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DETERMINANTS OF FARMERS'PARTICIPATION IN FOOD QUALITY SCHEMES IN ITALY AND FARM-LEVEL PERFORMANCE ANALYSIS BASED ON FADN.

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Abstract

The European quality scheme includes four types of quality labels: PDO – Protected Designation of Origin; PGI – Protected Geographical Indication; TSG – Traditional Speciality Guaranteed; EU organic label. The involvement in food quality schemes has implications on farm performance because the economic and structural characteristics of farms are different from those in farms non participating to the quality schemes. Yields, prices, income and cost structure are influenced both by the specific production conditions and by external variables that usually are not taken into consideration in the normal assessment of farm performance (local conditions, local market, etc.).

One first level of analysis on farm performances of participating and non-participating farms can be made using the FADN database which permits the assessment of farm performance and productivity and, in some cases, the calculation of gross margin for the different production processes. At EU level, the individuation of farms included in quality schemes is possible only since 2014. This information is available for a longer time period in the Italian FADN, which system allows the calculation of gross margin for the single production process carried out in the farm.

The objective of the work is to give a first framework about the information concerning farm quality scheme collected by FADN at EU level with a focus on the Italian FADN and on the differences between participating and non-participating farms in terms of costs, revenues, yields, farm performance and productivity. The analysis will be made on different Farm Types and different production processes. The work is the first step of a more deep analysis aiming to investigate the determinants influencing the different behaviour of farms involved - or not - in the quality schemes.

Keywords: Quality Schemes, FADN, Farm Profitability

1. INTRODUCTION

The food quality improvement and the implementation of Food Quality Systems (FQS) in the EU Member States, has been part of the EU agricultural policy since the beginning of the 90s. Before 1992, some EU Member States established their own rules to encourage and protect specific foodstuffs applying different rules in their own national systems (mainly wine quality labelling as, for instance, the French AOC - *Appellation d'Origine Contrôlée* or the Italian DOC - *Denominazione di Origine Controllata*). In 1992 the EU introduced a system to protect and promote traditional and regional food products, protecting their names and establishing the conditions under which they could be used so that their specific and traditional character could be preserved. Since then, the EU protects by legislation particular products names which are linked to territory or to a production method. It has developed three "quality logos" that help producers to market their products better, providing them legal protection from misuse or falsification of a product name. Two logos have a strong geographical element, referring to a geographical indication closely linked to a specific production areas: the Protected Designation of Origin (PDO) and the Protected Geographical Indication (PGI). One logo relates to traditional production methods: the Traditional Speciality Guaranteed (TSG). Another important element of the EU FQS is represented by the labelling of organic farm products and foods, which legislation has been adopted in 1991. The benefits of organic food production are linked to the environmental protection, food quality and animal welfare: all these benefits are guaranteed to the consumers thanks to a certification and a specific logo.

The paper presents a farm-level analysis aiming to explain the determinants influencing the farmers' participation in FQS and the differences between participant and non-participants in terms of costs, revenues, yields, farm performance and productivity. The main source of information in the Italian FADN, in which the different type of certifications are surveyed every accounting year.

A general overview of the PDO/PGI/STG label in Italy and the organic farming in terms of number of certified products and distribution in the national territory is described in the Chapter 2. The high quantity of certified products reflects the diversity of traditions in every Italian region and the specific characteristics linked to the geographical origin.

Chapter 3 is focused on the determinants identified using a Logistic Binary Regression, where the decision to uptake for the specific FQS (geographical denomination or organic farming) depends from a set of selected explanatory variables, some of them belonging to FADN dataset, others collected from external sources (Eurostat, Italian Ministry of Agriculture). The Chapter is divided in three sections: the first section describes the variables selected as determinants while the results of the econometric regression are resumed in the second and third section, applying the same model to PDO/PGI scheme and organic farming.

2. FOOD QUALITY SYSTEMS IN ITALY: THE GEOGRAPHICAL INDICATION SYSTEM AND THE ORGANIC FARMING.

2.1 Geographical Indications in Italy: PDO, PGI, STG

Italy is the European country with the highest number of geographical certifications granted by the European Union, followed by France (226 certifications in food sector and 432 certifications in wine sector). The quality-certified products in Italy at 31 December 2015 included 799 Protected Denomination of Origin (PDO) and Protected Geographical Indication (PGI) and 2 Traditional Speciality Guaranteed (TSG),

generating a value of production close to 13.4 billion euros (about 10% of the agro-food industry turnover) and an export value of 7.1 billion euros (about 21% of the whole agro-food export) (ISMEA- Qualivita, 2016).

