurality?

Table 3 considers the level of rurality of municipalities.[19] We use the National Rural Network classification that groups municipalities in urban poles, rural areas with specialised intensive agriculture, intermediate rural areas, rural areas with comprehensive developed problems.[20] In comparison with conventional rural classifications based on population density, this one allows us to capture the complementary effect generated not only by being classified as a rural municipality but also by being

[19] Even if the baseline estimations have highlighted the no relevance of socio-economic conditions for PDO wines, we conduct the analysis also for PDO wines, but, as we can expect, the test is not significant. Both the socio-economic index and the interaction terms are not significant.

[20] More information available at https://www.reterurale.it/areerurali.

Table 3. PDOs, rurality and economic vulnerability.

	PDO food
Economic vulnerability index (EVI)	-3.067*** (0.954)
Economic vulnerability index*Rurality	
EVI* rural areas with specialised intensive agriculture	1.602* (1.001)
EVI* intermediate rural areas	2.422*** (0.971)
EVI* rural areas with comprehensive developed problems	2.234*** (0.957)
Rurality dummy	✓
Agricultural controls	✓
Socio-economic contextual conditions	✓
Economic vulnerability index – Spatial lag	✓
Territorial characteristics – spatial lags	✓
Regional output agricultural sector	✓
Municipalities and year FE	✓
Observations	9,144
Municipalities	4,572

Notes: observations are at the municipality-year level; fixed effects estimations; standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Test for multicollinearity has been performed; estimations for the odd-ratio are coherent.
Model (1) has been augmented with the interaction term between the level of vulnerability index and the level of rurality; all the other explanatory variables are the same.
Evi*non rural as the control level.
Source: Author's elaboration.

Table 4. Effects of contextual factors on PDO-food by product categories.

	PDO-cheese	PDO-cured ham
Utilized Agricultural Area (UAA)	-0.001*** (0.000)	0.000** (0.000)
Agricultural intensity	0.161 (0.199)	2.916** (1.487)
Family farms	0.997*** (0.245)	10.176*** (1.935)
Population density	0.000 (0.000)	0.002 (0.002)
Illiteracy rate	-0.551*** (0.057)	-2.511*** (0.731)
Employment rate	-0.016 (0.046)	0.071 (0.075)
Employed people in agriculture, forestry and fishing	0.031*** (0.007)	0.009 (0.044)
Employed people in tradable sectors	0.015*** (0.007)	-0.087* (0.047)
Employed people in services sectors	-0.029*** (0.008)	-0.191*** (0.071)
Economic vulnerability index	-0.074** (0.035)	-0.671*** (0.309)
Economic vulnerability index – Spatial lag	✓	✓
Territorial characteristics – spatial lags	✓	✓
Regional output agricultural sector	✓	✓
Observations	5,715	550
R^2adj	0.23	0.38

Notes: observations are at the municipality level (Yi); cross-section estimations; standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Test for multicollinearity has been performed.
PDO-cheese: Parmigiano Reggiano PDO, Grana Padano PDO, Mozzarella di Bufala Campana PDO, Gorgonzola PDO, Pecorino Romano PDO, Asiago PDO.
PDO-cured ham: Prosciutto di Parma PDO and Prosciutto San Daniele PDO.
Source: Author's elaboration.

more devoted to intensive agriculture activities or suffering from structural bottlenecks.

The results confirm the overall negative impact, in line with the baseline estimations, which however diminishes in the case of intermediate rural areas. The socio-economic vulnerability in these areas does not particularly hind the economic returns of GIs.

How are the territorial effects distributed across PDOs category? In terms of economic returns, cheese and cured-ham PDOs are the most repressed, in line with the national trend.[21] The model is estimated for each category separately (in order to compute product-specific effects) and focused on those regions where the production area is located. In the case of cured-ham, successful PDOs would seem to be particularly brought forward from the presence of higher productivity rates and the presence of family farms. In the case of cheese, the presence of thriving socio-economic preconditions and higher-value-added economies would be more relevant. In terms of socio-economic vulnerability, municipalities with cured-ham PDOs are the most affected.

