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Article

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Does the Institutional Quality Affect Labor Productivity in Italian Vineyard Farms?

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Abstract. The paper aims at analyzing the effect of institutional quality on labor productivity in the agricultural sector. To meet this aim, a Gaussian log-linear model was applied to 773 vineyard farms, located in 71 Italian provinces. The applied methodology enabled to quantify the overall impact of the institutional quality on labor productivity by discriminating with respect to the Italian regions and macro-areas (i.e. North, South or Central Italy). The findings of the investigation show a positive effect of the institutional quality on labor productivity, with an overall impact of 39%. Moreover, huge differences among Italian regions and macro-areas were detected. The study findings provide recommendations for academics and policy-makers to improve both theoretical and practical aspects.

Keywords: IQI, labor productivity, vineyard farm.

1. INTRODUCTION

In the last decades, institutional factors have attracted great interest as one of the main determinants of economic performance of countries and regions [1, 2, 3, 4]. A large literature has emphasized the role of institutions in influencing both inputs (physical and human capital) and productivity, thus focusing on the existence of an additional effect of institutions on the per capita Gross Domestic Products (through productivity changes). Previous studies have also emphasized the role of institutions into influencing the ability of firms to combine inputs more efficiently [5, 6, 7]. Often, a positive and important *of context* factor is also recognized in the good institutional quality of the geographical area where the firm is located. Such a quality may be defined as a fruitful combination of formal institutions, good rules and

practices, cooperation among firms, researchers and policy makers [8, 9, 7, 10].

In this vein, institutions shape the key incentives of individuals and firms, influencing investments in physical capital, human capital, technology and the ability to organize production, determining not only the potential for aggregate economic growth, but also the distribution of resources [11, 12, 13]. As for the agricultural sector, some authors have theoretically analyzed the effect of institutional context on economic performances of farms [14]. However, few researches have empirically investigated the effect of institutional quality on farm's economic performances [15, 13, 16]. Accordingly, the general goal of this study is to empirically investigate the effect of institutional quality on economic performances of Italian farms. In particular, since better institutions create a legal structure which increases: i) the adoption of technological innovation [17], ii) the likelihood that a firm conducts and transfer R&D activities [18] and iii) the human development [19], the research hypothesis is that the institutional quality positively affects labor productivity in Italian vineyard farms. Precisely, by taking Italian farms specialized in viticulture (wine of excellence) as a case study, the specific goals of the present study are to: i) investigate the effect of the institutional quality on labor productivity, ii) quantify the effect of institutional quality on labor productivity, and finally, iii) assess the effect of institutional quality on labor productivity among Italian regions and macro-areas (North, Center and South).

Italian vineyard farms have been chosen for the following reasons: i) Italy is one of the main wine producing and wine-exporting country in the world [20, 21, 22]. In fact, in 2016, Italy has produced more than 50 million hL of wine, the highest in the world. [23] Currently it counts more than 600.000 hectares of vineyards and around 350 autochthonous grape varieties, 470 protected designation of origin (PDO) wines and 120 protected geographical indication (PGI) wines [24]; ii) viticulture is widely spread in all Italian regions; iii) during the last decade, the labor productivity in Italian viticulture is gaining attention by strengthening the mechanization along the production process [25, 22].

For the purposes of the present paper, we refer to the Farm Accountancy Data Network (FADN), a dataset which records information about statistically representative aspects of farms and farmers, referred to 2012. As for the institutional quality, we have accounted for the Institutional Quality Index (IQI) developed by Nifo and Vecchione [9]), which regards institutional quality in Italian provinces as a composite indicator derived by 24 elementary indexes grouped into five institutional

dimensions (namely corruption, government effectiveness, regulatory quality, rule of law, voice and accountability).

The investigation is conducted on a sample of 773 Italian vineyard farms, located in 71 of the overall 107 Italian provinces. Given the nature of the data, a Gaussian log-linear model is performed.

The paper is organized as follows: paragraph 2 outlines the theoretical framework; paragraph 3 illustrates the statistical model once described the materials of the study. Then, the study findings are exploited in paragraph 4, and discussed in paragraph 5. Conclusions and implications are drawn in paragraph 6.