The Food Quality System (FQS) based on the geographical indication is divided in two groups: the food sector and the wine sector. Table 1 resumes the importance of the PDO/PGI/STG system in Italy[1].

Table 1: Geographical Indication in Italy at 31 December 2015: a global framework

	Food Sector	Wine Sector
Number of PDO	164	405
Number of PGI	112	118
Number of TSG	2	-
Total PDO/PGI	278	523
Number of Consortiums	124	95
Certified production (quantity)	1,5 million tonnes	2,8 billion bottles
Value of production (€)	6.4 billion	7.0 billion
Export value (€)	2.8 billion	4.3 billion

Source: ISMEA-Qualivita, 2016

The only Traditional Speciality Guaranteed (TSG) in Italy is represented by the "mozzarella" and Neapolitan pizza. TSG does not refer to an origin, but the objective is the promotion of a traditional composition of the product or a traditional production method.

The Regions with the most PDO/PGI products, are Veneto, Tuscany and Piedmont (Table 2).

At the end of 2015, 9 more geographical indication labels have been registered in Italy: 3 PDO and 6 PGI (13 more in 2016). The "food" sectors with the highest number of certifications are fruit, vegetable and cereals (106 products; 38% of the total), cheese (51; 18%), extra-virgin olive oils (43; 16%) and meat preparations (40; 14%).

[1] At July 2017, there were 293 PDO/PGI/TSG registered in the food sector and 523 PDO/PGI in the wine sector (Italian Ministry of Agriculture and Forestry).

Table 2: Number of Geographical Indication in Italy at 31 December 2015

	Food Sector			Wine sector			Total PDO/PGI/STG		
	PDO	PGI	Total*	PDO	PGI	Total	PDO	PGI	All
Abruzzo	6	3	11	9	8	17	15	11	28
Basilicata	5	4	11	5	1	6	10	5	17
Calabria	12	5	19	9	10	19	21	15	38
Campania	13	9	24	19	10	29	32	19	53
Emilia Romagna	18	23	43	20	9	29	38	32	72
Friuli Venezia Giulia	5	1	8	14	3	17	19	4	25
Lazio	15	11	28	30	6	36	45	17	64
Liguria	2	2	6	8	4	12	10	6	18
Lombardy	20	12	34	27	15	42	47	27	76
Marche	6	6	14	20	1	21	26	7	35
Molise	5	1	8	4	2	6	9	3	14
Piedmont	13	8	23	58	-	58	71	8	81
Apulia	12	6	20	32	6	38	44	12	58
Sardinia	6	1	9	18	15	33	24	16	42
Sicily	17	12	31	24	7	31	41	19	62
Tuscany	15	13	30	52	6	58	67	19	88
Trentino - South Tyrol	9	5	16	8	4	12	17	9	28
Umbria	4	5	11	15	6	21	19	11	32
Aosta Valley	4	0	6	1	-	1	5	0	7
Veneto	18	18	38	42	10	52	60	28	90
Italy	164	112	278	405	118	523	569	230	801

** Two STG are registered in Italy: they are included in the total of every region.*
Source: ISMEA-Qualivita, 2016

In 2015, there were in Italy 80,010 certified operators (Table 3), up by 160 units (+ 0.2%) from 2014: 91.1% were exclusively involved in production activities and 5.7% in product transformation; the remaining 2.2% performed both activities. 6,620 new certified operators have been recorded in 2015 (6,233 producers and 1,169 transformers) while the number of exit has been lower (6,458 units: 5,341 producers and 864 transformers), determining a positive balance in the number of operators. Even if producers (75,463 units) are present in every Italian Regions, more than one half (52.2%) is concentrated in three Regions: Sardinia (19.7%), Tuscany (17.0%), Trentino-South Tyrol (15.5%). Livestock farms are particularly concentrated in those Regions traditionally specialized in the pig farming and in the quality dairy sector: Sardinia (38.0% of the total), Lombardy (14.0%), Emilia Romagna (10.7%) and Veneto (7.8%). Among producers, the cheese sector is particularly highly represented (26,042 units, equal to 34.5% of the total), followed by olive oil (19,567 or 25.9%) and fruit, vegetables and cereals (17,061 or 22.6%). Producers use 170,266 hectares of agricultural surface (+4.6% compared to 2014) obtaining 154 PDO/PGI and manage 39,307 livestock farms (-5.1% compared to 2014) obtaining 85 PDO/PGI (ISTAT, 2016).

