Evaluating Socio-Economic Impacts of PDO on Rural Areas

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Abstract
The European Agricultural Policy tries to achieve sustainable agriculture by paying appropriate subsidies. EU makes agri-food chains more competitive by developing quality policy through the definition and promotion of food quality schemes which consider the area of production as credence good. Those products are classified as Geographical Indication (GI) and include PDO and PGI products. In particular, the generated effects of GIs on territorial level are not clear. The objective of this research is to evaluate the socio-economic impacts of GIs on the territory of origin indicated in the product specification. The research considers all the NUTS 3 regions of Italy, France and Spain during 1993 – 2014 in a framework of dynamic panel model. The results shown that an increase of the number of GI products generate a positive socio-economic impact in a short and long run.

Key words: Geographical indication; Local Development; Productivity; Employment; Dynamic Panel Model.

Background and motivation

The European Agricultural Policy tries to achieve sustainable agriculture by paying appropriate subsidies. EU makes agri-food chains more competitive by developing quality policy through the definition and promotion of food quality schemes.

The main purpose of this policy, started with the EC Regulation 2081/1992, is to assure European consumers to access food with intrinsic qualitative attributes that are perceivable by consumers as credence attributes (Anania and Nistico, 2004; Grunert, 2005 and Nelson, 1970). The latter are identified in the origin of the products, in the production techniques used that reflect the traditions and knowledge of a territory and refer to those foodstuffs that have the Designation of Origin (DO) as PDO and PGI. For these products, thanks to the reputation that accompanies them, consumers have a positive willing to pay (WTP) that, in theory, allows producers to gain a price premium.

Therefore the quality index becomes an instrument for measuring food quality at different levels and also consist more economically convenient contents. However, the purpose of this policy is not only to gain greater competitiveness, but is also an important tool for rural development, since most of the businesses involved are SMEs located in often disadvantaged rural areas.

The operational tools identified in the Regulations undertaken to reach the above objectives were, and remain, i) the protection of the intellectual property of the geographical name that identifies the origin of the product (O' Connor, 2015); ii) the use of a production specification that defines: the area of origin, the production technique and the quality of the

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product (Belletti and Marescotti, 2011); iii) certification of the quality of products and compliance with the rules through an independent third party certification body (Mancini and Consiglieri, 2015). The Producer Association (PA), which brings together the GI-chain producers, has the task of managing the specifications, protecting the name and the collective promotion of the product brand on the European markets. On the other hand, the EU allows the use of a quality sign (logo) that easily identifies PDO and PGI products and which increases the reputation of the Associations and companies that have obtained the European Denomination (Giacomini et al 2011, Arfini, 2017)

Over time, (Arfini et al, 2010), Regulation 2018/1992 has been updated twice, first with Regulation 510/2006 and more recently with Regulation 1151/2012 known as "quality package". Regulatory compliance has sought to improve the overall functioning of the GI system at the European level. In particular, the Commission's action: i) created the European register of GIs, known as DOOR Database; ii) strengthened the role of the PA that have acquired the status of Inter-branch organization and the right to set production quotas (Arfini, 2013).

It is undeniable that the protection and promotion of GIs in Europe is a successful policy. If are considered the number of products registered over time, we observe a continuous "mobilization" of producers requesting the registration of food products characterized by a strong link with the production territory. The latter is represented by environmental and pedo-climatic factors and by a traditional process in producing, storing and transforming raw materials up to the "typical" product appreciated by consumers. From 1996 to date, there were 1,429 GIs, of which 25 from 10 non-European countries. On the other hand, the growing notoriety among European consumers of the PDO and PGI quality signs demonstrates their appreciation of the European policy to support the quality of food products through the use of territorial collective labels (Rosati, 2018).

GIs refer to ancient products but at the same time modern and sophisticated for their extrinsic characteristics (links with the territory, craft character, independent certification) and the ability to meet the quality needs of consumers. GI products are differentiated from "conventional" products for several important aspects including: i) the production chain is embedded in the production territory, ii) the companies in the supply chain collaborate with each other in the definition of production rules but compete with each other in the market, and iii) forms of integration between companies aimed at reducing transaction costs are developed (Mancini et al, 2016).

The GIs productive system by its nature is very fragmented because some Denominations (be they PDO and PGI) have an international character and reputation, with international markets, while other Denominations have a local character and outlet markets are those of proximity. Some denominations are characterized by the presence of large companies while others by SME if not micro enterprises. Some denominations have supply chains that are limited to the agricultural phase while others have very complex supply chains developed mainly in the industrial phase (Vandercandelaire, 2009).

The simultaneous presence of these differences makes the world of the European GIs still very little transparent and known to researchers and the expected effects of the European policy have not yet been fully measured and ascertained.