2. THEORETICAL BACKGROUND

The decisive impact that institutions may have on economic growth, on the environment, on service level-of-quality, and on overall efficiency of an area has been examined by a broad strand of the economics literature that, in recent years, has paid growing attention to the role of political and administrative contexts as well as social, historical and cultural factors in conditioning and steering development processes. Starting from the work of Douglass North [1, p. 3], according to whom "institutions are the rules of the game in a society", institutions contribute to forming the set of incentives underlying behavior and individual choices. As a consequence, several studies have been concerned with measuring the quality of political and administrative institutions (in terms, for example, of well-defined property rights, respect for regulations, degree of corruption, and barriers to entry on markets) both for cross-country [26, 27, 28, 29, 30, 31, 32, 33] and inter-regional comparisons [34, 35, 36, 37]. Several researches [6, 38, 39, 40] have specifically focused on the importance of institutional quality as the basic determinant of economic growth and total productivity of factors in the long term. The institutional differences as a key factor of growth and stagnation as well as disparities in productivity and accumulation of physical and human capital is also investigated [11]. Some authors have focused on the role of sub-national institutions, particularly the regional ones, in fostering economic growth. Porter [41, 42] has argued that economic development is pursued by favoring not isolated companies but industrial clusters, which include firms, suppliers and also local institutions and research centers. Additional contributions have extended the notion of institutional quality to social capital endowment [43, 44, 45] and institutional thickness [46]. Empirical evidence has pointed out that social cohesion [47] as well as the spread of collaborative

and associative practices [43, 48, 49] are drivers of economic development.

Notwithstanding the institutional quality has been investigated from decades to come, the role of institutional context on value creation in agricultural sector has gained attention only in the last few years [16, 50, 13, 51, 14]. Through disparate analytical perspectives, several theoretical and empirical studies have shown different relations between institutional quality and economic performance in agricultural sector ([6, 14, 51]. Lin et al. [16], by using structural gravity models to measure how institutions affect the trade performance of some coconut producing countries, have shown that government effectiveness increases trade flows of high value coconut products. Conversely, Nadarajah and Flaaten, [13] by investigating the relationship between annual growth in aquaculture production and the quality of institutions, emphasized the insignificant correlation between aquaculture growth and the quality of institutions in analyzed countries. The institutional context has been also analyzed as determinant of voluntary traceability standards in the Italian wine sector (50).

A previous study, from Marotta and Nazzaro [14], theoretically analyzed the role of institutional context in new business models for value creation in agriculture sector. More deeply, according to the “value portfolio” (VP) model, macroeconomic factors such as territorial assets, the quality of institutions and policies play a strategic role on value creation in agricultural sector.

In other words, the VP of a farm is composed by organizational schemes in which internal resources of a farm (i.e. entrepreneurship and human resources; physical and financial resources; technological resources and networking) are combined with the external ones, such as social capital, fixed social capital and institutional context [52, 53, 14]. Based on what has been discussed so far, it is crucial to investigate also empirically the effect of institutional quality on labor productivity in agricultural sector.

3. MATERIALS AND METHOD

3.1 Data

In order to achieve the specific aims of the study a cross-section dataset from the FADN have been used. The dataset records information about statistically representative farms and farmers aspects. The FADN is composed by an annual survey carried out by the member states of the European Union. It is the unique source of microeconomic data based on the same principles in all European countries that aims to provide representative

data along three dimensions: the economic size, type of farming and the region. More deeply, the aim of the network is to collect accounting data from farms in order to know incomes and to conduct business analyses of agricultural holdings with the aim of evaluating, ex-ante and ex-post, the impacts of the Common Agricultural Policy (CAP). Our analysis includes data on overall 773 Italian farms specialized in viticulture producing grapevines for quality wine (with certification of origin PDO/PGI or variety indication as regulated by EU Reg. 1308/2013 and Reg. 607/2011) and located in 71 Italian provinces of all Italian regions (Appendix A). A summary statistics of the variables included in the model is given in section 3.2.

In order to know information about the quality of institutions in Italian provinces, we referred to the institutional quality index. Major attention should be devoted to the IQI description. This is achieved in the following subsection.

3.1.1 The IQI index

The aim of this subsection is to describe the IQI that is getting momentum in recent scientific studies [7, 54, 55, 10]. It is a composite indicator that measures the quality of Italian institutions at province level through the analytic hierarchy process [56] for the period 2004-2012. The following five dimensions: “Voice and Accountability”, “Government Effectiveness”, “Regulatory Quality”, “Rule of Law” and “Control and Corruption” are the main components of the IQI. The first one concerns the degree of freedom of press and association, the second one is related to the quality of public services as well as the definition and the implementation of policies by the local government. The third refers to the ability of government to promote and formulate effective regulatory interventions, while the fourth accounts for the perception of the law application in terms of contract fulfilment, property rights, police forces, activities of the magistracy as well as crime levels. Lastly, the fifth dimension takes into account the degree of corruption of public employees. The IQI index is prompted by the World Governance Indicator (WGI) proposed by Kraay et al. [57] in the context of the *Knowledge for Change Programme* promoted by the World Bank. However, it considers only five of the six dimensions of the WGI. Indeed, the so-called “Political stability and absence of violence and terrorism” dimension is omitted in the IQI since it is related to the frequency of terrorist attacks and to the presence of military in politics, that are not relevant in Italy [9]. Each dimension is composed, in turn, by the aggregation of elementary indexes (see Figure 1) evaluated by data from institutional sources,