These results need to be framed in the exception to the origin requirement for raw materials (e.g., meat and milk), which may come from another geographical area, of some of these PDOs. The external sourcing makes local expertise and specificities more important in shaping the economic success of GIs as related to product production and transformation. Only a few restricted areas have developed as production areas for hams with a designation thanks to the unique, inimitable condi-

[21] In Italy, the dairy sector accounts for the 57 per cent of the GIs' market in terms of production value.

tions and specific human skills.[22] The evidence of the positive effects of family farms goes in this direction; it is valid only for product-specific nature, with no insights for Italian PDOs as a whole.

CONCLUSIONS

Territorial features play a fundamental role in agri-food production systems. They generate a sort of entry barrier deriving from the strong linkage with the place of production, its inimitable resources, and specific competences. In this perspective, the quality system of the designations of origin has assumed a crucial role, as it represents the first step to deal with rural development by distinguishing local products from standardized ones.

Local production systems are very promising in terms of reducing environmental impacts, safeguarding local expertise and avoiding those high-quality local products will be crushed by industrialized and quantity-oriented competitors, like the New World Wines countries (Mariani et al., 2012). Conversely, several studies have provided insights on the responsibility of one-fits-all and place-blind approaches for the growing decline in the returns of a public intervention targeting local needs (Rodriguez-Pose, 2020). They could risk triggering communities towards homogenous economic systems and standardized productions.

On their part, agri-food policies have slowly proven to adapt to this paradigm (EC, 2016). There is a great deal of interest harnessing rural and regional territorially-sensitive development tools in the service of building local agri-food systems.

This paper has contributed to this debate by empirically demonstrating that territorial factors are fundamental to understand local dynamics, and the socio-economic benefits of local production systems, like GIs. We identify that a product-territory nexus exists, but that the affecting territorial factors differ across regions and sectors. Imbalances come from both socio-economic conditions (food PDOs) and socio-cultural knowledge (wine PDOs).

GIs require a full-ranging adaptation of local economies. Producers must follow product specification, new administration offices (i.e., *Consortia*) must be established to collectively manage the appellation and intersectoral productive and services mechanisms activated. The presence of a fertile socio-economic context could support this process. However, these peculiarities are not evenly distributed across all municipalities.

This territorial imbalance of GIs requires above all addressing the territorial distress felt by the areas that have been left behind by a preventive territorial analysis of the production area, more severe than the socio-economic report required for the application. The territorial diagnosis should be conducted to collect information on the socio-economic conditions of the area, the other EU policies in force and local potential strengths and weakness with the ultimate aim to find territorial features contributing to the success of different types of territories. Even if EU institutions have highlighted the importance of supporting GIs products by a common regulation to achieve rural development, these results show that the GIs scheme, as it is now, is yet far away from ensuring the benefit of such regime to all products, and places-of-origin. A possible adaptation of GIs scheme to the socio-economic condition of production areas may be introducing to guarantee far-reaching general provisions for less-developed areas or niche products. For instance, from the offer side, the lack of a florid socio-economic context should entail an effort by EU and national institutions to create synergies between producers, associations and regional authorities prior to the designation.

Ideally, only by creating a sort of policy package within the existing EU policy mix, the GIs regime could operate as a flexible strategic tool to support the local development and well-being of all the regions-of-origin. Being aware of the key role of territories should be a necessary condition for policymakers and practitioners to understand why agri-food systems located in similar regions sometimes react so differently to the same policies.

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APPENDIX

Table A1. Description and sources of variables.