In the processing system (7,150 units), the most important sector is the production of extra-virgin olive oil (1,811 or 25.3% of the total), followed by cheese (1,529 or 21.4%) and fruit, vegetables and cereals (1,350 or 18.9%). More than one half of the processors work in four Regions of the Central and Northern Italy: Emilia Romagna (20.8%), Tuscany (16.7%), Veneto (6.9%) and Lombardy (6.8%).

Table 3: PDO/PGI/STG certified operators in Italy per Region, macro-area, altitude and gender

	Production system						Processing system				Total certified operators	
	Producers (a)		Livestock farms		Area		Processors		Plants			
	N.	%	N.	%	Ha	%	N.	%	N.	%	N. (b)	%
Regions												
Abruzzo	963	1.3	458	1.2	1,441	0.8	202	2.8	322	3.1	1,074	1.3
Basilicata	112	0.1	38	0.1	175	0.1	41	0.6	54	0.5	135	0.2
Calabria	494	0.7	57	0.1	5,049	3.0	326	4.6	397	3.8	637	0.8
Campania	2,754	3.6	1,514	3.9	1,970	1.2	513	7.2	756	7.2	3,117	3.9
Emilia Romagna	5,037	6.7	4,187	10.7	6,110	3.6	1,490	20.8	2,164	20.7	6,277	7.8
Friuli Venezia Giulia	782	1.0	777	2.0	55	0.0	92	1.3	129	1.2	858	1.1
Lazio	2,607	3.5	2,011	5.1	2,977	1.8	379	5.3	561	5.4	2,836	3.5
Liguria	1,347	1.8	-	-	2,681	1.6	158	2.2	213	2.0	1,420	1.8
Lombardy	5,882	7.8	5,486	14.0	1,505	0.9	485	6.8	769	7.4	6,236	7.8
Marche	702	0.9	689	1.8	128	0.1	172	2.4	348	3.3	857	1.1
Molise	172	0.2	87	0.2	378	0.2	29	0.4	57	0.5	196	0.2
Piedmont	2,653	3.5	1,728	4.4	5,116	3.0	227	3.2	327	3.1	2,810	3.5
Apulia	2,714	3.6	84	0.2	26,021	15.3	379	5.3	478	4.6	3,028	3.8
Sardinia	14,894	19.7	14,918	38.0	985	0.6	175	2.4	229	2.2	14,952	18.7
Sicily	2,768	3.7	80	0.2	17,694	10.4	365	5.1	472	4.5	2,999	3.7
Tuscany	12,844	17.0	1,539	3.9	66,497	39.1	1,193	16.7	1,793	17.2	13,334	16.7
Trentino-South Tyrol	11,723	15.5	1,176	3.0	21,866	12.9	88	1.2	125	1.2	11,809	14.8
Umbria	2,051	2.7	702	1.8	7,046	4.1	233	3.3	378	3.6	2,197	2.7
Aosta Valley	693	0.9	710	1.8	-	-	112	1.6	222	2.1	729	0.9
Veneto	4,271	5.7	3,066	7.8	2,573	1.5	491	6.9	653	6.3	4,509	5.6
Macro-area												
North Italy	32,388	42.9	17,130	43.6	39,905	23.5	3,143	44.0	4,602	44.1	34,648	43.3
Central Italy	18,204	24.1	4,941	12.6	76,469	45.0	1,977	27.7	3,080	29.5	19,224	24.0
South Italy	24,871	33.0	17,236	43.8	53,712	31.6	2,030	28.4	2,765	26.5	26,138	32.7
Altitude (c)												
Mountains	20,950	27.6	7,469	19.0	36,643	21.5	1,230	17.1	1,791	17.1	21,627	26.9
Hilly areas	36,683	48.3	17,506	44.5	103,778	61.0	3,773	52.5	5,492	52.6	38,924	48.3
Flat areas	18,250	24.1	14,332	36.5	29,845	17.5	2,185	30.4	3,164	30.3	19,954	24.8
Gender												
Men	60,281	79.9	34,262	87.2	128,478	75.5	6,119	85.6	9,098	87.1	64,400	80.5
Women	15,182	20.1	5,045	12.8	41,788	24.6	1,031	14.4	1,349	12.9	15,610	19.5
Italy	75,463	100.0	39,307	100.0	170,086	100.0	7,150	100.0	10,447	100.0	80,010	100.0