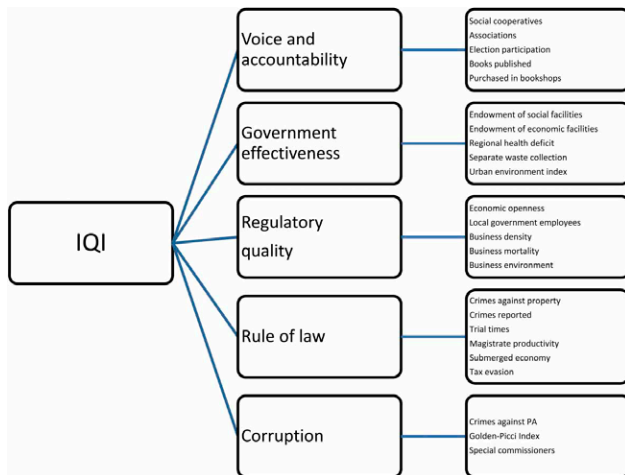


Figure 1. Dimensions and elementary indexes of IQI. Source: Structure of the Institutional Quality Index (IQI) from Lasagni et al, [7].

research institutes and professional registers. Appendix B reports the list of all elementary indexes employed and sources.

As for the methodological approach, three steps have been implemented to obtain the IQI index from elementary indices, such as: normalization, attribution of weights to each index and aggregation. First of all, the elementary indices were normalized, then measured in the interval $[0, 1]$, determining the distance of each of them from the maximum value found at the province level. Thus, through the analytical hierarchy process (AHP) [56], a weight was assigned to each normalized elementary index. Finally, once normalized and weighed, the elementary indices were aggregated to obtain the institution's quality index for 107 provinces – from 2004 to 2012 – which, by construction, takes values in the interval $[0,1]$ [9]. Appendix B reports values of IQI of each Italian province and region included in the study.

3.2 Method description

The effect of institutional quality on labor productivity in Italian vineyard farms is assessed by designing the following Gaussian log-linear model:

$$\ln_LP_i = \alpha + \beta \text{ young}_i + \gamma \text{ farm}_i + \delta \text{ IQI}_i + \varepsilon_i \quad i=1,2,\dots,773. \quad (1)$$

where \ln_LP is the logarithmic of the labor productivity for each i -farm. More specifically, the LP is the dependent variable of the model obtained by the ratio between the gross marketable output (GMO) and the work units employed in each farm (euro/worker).

Some control variables were chosen, including farmers and farms aspects, based on what the scientific literature considers as crucial elements for labor productivity in agricultural sector [58, 59, 60, 61, 62, 63, 64, 65, 66]. *Young* is a dummy variable, meaning the youth of the farmer that assumes value 1 if the farmer is 40 years old and 0 otherwise. In our model we called *farm* the vector of farms' variables. The vector includes five control variables, i.e. *machines capital*, *land-labor ratio*, *circulating agricultural capital*, *irrigation* and *second pillar founding*. The variable *machines capital* is the ratio between the economic value of machines and the used agricultural area (UAA), attached to the level of farm's investments in mechanization. The *land-labor ratio* variable, obtained by dividing the UAA per worker, giving information on the number of hectares per worker is a measure of the labor intensity. The *circulating agricultural capital*, defined as the ratio between the circulating agricultural capital and the (UAA), is an indicator that suggest the availability of euros per hectare. The *irrigation* variable is a dummy variable that assumes value 1 if the farm has irrigated land and 0 if the farm has not irrigated land. As for the *second pillar founding* variable, it is a dummy variable that means whether or not the farm received subsidies from the second pillar founding of the CAP. In other words, the variable assumes value 1 if the farm has received some payments for measures of Axis 2 from the Rural Development Plan and 0 otherwise.

The *IQI* is an explanatory variable of our model that measures, in the interval from 0 to 1, the institutional quality of the province in which the farm is located. Finally, ε is the error term.

A descriptive statistics of the variables included in the model is given in Table 1.

The average *LP* is around 50 thousand euros. As for the age of farmers, only 13% is younger than 40 years. The average value of the *machines capital* is roughly 3 thousand euros per hectare, about 1 thousand euros lower than the average *circulating agricultural capital* per hectare (3985.73 euros/ha). As for the *land-labor ratio*, each worker has, on average, less than 10 hectares (9.22). The 38% is the percentage of the irrigated land, while the 47% is the percentage of farms that have received founding from the second pillar founding. Last, the average value of the *IQI* is 0.69, with the lowest equal to 0.04 and the highest value equal to 1 (meaning the maximum of the *IQI*).

Table 1. Descriptive statistics of the variables included in the statistical model.