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The most common question that researchers and policy makers have placed in the initial phase of implementation of this policy is whether the GI tool effectively guarantees the success of companies and supply chains and thus can be considered a useful rural policy tool. The answer that seems increasingly appropriate is that success depends on the governance that develops on several levels: enterprise, production system and market. As a company, firms must necessarily develop appropriate governance to compete in their respective markets; As a system, the combined action between Protection Consortia, Certification Bodies and other Local Authorities allow to generate trust and reputation towards the product; as market, it is necessary to know how to communicate the intrinsic and extrinsic qualitative characteristics of GIs products in order to avoid their trivialization and the use of price-based commercial policies. It follows that the sign of European quality is not sufficient to guarantee commercial success and greater added value for producers (Vandrcandelaire, 2009).

Other aspects investigated so far have concerned i) the affective capacity of protection of the name in EU and international markets; ii) problems arising from compliance in applying the Disciplinary in the Member States; iii) the potentially discriminating effects of the product specification on producers; iv) the level of acceptance by consumers in big retailers, as well as v) the generation of public goods linked to GI products (Belletti and Marescotti, 2011).

Recently, efforts have been made to understand the impact of GI products not only on rural development but also on local development. While rural development emphasizes the agricultural sector, the presence of the human factor in rural areas and the preservation of natural conditions that allow the social and economic environmental sustainability of GIs products, local development emphasizes the ability to generate positive repercussions in sectors other than purely agricultural ones such as manufacturing, construction and technology. It is evident that rural development and local development are linked together when the industry is integrated with agriculture and when there is massive use of technology to meet the demand of national and international markets. Technology often aim at guaranteeing the food safety, lowering production costs and reducing operator tiredness. Technology is very often originated and developed within real highly specialized production clusters where are observed the presence of a network organizations typical of advanced and modern local development systems. The result of the simultaneous presence of rural development and local development strategies is a synergistic effect that brings benefits such as maintaining employment, diversifying production, improving the quality of life and reducing the rate of abandonment in rural areas (Sforzi and Mancini, 2012).

The relationship between GIs and rural development has so far been tackled in a systemic and territorial key that analyzes food production systems such as Localized Agri-Food System (LAFS). The work carried out in Europe and in Central and South America has always highlighted the role and impact of local institutions and their governance action on the different dimensions of GI products: quality, preservation of the environment, the cultural and social dimension, the consumption dimension, the ability of companies to commercialize in local, national and international markets, the ability to transfer knowledge and innovation along the supply chain and finally on the sustainability of the GI (understood as territory and supply chain) as a whole.

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Despite this intense systemic and micro-based research activity, until now no macro-economic analysis has been developed on the relationship due to the effect of the growth of recognized Denominations and socio-economic impact at a territorial level on a European scale. The research activity has been developed using the "case studies" method which, however, presents objective limitations given by the difficulty of representing complex production and territorial realities for reasons of availability of data and economic resources constraints. The result is that usually "successful cases" are analyzed but they are not easily comparable and reproducible in other production contexts.

Some research (Arfini and Capelli, 2011) using sources from Qualivita Foundation have allowed to representing the complex production reality of the Italian GIs, limiting itself to describing system inconsistencies and the different level of participation of agents in the supply chain but without describing the socio-economic impacts at the territorial level.

While there is empirical evidence of the competitiveness of products with a Designation of Origin (Santini et al., 2013), their socio-economic impact at the territorial level is not yet fully evident. In particular, the generated effects on economic sectors related to the DOs are not clear. Even with presence of one or more GI that generated pull effects compared to other economic sectors, during the time, impacts at the territorial level concerning the economic, social and employment aspects of convoluted areas.

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The rest of the paper is structured as follows. The next section provides the Methodology and econometric specification in order to motivate our productivity and labor empirical models. Section 3, describe the data used and how we build the territorial information on GIs. Section 4, present and discuss the results. The final section offers concluding remarks and policy discussions.

Methodology and econometric approach

The aims of this section is to derive a consistent empirical approach to investigate the impact of the diffusion of GIs on socio-economic indicators. We focus our attention on two main socio-economic variables: sectoral labor productivity and sectoral employment. Labor productivity is measured as value added per work considering both agricultural and the manufacturing sector.

To rationalize our empirical analysis, we derive our econometric specification for sectoral labor productivity growth from a standard convergence growth model in a panel data context (see Caselli et al. 1996; Rodrik, 2013).

Differently, to study the employment effects of GIs diffusion, we rely on a dynamic labor partial adjustment model (Bond and Van Reenen, 2007), firstly applied to the agricultural context by Petrick and Zier (2012) in a study of the labor effects of the Common Agricultural Policy (CAP).