Variable	Definition	Source
PDO	Dummy variable equal to 1 if the municipality is included in one of the PDO production areas	Author's elaboration
Local Context		
Population density	Logarithmic transformation of population density - Inhabitants per km^2	Population and Housing Census, ISTAT
Illiteracy rate	Share of illiterate residents	Population and Housing Census, ISTAT
Employment rate	Share of residents working-aged 15 years or over	Population and Housing Census, ISTAT
Employed people in agriculture, forestry and fishing	Share of economically active population working in agriculture, forestry and fishing sectors	Population and Housing Census, ISTAT
Employed people in non-tradable sectors	Share of economically active population working in non-tradable sectors	Population and Housing Census, ISTAT
Employed people in tradable sectors	Share of economically active population in tradable sectors	Population and Housing Census, ISTAT
Population density – Spatial lag	Logarithmic transformation of population density in neighbouring municipalities - Inhabitants per km^2. Nearest neighbour approach.	Author's elaboration – Geographical Information System
Employment rate – Spatial lag	Share of residents working-aged 15 years or over. in neighbouring municipalities. Nearest neighbour approach	Author's elaboration – Geographical Information System
Local Agriculture		
UAA	Utilised Agricultural Area	Agricultural Census, ISTAT
Agricultural intensity	Utilized Agricultural Area/Total Agricultural Land	Agricultural Census, ISTAT
Big farms	Share of farms with more than 100 ha	Agricultural Census, ISTAT
Family farms	Share of family employees	Agricultural Census, ISTAT
Livestock farms[1]	Share of farms with livestock	Agricultural Census, ISTAT
Vineyards[2]	Share of wine grape UAA	Agricultural Census, ISTAT
Regional output agricultural sector	Output of the agricultural industry - basic and producer prices	EUROSTAT
Local Economy		
Economic vulnerability index	Socio-economic condition of each municipality related to some principal components: education, income, employment and housing	8mila Census, ISTAT
Economic vulnerability index	Socio-economic condition in neighbouring municipalities. Nearest neighbour approach.	Author's elaboration – Geographical Information System

Notes: (1) The variable livestock is included only in the model related to the presence of food PDOs. (2) The variable vineyard is included only in the model related to the presence of PDO wines.
Source: Author's elaboration.

Table A2. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Local Agriculture					
Utilised Agricultural Area (UAA)	23,265	1729.34	2,860.02	0	64246.74
Agricultural intensity	23,265	0.70	0.23	0	1
Big farms	23,265	0.029	0.07	0	1
Family farms	23,265	0.86	0.15	0	1
Livestock	15,479	0.43	0.28	0	4
Vineyards	23,265	92.87	355.43	0	13512.79
Regional output agricultural sector	23,265	3,274.705	1,868.87	56.9	6,485.86
Local Context					
Population density	23,265	280.35	630.08	0.9	15164.90
Illiteracy rate	23,265	1.81	2.42	0	30.1
Employment rate	23,265	43.02	8.73	11.7	74
Employed people in agriculture, forestry and fishing	23,265	11.18	10.31	0	80
Employed people in tradable sectors	23,265	35.38	10.45	0	88.9
Employed people in services sectors	23,265	17.76	5.46	0	71.6
Population density – Spatial lag	23,265	282.93	529.24	1.35	10547.55
Employment rate – Spatial lag	23,265	43.03	7.98	20.7	66.55
Local Economy					
Economic vulnerability index	23,265	99.03	2.49	92.4	120.9
Economic vulnerability index – Spatial lag	23,265	97.49	0.92	95.1	102.9

Source: Author's elaboration on data collected from PDO codes of practice and ISTAT.

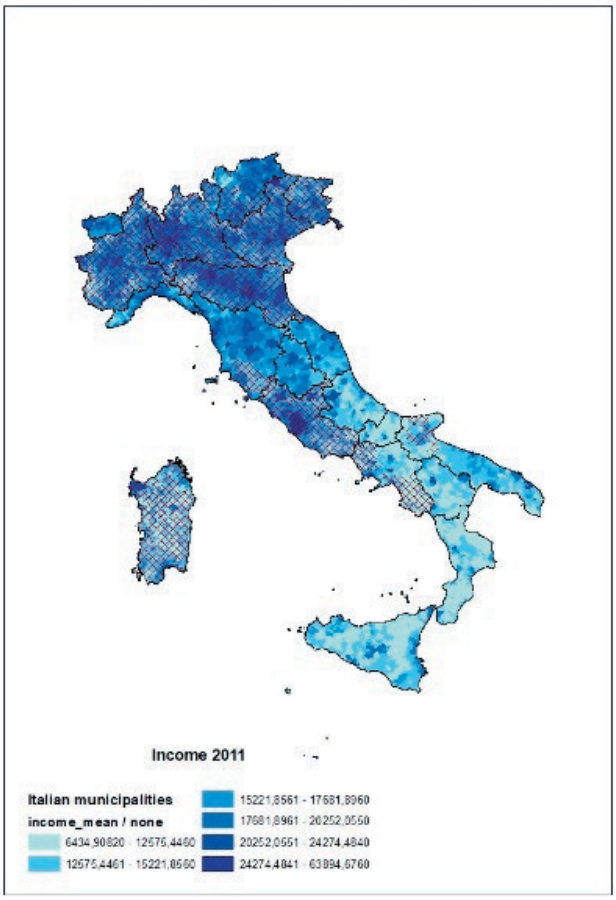

Figure A1. PDOs and income spatial distribution. Source: Author's elaboration on data collected from PDO codes of practice and ISTAT.