Variable name	Variable Description	Mean	Std. Dev.	Min	Max
<i>Dependent variable</i>					
LP	Labor Productivity (euro/worker). The ratio between the GMO and the units of labor	48262.17	43514.6	1148.39	360860.8
<i>Independent variables</i>					
Young	1 = under 40 years old; 0 = otherwise	.13	N.A.	0	1
Machines capital	Ratio between machines capital and UAA (euro/ha)	2949.81	7482.68	0	105383.8
Land-labor ratio	Available UAA per worker (ha/worker)	9.22	9.54	.64	107.25
Circulating Agricultural Capital	Ratio between circulating agricultural capital and used agricultural area (euro/ha)	3985.73	17223.03	0	333915.2
Irrigation	1=yes; 0=no	.38	N.A.	0	1
Second Pillar Founding	1=yes; 0=no	.47	N.A.	0	1
IQI	Institutional Quality Index	.69	.14	.04	1

N.A.: Not Applicable*.

Table 2. Effect of IQI (Institutional Quality Index) on value creation in vineyard farms. Gaussian log-linear model estimates.

Parameters	β	Coef. (e^β)	Std. Err.	t	p-Value
IQI	0.330	1.39	0.17	1.88	0.060 *
Young	0.104	1.11	0.07	1.43	0.155
Machines_capital	0.006	1.01	0.00	1.65	0.099*
Circulating Agricultural Capital	0.013	1.01	0.00	9.29	0.000***
Irrigation	0.202	1.22	0.05	3.95	0.000***
Second pillar founding	0.115	1.12	0.05	2.33	0.020 **
Land-labor ratio	0.035	1.03	0.00	13.44	0.000***
Cons	9.719	16.63	0.13	72.80	0.000***

Note: N=773; * p-value < 0.1; ** p-value < 0.05; ***p-value < 0.01. $R^2 = 0.26$.

4. RESULTS

4.1 The Gaussian log-linear model estimates

Results from the designed statistical model are summarized in Table 2. At a first glance, the coefficient of IQI has a significant and positive effect on LP, meaning that the institutional quality positively affects the labor productivity thus corroborating our research hypothesis. As for the impact of the institutional quality on the dependent variable, we followed Benoit [67] for interpreting coefficients with logarithmic transformation. In the log-linear model, the interpretation of estimated coefficient β (see the second column of the Table 2) is that a one-unit increase in X will produce an expected increase in log Y of β units. In terms of Y, this means that the expected value of Y is multiplied by e^β . Briefly, in terms of effects of changes in X on Y (unlogged),

each 1-unit increases in X multiplies the expected value of Y by e^β . Accordingly, the impact of the IQI on LP is quantified in 39% (the third column of the Table 2). This means that going from the lowest level of the IQI (equal to 0) to the maximum one (equal to 1), the labor productivity will increase by 39% in Italian vineyard farms. Except for *young*, all control variables are statistically significant. More deeply, all of them have a positive effect on LP.

4.2 The sensitivity analysis of the IQI index

The sensitivity analysis allows to determine and to quantify the impact of small input perturbations on the model output [68]. Thus, we have carried out several perturbations to the IQI index. More deeply, we have assigned several different values to the institutional

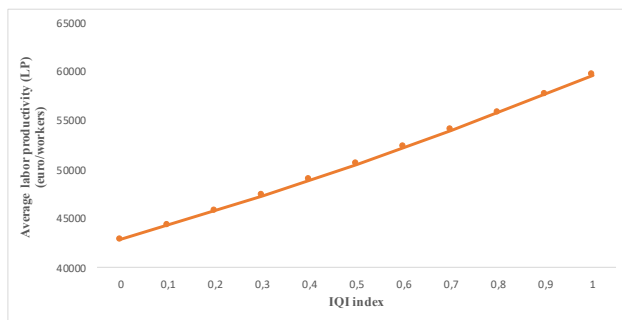
Table 3. Assumptions tested in the sensitivity analysis.

Assumptions	Average labor productivity (euro/worker)
<i>The IQI index is equal to 0</i>	42901.02
<i>The IQI index is equal to 0.1</i>	44340.35
<i>The IQI index is equal to 0.2</i>	45827.97
<i>The IQI index is equal to 0.3</i>	47365.49
<i>The IQI index is equal to 0.4</i>	48954.60
<i>The IQI index is equal to 0.5</i>	50597.03
<i>The IQI index is equal to 0.6</i>	52294.56
<i>The IQI index is equal to 0.7</i>	54049.04
<i>The IQI index is equal to 0.8</i>	55862.39
<i>The IQI index is equal to 0.9</i>	57736.57
<i>The IQI index is equal to 1</i>	59673.63

quality index in the range from 0 to 1 (0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1) where 0 corresponds to the minimum level of the institution quality while 1 is the maximum value. Afterwards, we have quantified the average labor productivity, at each level of IQI (Table 3).