Labor productivity growth model

Our starting point is a standard productivity growth equation on panel data (Caselli et al. 1996). Formally, the growth in labor productivity, ΔY_{it}, in the territorial unit *i* in year *t*, can be represented by the following general equation:

(1) $$\Delta Y_{i,t} \equiv \ln Y_{i,t} - \ln Y_{i,t-1} = \beta \ln Y_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t}$$

where the (log) lagged productivity level, $Y_{i,t-1}$, is the standard convergence term, $X_{i,t-1}$ is a row vector of determinants of productivity, and $\varepsilon_{i,t}$ is an error term.

As discussed in Caselli et al. (1996), the interpretation of (1) depends on the coefficient on lagged productivity, β. A negative and statistically significant coefficient is consistent with the prediction of the Solow growth model, namely countries, or regions (Barro and Sala-i-Martin, 2004), relatively far from their (long-run) steady-state productivity level, will experience a faster productivity growth rate. This prediction is also called, conditional convergence, because in our equation (1) the vector $X_{i,t-1}$ include proxy for the steady-state level the country/region is converging to.[1] Differently, if $\beta = 0$ there is no convergence. However, as often happened across different dataset, especially when the analysis is conducted within country at regional level, $\beta < 0$, a prediction strongly supported by regression results.

Critical to our approach are the variables included in the vector $X_{i,t-1}$. Conceptually they should depend on the particular variant of neoclassical growth model the researcher is interested in (Caselli et al. 1996). For example, standard covariates in a neoclassic growth framework are investment in physical and human capital, indicators of the quality of institutions and size of government, trade openness and so on (e.g. Barro, 1991). However, as showed by Caselli et al. (1996) if country or region converge to different steady state, then the included covariates should always account for country/region specific effects, μ_i, capturing differences in technology and other unobservable determinants. This fixed effects specification of the growth model is particular useful in our context. This is because by working at disaggregated territorial level, due to the lack of available data, we cannot control for the standard growth determinants. In addition, we also included time dummies, θ_t, to capture common shocks affecting the growth process.

Including individual effects and time effects, the equation (1) can be rewritten as follow

(2) $$y_{i,t} = \tilde{\beta}\, y_{i,t-1} + \varphi X_{i,t-1} + \mu_i + \theta_t + \varepsilon_{i,t}$$

Where $\tilde{\beta} = 1 + \beta$ and $y_{i,t} = \ln(Y_{i,t})$.

This new equation clearly show that estimating the growth equation (1) is equivalent to run a dynamic panel model with the lagged-dependent variable on the right hand-side. Equation (2) will represent our basic empirical model to test the extent to which the diffusion of GIs contributed to sectoral productivity growth.

[1] Clearly, if the steady-state level of productivity the countries/regions are converging to is the same, then the vector $X_{i,t-1}$ become the regression constant, and we move from a conditional to an absolute convergence equation (see Barro and Sala-i-Martin, 2004).

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More specifically, we include in the vector $X_{i,t-1}$, an indicator variable measuring the evolution over time of the number of GI products in each territorial units *i*. With individual and time effects included, we identify the GIs productivity growth effect by exploiting the within time variation in the number of GIs and productivity. The model is thus similar to a standard difference-in-difference specification, where the estimated coefficient on the GI indicator variable will measure the difference in productivity growth of the treated unit (a region where the GI indicator change by one unit), relative to the counterfactual unit (a region where there are not GIs, or their number do not vary over time).

Labor dynamic adjustment model

To study the effects of GIs diffusion on employment in the agricultural and industrial sector, we rely on a dynamic partial adjustment model, recently adopted by Petrick and Zier (2012). The underline logic of the model it is based on a price-taking firm with convex adjustment costs of labor, induced by the existence of firing and hiring labor costs. By aggregating the firms' behavior at the regional level, the model can be represented by the following simple equation

(3) $$\Delta L_{i,t} \equiv L_{i,t} - L_{i,t-1} = \gamma(L_{i,t}^{*} - L_{i,t-1})$$

where $\Delta L_{i,t}$ is the yearly gross variation of labor stock of the region *i*, $L_{i,t}^{*}$ is the projected long-run equilibrium level of employment in region *i* and time *t*, and $L_{i,t}$ is the current stock of labor (see Petrick and Zier, 2012). Equation (3) tell us that a regionally representative firm only partially adjusts the labor stock over time to the steady-state level, because this could be costly. In addition, $0 \leq \gamma \leq 1$, represents the speed of adjustment, and will be decreasing in these adjustment costs.

Similarly to the discussion above concerning labor productivity growth equation, the steady-state employment level, $L_{i,t}^{*}$ is unobserved. As such, in the previous empirical application of this model it has been proxy by a vector of covariates $X_{i,t}$, including, e.g., output, factor stocks and so on, assumed to be exogenous (see Bond and Van Reenen, 2007). In the vector $X_{i,t}$, we always include the lagged per-capita GDP as control. Concerning the impact of GIs on employment, we adopt a similar logic than Petrick and Zier (2012), by assuming that the presence of GIs affect the long-run equilibrium labor demand in equation (3). This is a reasonable assumption considering especially the level of agricultural employment. Indeed, the existence of GI production, by imposing specific constraints on production technique, normally related to (old) local tradition, should retain in the sector more labor.