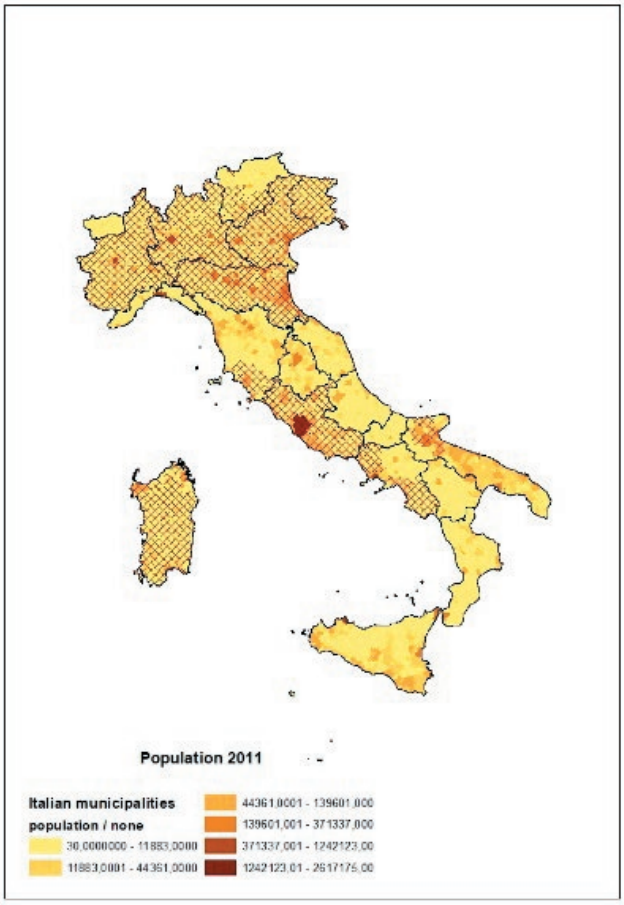

Figure A2. PDOs and population spatial distribution. Source: Author's elaboration on data collected from PDO codes of practice and ISTAT.

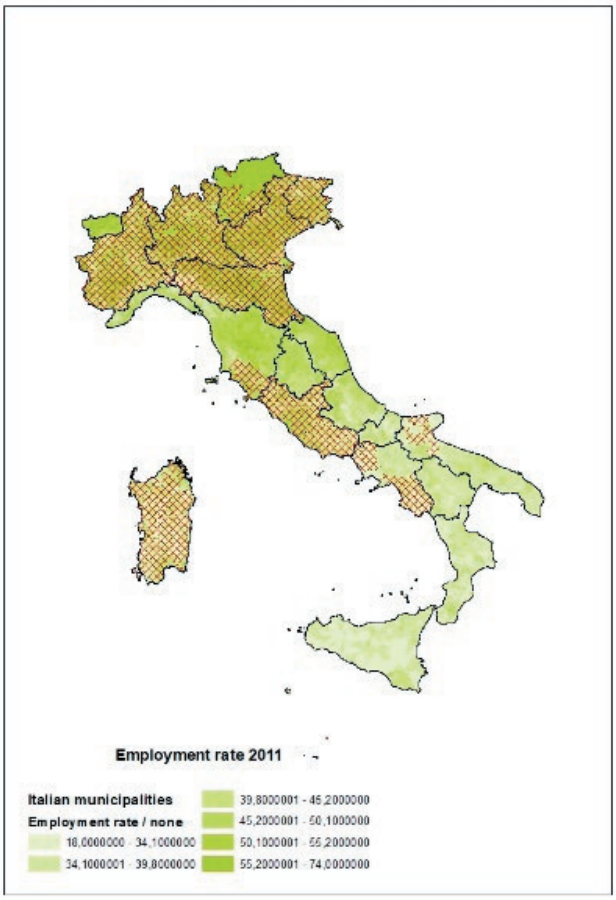

Figure A3. PDOs and employment spatial distribution. Source: Author's elaboration on data collected from PDO codes of practice and ISTAT.