In the Figure 2 we have plotted the LP (y-axis) versus the perturbations of the IQI(x-axis). The graph reveals the linear effect of institutional quality index on the LP. Specifically, the sensitivity analysis indicated that the institutional context has a positive and constant impact on labor productivity in vineyard farms. The slope of the line in Figure 2 is the sensitivity of the LP with respect to the IQI (by taking fixed the other variables). In particular, as shown by the statistical model, if the IQI index is equal to 1 the average LP is 39% higher than that obtained under the IQI index equal to 0.

In Table 4, the difference between the average LP at region level by considering the current IQI and that obtained by giving to all provinces the maximum IQI value (i.e. equal to 1) suggests the economic loss, in terms of labor productivity, due to low institutional quality. The developed analysis shows that the LP in the

**Figure 2.** The sensitivity analysis changing IQI index.**Table 4.** The average labor productivity (LP) in Italian regions at current IQI and at maximum value of IQI (equal to 1) in all Italian provinces.

	Average LP (tEur/w) at current IQI	Average LP (tEur/w) at IQI equal to 1 in Italian provinces	Economic loss (%) due to low institutional quality
Trentino Alto Adige	139633	146329	4.80
Tuscany	44225	47043	6.37
Abruzzo	37970	40589	6.90
Emilia Romagna	110657	119892	8.35
Valle D'Aosta	57200	62182	8.71
Veneto	46239	50291	8.76
Umbria	72550	79120	9.05
Friuli Venezia Giulia	49611	54512	9.88
Piedmont	46027	50775	10.32
Lombardy	45512	50218	10.34
Marche	43628	48158	10.38
Lazio	46242	52960	14.53
Liguria	45628	53438	17.12
Campania	35125	41444	17.99
Puglia	44793	54109	20.80
Sardinia	76916	93006	20.92
Basilicata	45715	55770	21.99
Molise	48154	62701	30.21
Sicily	60323	78563	30.24
Calabria	31245	42894	37.28

Italian regions and macro-areas (Northern, Southern and Central) is not homogeneous.

More specifically, it is possible to state that in Calabria the average economic loss caused by the low quality of institutions is more than 37%. Conversely, in Trentino Alto Adige the average economic loss is roughly 5%. Moreover, the economic loss increases by passing from the North to the Southern regions, as shown in the last column of the Table 4. Accordingly, investments for improving the institutional quality in the Southern regions would enhance the labor productivity in vineyard farms, thus improving the agricultural sector in underdeveloped areas.

5. DISCUSSIONS

The present paper had three specific goals. First, it developed, for the first time, an empirical study to analyze the relation between the institutional quality of the Italian provinces and labor productivity in Italian vineyard farms. Second, once answered to the first aim, the

study quantified the effect size of the institutional quality on the economic value created per worker and finally, it measured the impact of the institutional quality on labor productivity in vineyard farms located in all Italian regions and macro-areas (North, South and Central Italy). To this end, we developed a Gaussian log-linear model, which considers the ratio between the gross marketable output and the number of workers employed in each farm as the dependent variable of the statistical model. Further, the IQI is one of the independent variables together with the farms and farmers' aspects. The model output highlighted a significant and positive effect of the institutional quality on labor productivity in Italian vineyard farms.

Although there are no previous empirical studies about the effect of institutional quality of Italian provinces on labor productivity in agricultural sector, our findings are consistent with previous theoretical and empirical studies developed in non-agricultural sector [5, 14, 51, 69, 9, 7, 70]. Based on the study findings, one can state that vineyard farms operating in a good institutional context consistently increase the labor productivity. Several reasons may explain this result. First, getting the "right" price from the market and reducing the transaction costs is helpful in increasing the gross marketable output. Several authors, from decades to come, have indeed highlighted the role of both formal and informal institutions in improving the level and quality of entrepreneurship [71] as well as in removing the market imperfections and the transaction costs [1, 32]. Furthermore, a favorable institutional context (in terms of bureaucracy efficiency and economic facilities) encourages farms to invest in technology and mechanization [18, 7], thus increasing the economic value created through the intensification of output produced per worker. The availability of economic facilities is also helpful for improving crop productivity and technical efficiency by the increase of financial services [72]. Further, associations and social cooperatives are helpful tools for labor productivity by overcoming market imperfections and constraints [73, 74, 75, 76]. Indeed, according to Fischer and Qaim [77] social cooperatives increase farm income and profit. Moreover, being part of social cooperatives and associations may improve labor productivity by sharing knowledge and information among workers.