By adding regional and time effects, to control for the unobserved steady-state labor demand, we have the following reduce-form equation of the labor dynamic:

(4) $$\ell_{i,t} = \lambda \ell_{i,t-1} + \rho X_{i,t} + \mu_i + \theta_t + \varepsilon_{i,t}$$

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with $\ell_{i,t} = \ln(L_{i,t})$, λ and ρ are the coefficients to be estimated, μ_i and θ_t are region specific and time fixed effects, while $\varepsilon_{i,t}$ is the error term. Note, given (3), from the above empirical model we have an estimates of the speed of adjustment $= 1 - \lambda$.

Econometric issues

The productivity and labor equations (2) and (4), represent dynamic panel models with the lagged-dependent variable on the right hand-side, plus regional and time fixed effects. As a result, the coefficient on the GI variable (subsumed in the vector $X_{i,t}$), only picks up the impact on regional productivity (employment) growth that *departs* from its trend growth.

A problem in estimating both equations (2) and (4) with a full set of fixed effects is that the lagged level of the dependent variable tends to be endogenous in a panel where the unit of cross-sectional observation, *N*, are significantly higher than the yearly observations, *T* (see Arellano and Bond, 1991).[2] To avoid this inconsistency, Arellano and Bond (1991) propose a Generalised Method of Moments (GMM) estimator as an alternative to the least square with dummy variable (LSDV). This implies transforming the model into a two-step procedure based on first difference to eliminate the fixed effects, as a first step. In the second step, the (endogenous) lagged dependent variable is instrumented using the *t* – 2, *t* – 3, and longer lag levels of the dependent variable. In addition, as both productivity and employment display strong autocorrelation, its lagged levels tend to be weak instruments. To overcome this issue, we use the system GMM (SYS-GMM) estimator (Blundell and Bond, 1998; 2000) that exploits also the second moment conditions of the level equation.

Formally, the system GMM implementation for the labor productivity equation, will be as follow:

$$\Delta y_{i,t} = \tilde{\beta}\, \Delta y_{i,t-1} + \varphi \Delta X_{i,t-1} + \psi \Delta GI_{i,t} + \theta_t + \Delta\varepsilon_{i,t}$$

(5)
$$y_{i,t} = \tilde{\beta}\, y_{i,t-1} + \varphi X_{i,t-1} + \psi GI_{i,t} + \theta_t + \pi_{i,t}$$

where $GI_{i,t}$ is an indicator variable measuring the number of GI for the region *i* in year *t*, and represent our variable of interest.

A very similar system GMM model will be estimated considering the employment equation:

$$\Delta \ell_{i,t} = \lambda\, \Delta \ell_{i,t-1} + \rho \Delta X_{i,t-1} + \omega \Delta GI_{i,t} + \theta_t + \Delta\varepsilon_{i,t}$$

(6)
$$\ell_{i,t} = \lambda \ell_{i,t-1} + \rho X_{i,t-1} + \omega GI_{i,t} + \theta_t + \pi_{i,t}$$

where all the terms are already defined above.

Using the system of equations (5) and (6), our aim is to estimate unbiased GI coefficients, ψ and ω, for the productivity and employment equation, respectively. These coefficients measure the extent to which the regional diffusion of GI exerted an effect on agricultural and industrial productivity as well as on employment.

Data and variables

[2] This is the so-called Nickell bias, which results when panel data models with fixed effects and lagged dependent variable are estimated by the standard within (OLS) estimator and the time dimension, T, is finite. Overall, our dataset have 265 NUTS 3 regions observed over the 1993-2014 period, thus *N*>>*T*.

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Our analysis focuses on three European countries, France, Italy and Spain, which socio-economic performance are analyzed at NUTS3 territorial level and over 22 years, from 1993 to 2014. These three countries account more than 60% of total GIs registered among the 15 European Countries. The 22 years of the analysis allow to capture the socio-economic performances before and after the entry into force of EU legislation on GIs, occurred in 1996.

The dataset includes 265 territories at NUTS3 level (110 in Italy, 96 in France, 59 in Spain), and 728 Geographical Indications (293 In Italy, 244 in France, 191 in Spain). To connect the information of each GI with the territory to which it refers, we built an original dataset starting from the European DOOR database (Database of Origin and Registration), which collects official information on all the registered EU geographical indications, from 1996 to 2014. Thus, we analyzed the 'Code of Conduct', available on the DOOR database for each of the 728 GI product, to identify the NUTS3 regions representing the area of supply (for PDO products) and of processing (for PDO and PGI products) of GIs. Moreover, the GI products have been classified into seven product categories, then aggregated to four product groups for the empirical analysis.[3] The most relevant are dairy, meat and fruit & vegetables, representing the 74% of GI products of the three countries.

Table 1 describes our territorial dataset on GI and reports, for five different years of the analyzed period, the share of NUTS3 regions that host one (or more than one) GI products, at the overall level and by distinguishing among product categories and countries. The data show that in the first year of EU legislation on GIs, the 69% of the 265 regions was already involved in these productions, while at the end of the analyzed period only few regions result not included in any GI Code of Conduct. Those not-involved regions are mainly located in Spain, and at a lower extent in France, while all the 110 Italian NUTS3 present (at least) one GI product. The distinction among product categories highlights the meat sector as the category that involves the highest number of territories, reaching in 2014 the 74% of the overall 265 NUTS3 regions, and till the 80% of French NUTS3 regions.[4] GI production in the dairy sector, where we find many famous French and Italian cheeses (e.g. Roquefort, Parmigiano Reggiano), involves the highest share of territories at the beginning of the period (38%), and grows till the 62% of regions in 2014. By contrast, the production of GI fruit & vegetables, that initially concerned only a small share of regions (10%), spread out strongly, reaching the 65% of the 265 regions in the last year of the analysis. Another product category that experience strong increase in the number of territories is the Olive Oil, passed from 4% to 37%, and till 60% in Italy.

To measure the economic performance of regions we used the productivity, value added and employment dimension at the NUTS3 territorial level and for the specific agricultural and industrial sectors. Those data come from the Cambridge Econometrics' Regional Database based on Eurostat.[5] A preliminary look at the agricultural data, reported on Figure 1, allows to see how these economic variables seem to be connected with the presence of GIs. The graphs

[3] The seven group of product are: Dairy, Meat, Fruit & Vegetable, Olive oil, Pasta, Fish, and others (e.g. Balsamic vinegar, honey, spices); when we consider four groups we maintain Dairy, Meat, Fruit & Vegetable groups, and aggregate: Olive oil, Pasta, Fish, and others in a new 'Other' product group.
[4] Note that the share concerns the number of NUTS3 regions involved in the GI production, not their dimension.
[5] Descriptive statistics on the variables used in the empirical analysis are reported in Appendix (see Table A1)

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report the socio-economic regional dimension against the regional number of GI, over the analyzed period and among the single countries. The correlation between GI and territories seems positive for all the countries and variables, but France where higher GIs are not related to higher agricultural productivity. However, the strong persistence of these economic dimensions and the presence of many factors which are likely to influence the socio-economic development of regions reduce the pattern of this bivariate relationship. Our econometric analysis will shed some light on the role played by the GIs in determining economic regional dimensions.

Other control variables, used in the econometric analysis, come from Cambridge Econometrics' Regional Database. Those are GDP and Population and are both measured at NUTS3 level.

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Empirical results

Tables 2 to 4 report the effects of GI production on regional productivity and employment, by estimating the system of Eqs. (5) and (6) with the system GMM estimator. In all tables, columns (1) and (2) report the GI effects on the agricultural sector, while columns (3) and (4) consider effects on the industrial sector.

All standard tests used to check for the consistency of the SYS-GMM estimator (Roodman, 2009) are reported at the bottom of the Tables. The Arellano-Bond tests for autocorrelation indicate the presence of first-order serial correlation but does not detect second-order autocorrelation. Hence, under this circumstance the use of a dynamic GMM specification is correct, while the OLS estimator should be inconsistent. The standard Hansen tests for the suitability of the instruments confirm that our set of instruments is valid. As suggested by Roodman (2009), the number of instruments should not exceed the number of groups; hence, to control for instruments proliferation that could cause a weak Hansen test, we used only 9 lags instead of all available lags for instruments.

The coefficient of the lagged dependent variable ($y_{i,t-1}$) is always significant, positive, and particularly high (around 0.9), confirming the strong persistence of all our dependent variables. The level of economic development measured as (real) GDP per-capita, is always significant and positive, except when agricultural employment is considered. The latter result confirms, in line with the expectation, the negative impact of development on agricultural employment, while the effect on industrial employment result to be always positive.

Moving to the effect of GI, Table 2 reports its overall effect over labor productivity and employment in the agricultural and industrial sectors. Starting from the GI productivity effect (see columns 1 and 3), the estimated coefficients are negative for both the agricultural and industrial sector, though only in the last case it is statistically significant at 5% level.