As for the measure of the effect of the institutional quality on the average labor productivity in vineyard farms located in the North, South and in the Central Italy, the finding showed the lowest LP in farms located in the Southern regions. This is in agreement with the work of Lasagni and co-authors [7]) who showed that

the total factor productivity in manufacturing firms is lower in industries located in the Southern Italian regions than those located in the Northern and in the Central ones. Differences in LP among Italian vineyard farms may be attributed to differences in transport and infrastructures [78] as well as to institutional factors [79]. More deeply, as for the transport field, according to Carlucci et al. [78] the Southern Italy suffers from an infrastructure and logistic gap compared to Northern Italian regions and, in the same regions, bureaucracy is less efficient in terms of costs and time required [80]. Moreover, widespread differences among Italian macro-areas are also shown in terms of corruption. Indeed, 6 of the 7 Southern regions have the number of reported crimes higher than the national average, meaning a high index of corruption that is a relevant issue in transport infrastructure financing and service provision [81, 82, 78]. To summarize, the main result of this study not only confirms the well known differences in endowments of institutional quality among Italian provinces, but it pointed out, for the first time, that these differences also affect economic performances, specifically the LP in the Italian vineyard farms.

The impacts of control variables assessed in this research, except for the "young" one, are also significant and they are in line with scientific evidences. First, the higher capital endowment, both in terms of machines and financial capital, increases the LP. These results are consistent with previous studies in which the mechanization at farm level is a very critical tool for enhancing economic productivity [58, 66]. Mechanization improves value created per workers in two ways: i) reducing the hard labor (and, consequently, drudgery) and ii) improving gross marketable output through the timelessness of agricultural operations [59, 63]. Conversely, the un-mechanized agriculture reveals much more negative economic performances [60, 64]. On the other hand, the availability of financial capital is helpful in purchase inputs of production, such as fertilizers and pesticides. Indeed, a good amount of economic capital allows a huge consistency of fertilizers and pesticides increasing crop yield and, once again, the gross marketable output per workers [62]. Likewise, the endowment of irrigated hectares may enhance value created reducing the risk of yield loss in vineyard farms located in the Mediterranean area, where a deficit of irrigation reduces the yield of grape [61]. As for the second pillar founding, the model output has shown a positive impact on LP. It is a natural result since several measures of the second pillar of the CAP providing physical investments¹ could enhance the

¹ <http://www.europarl.europa.eu/factsheets/en/sheet/110/second-pillar-of-the-cap-rural-development-policy>

output per workers. A positive role on value creation is also played by the land-labor ratio variable, in agreement with Urgessa [62] and Fuglie [65]. The latter highlighted that the growth of population in rural areas-through the decline of the ratio between land and labor - can reduce the average output per workers [65].

6. CONCLUSIONS AND POLICY IMPLICATIONS

The present study analyses, for the first time, the effect of macroeconomic aspects, e.g. the quality of institution, on labor productivity in Italian farms. To this end, we built a cross-section dataset of overall 773 Italian farms specialized in viticulture and located in 71 Italian provinces, where both micro and macroeconomic aspects are considered. Then, data were analyzed by means of a Gaussian log-linear model in order to grasp the effect of the institutional quality on LP. Despite some limitations, among the others the specificity of the farms (vineyard farms) considered for the research and the type of the dataset used (cross-section), results assign a critical role to the business environment and institutional quality into determining labor productivity differentials in Italian vineyard farms, in accordance with previous conceptualizations and empirical studies. This means that the economic performance of vineyard farms does not depend on internal resources of farms solely, but it is also affected by the quality of institutions in which farms operate. However, the variables (which we have shown to have a significant and positive impact on LP) that were used in the present study to describe the institutional quality, are not managed by farmers neither by the CAP instruments. As a consequence, the findings of the present study have theoretical and political implications. As for the former, a wide discussion can be found in pervious publications where the role of institutional context on economic performances of farms is discussed [83, 84, 69, 51]. As for the political implications, it should be emphasized that critical aspects for the agricultural development, such as infrastructure facilities, bureaucracy efficiency and business environment, are not influenced by the CAP. However, in the last decades, the policy makers have considered the second pillar of the CAP the only available tool to enhance the rural development, without considering the general EU development strategies. These latter, meaning the European Regional Development Found (ERDF) and the European Social Found (ESF), were indeed never integrated within the European Agricultural Fund for Rural Development (EAFRD), since they are almost exclusively implemented in urban areas.

Given the findings of the present study, one can state that the integration among different EU strategies is crucial to develop the agricultural sector, especially in Italian underdeveloped (typically southern) regions. As a consequence, since the institutional quality plays an important role in increasing the economic performances of farms, balancing all the EU strategies should be the main aim of the policy maker for the next programming period (2021-2027). An effective integration among EU strategies is needed to improve the agricultural sector to which citizens require many challenges, such as a better quality of food and environment as well as social sustainability.

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APPENDIX A

Table 1A. Number of vineyard farms located in each considered province.