The GI coefficient is positive and statistically significant on employment for both the agricultural and the industrial sector, although with different magnitude (see columns 2 and 4). Note, the estimated coefficient represents the short-run semi-elasticity of GI on employment.[6] Thus, quantitatively, the estimated (short-run) effects when interpreted as elasticity,[7] suggests that an increase of 10% in the number of GIs, induces an employment growth of 0.08% and 0.02% in the agricultural and manufacturing sector, respectively. However, due to the dynamic nature of our model, and the strong persistency in the level of employment, in the long-run a 10% growth in GIs translates in an employment growth of about 2.6% and 0.3% in the two sectors, respectively.[8]

From an economic point of view it is important to keep in mind that in our sample, the average growth rate of employment is negative, and equal to –2.7% per year in agriculture (–0.8% industry). Thus, our results suggest that in the long-run, regions with GIs have a slight

[6] As the log of zero is undefined, we use the GI variable in level and the estimated coefficients (ψ, ω) can be interpreted as semi-elasticities.

[7] To convert our estimated coefficient in elasticity term, you need to multiply it by the GI number sample mean (see Table A1).

[8] The long-run effect can be obtained by dividing the short run GI estimated coefficient by $(1-\lambda)$, where λ is the coefficient of the lagged dependent variable. Note that, the larger λ the slower is the adjustment of the dependent variable (e.g. employment) to a new equilibrium, and the bigger the effect that can be observed in the long-run.

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lower degrease in agricultural (industry) employment, or put it differently, producing GIs keep more job in the agricultural vis-à-vis regions that are not GIs producers.

Table 3 disentangles the GI effects among the three considered countries: Italy, France and Spain. Results confirm the positive impact of new GIs on agricultural labor for all countries, with estimated effects somewhat higher for Spain and Italy, in comparison to France. By contrast, the GI impact on agricultural productivity that remains close to zero for Italy and France becomes positive and significant at 5% for Spain. With regards to GI effect on industry sector, the positive and significant impact on employment, previously observed at the overall effect, is confirmed only for Italian regions.

Finally, to measure whether the overall effect of a new GI changes when we consider different product groups, we split the number of GI in four product categories: Dairy, Fruit & Vegetable, Meat and Other products. Results are reported on Table 4. Starting with the agricultural sector, the GI effects on productivity is still insignificant among the different products, while the effect on employment is positive and significant for all the product considered. Specifically, new GIs in the 'other' product group (e.g. oils, fish, pasta) and in the Fruit & Vegetable product group, exert the highest impact on agricultural employment, e.g. a one more GI increase employment of about 0.45% and 0.32% in the short-run, respectively. These effects are almost two times stronger than the respective numbers for Meat and Dairy products (equal to 0.18% and 0.17%, respectively). By contrast, only in Meat and Fruit & Vegetable product groups the presence of new GI exerts a positive and significant impact on industrial employment. Thus, only producing GI in these two product categories appears to spread spill-over effect in those 'industrial' activities that are directly or indirectly connected with the GI productions.

Discussion and conclusion

EU makes agri-food chains more competitive by developing quality policy through the definition and promotion of food quality schemes. The main purpose of this policy is to assure European consumers to access food with intrinsic qualitative attributes that are perceivable by consumers as credence attributes (Anania and Nistico, 2004; Grunert, 2005 and Nelson, 1970). The latter are identified in the origin of the products, in the production techniques used that reflect the traditions and knowledge of a territory and refer to those foodstuffs that have Geographical Indication. In this study, by using an original data set, we have tried to find out the socio-economic impact of producing GI products in Italy, France and Spain that together produce 60% of total GIs registered among the 15 European countries. The model applied in these three countries in term of GIs presence shows very interesting and clear results. A 10% growth in registered GIs in the short-run will generated a 0.08% increase in agricultural employment, and 0.02% in industrial employment, *ceteris paribus*. Moreover, in the long-run the same growth in GIs induce an employment effect of 2.6% and 0.3% for agriculture and industry sectors, respectively.

The GIs contribute to strengthening the rural areas and creating job opportunities that are consolidated over time. Although the results are not apparent, developing "multiplier" effect that impact on all the economic sectors and services present in the territory. The size of the impact is dependent from the type of GI sector. Where agricultural productions do not require

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complex transformations or require long maturation (such as the fruit and vegetable sector) the impact in terms of employment is greater in the agricultural sector and lower in the industrial sector. On the other hand, when the GIs based on meat products increase, the employment impact increases more for the manufacturing industry.

On the other hand, the impact on productivity is minor in the short and long term. This result is due to the dominant presence of small farms and Small Medium Enterprise. The structural characteristics of the producing firms and the handcraft production techniques are captured by the model justifying the results. The relevant result in term of policy implication, however, is that the GIs favour employment growth even in firm with low productivity. The sustainability of these companies is due precisely to the production characteristics that justify a greater consumers WTP and a higher market price.