Province	Number of farms	Province	Number of farms	Province	Number of farms	Province	Number of farms
Agrigento	3	Firenze	22	Palermo	1	Salerno	1
Alessandria	55	Foggia	1	Pavia	4	Sassari	4
Ancona	17	Forli-Cesena	1	Perugia	26	Siena	3
Aosta	51	Genova	3	Pesaro e Urbino	4	Sondrio	6
Arezzo	5	Gorizia	20	Pescara	10	Taranto	7
Ascoli Piceno	20	Grosseto	15	Piacenza	1	Teramo	9
Asti	57	Imperia	4	Pisa	1	Terni	17
Avellino	1	Isernia	9	Pistoia	1	Torino	1
Benevento	15	La Spezia	6	Pordenone	42	Trapani	3
Bergamo	5	Latina	1	Potenza	2	Trento	21
Bologna	3	Lecce	3	Prato	1	Treviso	15
Bolzano/Bozen	18	Lucca	1	Ragusa	2	Trieste	1
Brescia	12	Macerata	1	Ravenna	5	Udine	41
Brindisi	38	Mantova	7	Reggio di Calabria	2	Venezia	9
Cagliari	8	Modena	4	Reggio nell'Emilia	3	Verona	19
Caserta	3	Novara	1	Rieti	1	Vicenza	7
Chieti	36	Nuoro	1	Rimini	1	Viterbo	5
Cuneo	41	Padova	6	Roma	3		

Source: FADN dataset.

APPENDIX B

Table 2A. Structure of elementary IQI indexes

Index	Value	Source (details in notes)	Year
<i>Voice and accountability</i>			
Social cooperatives	Absolute Value ¹	ISTAT	2001
Associations	Absolute Value ¹	ISTAT	2004
Election participation	Turnout % ²	Interior Ministry	2001
Books published	Absolute Value ³	ISTAT	2007
Purchased in bookshops	Index ⁴	Sole24Ore	2004
<i>Government effectiveness</i>			
Endowment of social facilities	Index ⁵	Tagliacarne	2001
Endowment of econ. facilities	Index ⁶	Tagliacarne	2001
Regional health deficit	Absolute Value ⁷	MEF and MH	1997-2004
Separate waste collection	Separate/total ⁸	Tagliacarne	2007
Urban environment index	Index ⁹	Legambiente	2004
<i>Regulatory quality</i>			
Economy openness	Index ¹⁰	Tagliacarne	2001
Local government employees	Absolute Value ¹¹	ISTAT	2003
Business density	Index ¹²	Tagliacarne	2008
Business start-ups/mortality	Registration/cessation ¹³	Tagliacarne	2003-2004
Business environment	Index ¹⁴	Confartigianato	2009

<i>Rule of law</i>			
Crimes against property	Absolute Value ¹⁵	ISTAT	2003
Crimes reported	Absolute Value ¹⁶	ISTAT	2003
Trial times	Trial lengths I, II, III ¹⁷	Crenos	1999
Magistrate productivity	MagistrateTrials ¹⁸	Ministry of Justice	2004-2008
Submerged economy	Index ¹⁹	ISTAT	2003
Tax evasion	Index ²⁰	Revenue Agency	1998-2002
<i>Corruption</i>			
Crimes against PA	Index ²¹	Interior Ministry & ISTAT	2004
Golden-Picci Index	Index ²²	Golden and Picci (2005)	1997
Special Commissioners	Municipalities overruled ²³	Interior Ministry	1991-2005