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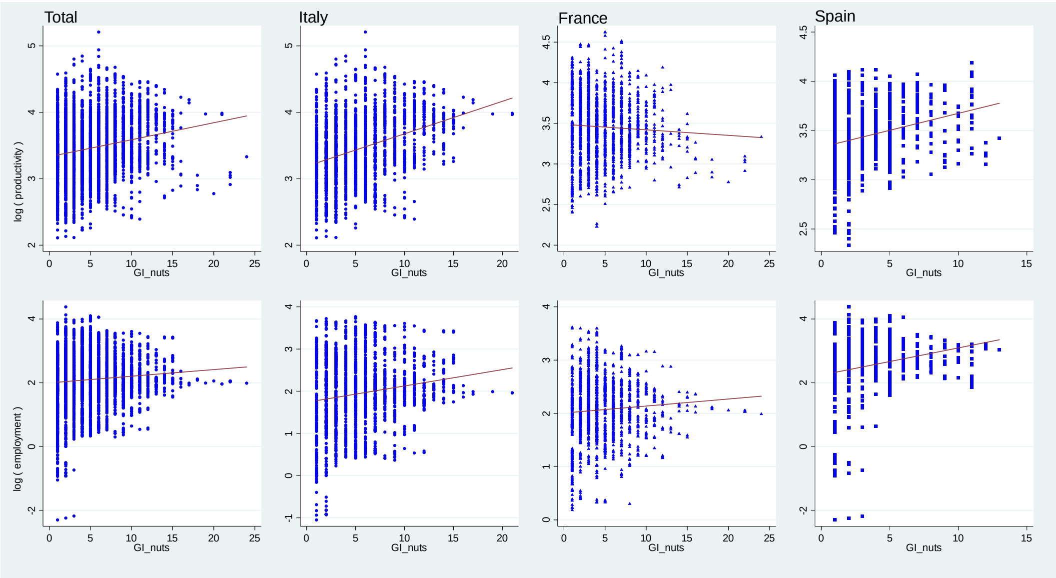
Figure 1: Productivity, Employment and GI at NUTS3 territorial level



Source: Authors' calculations. Employment data come from Cambridge Econometrics' Regional database and refer to the agricultural sector. Productivity is obtained as ratio between (real) VA and employment. The data of GIs at NUTS3 level has been derived by the Authors from DOOR database (see text). Lines are best fit to all data points.

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Table 1: Share of NUTS3 regions with GIs over period 1996-2014

	Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
diary	0.38	0.48	0.56	0.59	0.62	265
meat	0.24	0.51	0.63	0.71	0.74	265
fruit&vegs	0.11	0.29	0.42	0.52	0.65	265
oils	0.04	0.17	0.26	0.35	0.37	265
other	0.03	0.08	0.15	0.25	0.31	265
pasta	0.00	0.01	0.05	0.10	0.14	265
fish	0.00	0.00	0.01	0.06	0.08	265
Tot. GIs	0.69	0.83	0.88	0.91	0.94	265

	Italy : Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
diary	0.46	0.56	0.70	0.73	0.76	110
meat	0.14	0.52	0.69	0.74	0.75	110
fruit&vegs	0.12	0.31	0.52	0.59	0.73	110
oils	0.05	0.33	0.47	0.58	0.60	110
other	0.00	0.02	0.05	0.22	0.29	110
pasta	0.00	0.01	0.03	0.06	0.11	110
fish	0.00	0.00	0.00	0.06	0.08	110
Tot. GIs	0.68	0.89	0.92	0.98	1.00	110

	France : Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
meat	0.39	0.55	0.61	0.76	0.80	96
diary	0.38	0.49	0.53	0.56	0.58	96
fruit&vegs	0.13	0.34	0.43	0.52	0.58	96
other	0.05	0.18	0.26	0.30	0.33	96
oils	0.03	0.05	0.07	0.13	0.15	96
pasta	0.01	0.01	0.08	0.10	0.13	96
fish	0.00	0.01	0.02	0.04	0.05	96
Tot. GIs	0.83	0.86	0.92	0.92	0.93	96

	Spain : Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
diary	0.22	0.31	0.36	0.37	0.39	59
meat	0.20	0.42	0.56	0.58	0.61	59
fruit&vegs	0.08	0.17	0.24	0.41	0.61	59
oils	0.05	0.08	0.15	0.27	0.31	59
other	0.03	0.05	0.14	0.22	0.29	59
pasta	0.00	0.00	0.05	0.15	0.24	59
fish	0.00	0.00	0.00	0.10	0.10	59
Tot. GIs	0.49	0.68	0.73	0.76	0.83	59

Source: Authors' calculations (see text).