Notes:¹Social cooperatives per 100,000 residents, provincial level. ISTAT: “Le cooperative sociali in Italia” (2006) and “Le organizzazioni di volontariato in Italia” (2005); ²2001 general election, provincial level. Interior Ministry: “Archivio storico delle elezioni” <http://elezionistorico.interno.it/>; ³Books published, in absolute value, provincial level. ISTAT: “La produzione librai” (2007); ⁴Purchased books over resident population, provincial level. Il Sole24Ore “Dossier sulla qualità della vita” (2004); ⁵Includes education, healthcare and leisure facilities, provincial level. Tagliacarne Institute “Atlante di competitività delle province italiane” (2001); ⁶Includes the following networks: roads, railroads, ports, airports, energy, ICT, banking, provincial level. Tagliacarne Institute “Atlante di competitività delle province italiane” (2001); ⁷Regional health deficit per capita 1997-2004, regional level. Elaboration on Ministry of Economy and Finance and Ministry of Health data from “Relazione generale sulla situazione economica del Paese” (1997-2004); ⁸Share of separate waste collection on total waste collection, provincial level. Tagliacarne Institute “Atlante di competitività delle province italiane” (2001); ⁹Includes 25 indexes relative to: air quality, water quality, purification plants, waste management, public transportation, energy consumption, Public parks, Eco management, provincial level. Legambiente “Ecosistema Urbano 2004” (2004); ¹⁰Import + Export on the gross domestic product, provincial level. Tagliacarne Institute “Atlante di competitività delle province italiane” (2001); ¹¹Public servants over resident population, regional level. ISTAT: “Indicatori statistici sulle amministrazioni centrali e locali” (2003) <http://dati.statistiche-pa.it/>; ¹²Number of firms for 100 residents, provincial level. Tagliacarne Institute “Atlante di competitività delle province italiane” (2008); ¹³Firms registration/mortality, provincial level. Tagliacarne Institute “Atlante di competitività delle province italiane” (2003-2004); ¹⁴Includes 39 indexes relative to: entrepreneurship, job Market, tax system, market competition, banking, bureaucracy; public services to firms, firms’ cooperation, provincial level. Confartigianato: “L’indice Confartigianato – Qualità della vita dell’impresa” (2009); ¹⁵Number of crimes against property over resident population, provincial level. ISTAT: “Indicatori territoriali per le politiche di sviluppo” (2003); ¹⁶Number of crimes reported over resident population, provincial level. ISTAT: “Indicatori territoriali per le politiche di sviluppo” (2003); ¹⁷Average length of judicial process, regional level. CRENOS “Data-base on crime and deterrence in the Italian regions (1970-1999)”; ¹⁸Number of completed civil and criminal trials for magistrate, regional courts level. Ministry of Justice, statistics: “Graduatoria rispetto agli esauriti per magistrato presente” (2004-2008); ¹⁹ISTAT estimation, provincial level. ISTAT: “Le misure dell’economia sommersa secondo le statistiche ufficiali” (2003); ²⁰Based on the difference between the estimated added value by national accounts and tax system (IRAP and individual income tax returns), provincial level. Agenzia delle entrate: “Analisi dell’evasione fondata su dati IRAP, Anni 1998-2002” (2006); ²¹Number of crimes against the public administration over number of public servants, regional level. ISTAT: “Indicatori territoriali per le politiche di sviluppo” (2004); ²²Difference between the amounts of physically existing public infrastructure and the amounts of money cumulatively allocated by government to create these public works, provincial level. Golden and Picci (2005); ²³Absolute value of the overruled municipalities on total municipalities, regional level. Interior Ministry: “Relazione sull’attività svolta dalla gestione straordinaria dei Comuni commissariati” (1991-2005).

Table 3A. The Institutional Quality Index of considered provinces in 2012.

Province	IQI	Province	IQI	Province	IQI	Province	IQI
Agrigento	0.2135	Firenze	1	Palermo	0.1998	Salerno	0.5378
Alessandria	0.6651	Foggia	0.3511	Pavia	0.6229	Sassari	0.4713
Ancona	0.7505	Forlì-Cesena	0.7719	Perugia	0.7572	Siena	0.877
Aosta	0.7469	Genova	0.5228	Pesaro e Urbino	0.7524	Sondrio	0.6969
Arezzo	0.8635	Gorizia	0.775	Pescara	0.6235	Taranto	0.3795
Ascoli Piceno	0.6794	Grosseto	0.7928	Piacenza	0.7435	Teramo	0.7788
Asti	0.6614	Imperia	0.4221	Pisa	0.8757	Terni	0.7312
Avellino	0.4538	Isernia	0.2001	Pistoia	0.7705	Torino	0.6823
Benevento	0.5197	La Spezia	0.6083	Pordenone	0.703	Trapani	0.147
Bergamo	0.7405	Latina	0.5209	Potenza	0.3976	Trento	0.873
Bologna	0.695	Lecce	0.4937	Prato	0.8179	Treviso	0.7935
Bolzano/Bozen	0.8553	Lucca	0.8504	Ragusa	0.2887	Trieste	0.7984

Brescia	0.7029	Macerata	0.7209	Ravenna	0.8135	Udine	0.698
Brindisi	0.4459	Mantova	0.729	Reggio di Calabria	0.0398	Venezia	0.7247
Cagliari	0.3927	Modena	0.7035	Reggio nell'Emilia	0.7126	Verona	0.7312
Caserta	0.411	Novara	0.7585	Rieti	0.5958	Vicenza	0.7186
Chieti	0.8574	Nuoro	0.4515	Rimini	0.7645	Viterbo	0.5397
Cuneo	0.8075	Padova	0.7308	Roma	0.7297		

Source: 9.

Table 4A. The average IQI at region level in 2012.

Italian regions	Italian macro-area	Average IQI
Trentino Alto Adige	Northern	0.8642
Tuscany	Central	0.8109
Abruzzo	Southern	0.8020
Valle D'Aosta	Northern	0.7469
Veneto	Northern	0.7452
Emilia Romagna	Northern	0.7436
Umbria	Central	0.7396
Friuli Venezia Giulia	Northern	0.7158
Lombardy	Northern	0.7033
Piedmont	Northern	0.7021
Marche	Central	0.6955
Lazio	Central	0.5831
Liguria	Northern	0.5313
Campania	Southern	0.5010
Apulia	Southern	0.4374
Sardinia	Southern	0.4214
Basilicata	Southern	0.3976
Sicily	Southern	0.2065
Molise	Southern	0.2001
Calabria	Southern	0.0398
Total		0.6898

Source: our elaborations on data by Nifo and Vecchione (2014).