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Table 2: Socio-economic effects of GIs: Baseline results

	Agriculture		Industry	
	Productivity	Employment	Productivity	Employment
	(1)	(2)	(3)	(4)
Number of GI	-0.0002	0.0023***	-0.0010***	0.0006**
	(0.0008)	(0.0006)	(0.0004)	(0.0003)
log (GDP/POP)	0.0448***	-0.0220***	0.0287***	0.0235***
	(0.0153)	(0.0077)	(0.0063)	(0.0076)
$Y_{(t-1)}$	0.9206***	0.9769***	0.9736***	0.9829***
	(0.0172)	(0.0046)	(0.0126)	(0.0030)
No. of obs.	5,830	5,830	5,830	5,830
No. groups	265	265	265	265
No. instruments	256	256	256	256
AR1 (p-value)	0.000	0.000	0.000	0.000
AR2 (p-value)	0.091	0.478	0.835	0.626
Hansen (p-value)	0.12	0.144	0.124	0.088

Notes: Time dummies included in each regression. The SYS-GMM estimator is implemented in STATA using the xtabond2 routine. Windmeijer-corrected standard errors in parenthesis: *** < 0.01; ** < 0.05; * < 0.1

Table 3: Socio-economic effects of GIs: Results across countries

	Agriculture		Industry	
	Productivity	Employment	Productivity	Employment
	(1)	(2)	(3)	(4)
No. of GI_Italy	-0.0005	0.0028***	-0.0037***	0.0011***
	(0.0009)	(0.0005)	(0.0005)	(0.0003)
No. of GI_France	-0.0004	0.0016**	0.0015***	-0.0002
	(0.0009)	(0.0007)	(0.0005)	(0.0002)
No. of GI_Spain	0.0045**	0.0032***	0.0016***	0.0004
	(0.0018)	(0.0010)	(0.0005)	(0.0005)
log (GDP/POP)	0.0674***	-0.0215***	0.0631***	0.0195**
	(0.0251)	(0.0074)	(0.0075)	(0.0077)
$Y_{(t-1)}$	0.8891***	0.9763***	0.9021***	0.9848***
	(0.0243)	(0.0045)	(0.0126)	(0.0031)
No. of obs.	5,830	5,830	5,830	5,830
No. groups	265	265	265	265
No. instruments	258	258	258	258
AR1 (p-value)	0.000	0.000	0.000	0.000
AR2 (p-value)	0.096	0.479	0.824	0.626
Hansen (p-value)	0.092	0.137	0.115	0.094

Notes: Time and NUTS3 region dummies included in each regression. The SYS-GMM estimator is implemented in STATA using the xtabond2 routine. Windmeijer-corrected standard errors in parenthesis. *** < 0.01; ** < 0.05; * < 0.1

Table 4: Socio-economic effects of GIs: Results across product categories

	Agriculture		Industry	
	Productivity	Employment	Productivity	Employment
	(1)	(2)	(3)	(4)
No. of GI_Dairy	0.0004	0.0017**	-0.0018***	-0.0008
	(0.0015)	(0.0007)	(0.0007)	(0.0006)
No. of GI_Fruit&Veg	0.0000	0.0032***	0.0006	0.0014**
	(0.0017)	(0.0011)	(0.0008)	(0.0007)
No. of GI_Meat	-0.0014	0.0018*	-0.0010	0.0016***
	(0.0013)	(0.0010)	(0.0008)	(0.0006)
No. of GI_Other	-0.0009	0.0045***	-0.0021*	0.0005
	(0.0026)	(0.0016)	(0.0012)	(0.0009)
log (GDP/POP)	0.0458***	-0.0206***	0.0300***	0.0239***
	(0.0154)	(0.0074)	(0.0063)	(0.0080)
$Y_{(t-1)}$	0.9195***	0.9766***	0.9718***	0.9830***
	(0.0174)	(0.0045)	(0.0125)	(0.0031)
No. of obs.	5,830	5,830	5,830	5,830
No. groups	265	265	265	265
No. instruments	259	259	259	259
AR1 (p-value)	0.000	0.000	0.000	0.000
AR2 (p-value)	0.093	0.480	0.836	0.625
Hansen (p-value)	0.107	0.149	0.123	0.085

Notes: Time and NUTS3 region dummies included in each regression. The SYS-GMM estimator is implemented in STATA using the xtabond2 routine. Windmeijer-corrected standard errors in parenthesis. *** < 0.01;** < 0.05;* <0.1

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Table A1: Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
log (Agr_Productivity)	5,830	3.386	0.499	0.149	6.767
log (Agr_Employment)	5,830	1.958	1.116	-4.135	4.381
log (Ind_Productivity)	5,830	3.987	0.270	3.056	5.102
log (Ind_Employment)	5,830	3.213	1.149	-3.540	6.431
log (GDP/Pop)	5,830	3.049	0.276	1.998	4.423
Number of GI	5,830	3.560	3.683	0	46
Number of GI - Italy	2,420	4.293	3.781	0	21
Number of GI - France	2,112	3.647	3.840	0	46
Number of GI - Spain	1,298	2.051	2.649	0	13
Number of GI - Dairy sector	5,830	0.976	1.453	0	11
Number of GI - Meat sector	5,830	1.251	1.748	0	23
Number of GI - Fruit&Veg sector	5,830	0.623	1.131	0	10
Number of GI - Other sectors	5,830	0.516	0.906	0	7

Source: Authors' calculations (see text).

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