(a*): a producer can manage one or more livestock farms*
(b): an operator can be producer and transformer.
(c): the operators are distributed in the different altitudinal regions according to the distribution of surfaces, livestock farms or plants. The total could be different from what calculated in the other variables.
Source: ISTAT, 2016

Over three quarters of producers (75.9%) is located in mountain and hill areas, the remaining 24.1% is located in flat areas (Table 3).

The majority of operators are men (79.9% of producers and 85.6% of processors).

2.2 Organic farming in Italy

At 31 December 2015 the number of organic farms in Italy amounted to 59,959 units: 45,222 producers, 7,061 processors, 7,366 units both producers and processors, 310 marketing firms. The area under organic cultivation is 1,492,579 hectares. The two-years period 2014-2015 can be considered as a period of growth of the Italian organic sector: comparing to 2014, the number or organic operators is increased (+8.2%) as well as the organic surface (+7.5%). During 2015, more than 4,500 farms in about 104,000 hectares have decided to convert their farm toward the organic production (SINAB, 2017). More or less 12.0% of the Utilized Agricultural Area in Italy is interested by organic farming systems in 3.6% of the agricultural farms (ISTAT SPA, 2013).

The Regions with the highest number of organic operators (Table 4) are Sicily (11,326 units; +17.2% compared to 2014), Calabria (8,684 units; -1.2%), Apulia (6,685 units; +1.3%). These Regions concentrated about 45% of total organic operators. In particular the number of processors and importers is increased in the two-years period 2014-2015 (+14.4%) (RRN, 2017). As concern producers, the 66.5% of units work in South Italy while 23.9% is located in the northern part and 9.6% in Central Italy. On the other hand, the number of processors seems to be most important in the North of Italy (6.7%) than in the Southern part (6.5%), highlight a kind of duality of the organic agriculture in Italy that has always registered the production in the South and the processing products in the North. It is interesting the data concerning the increase of processors in the Southern Regions: +15.1% in 2015, more than the North (+14.4%) and the Italian average (+14.4%) (RRN, 2017).

Table 4: Number of organic operators in Italy in 2015

	Producers	Producers/ Processors	Processors	Importers	Total 2015	Total 2014	2014-15 (%)	%	% farms*
Sicily	9,807	813	694	12	11,326	9,660	17.2	18.9	5.2
Calabria	7,583	833	262	6	8,684	8,787	-1.2	14.5	6.5
Apulia	4,815	1,234	628	8	6,685	6,599	1.3	11.1	2.4
Tuscany	3,087	1,134	528	26	4,775	4,156	14.9	8.0	6.3
Emilia Romagna	2,773	303	812	51	3,939	3,876	1.6	6.6	4.8
Lazio	2,682	375	383	10	3,450	3,247	6.3	5.8	3.7
Sardinia	2,287	133	81	0	2,501	2,407	3.9	4.2	4.7
Marche	1,950	288	210	5	2,453	2,187	12.2	4.1	5.5
Piedmont	1,374	432	458	44	2,308	2,120	8.9	3.8	3.0
Veneto	1,180	312	770	42	2,304	1,880	22.6	3.8	1.3
Campania	1,394	251	375	13	2,033	2,016	0.8	3.4	1.4
Lombardy	839	285	741	56	1,921	1,700	13.0	3.2	2.3
Abruzzo	1,197	215	216	3	1,631	1,461	11.6	2.7	2.2
Umbria	1,124	266	150	6	1,546	1,217	27.0	2.6	4.1
Basilicata	1,055	102	76	0	1,233	1,225	0.7	2.1	2.5
South Tyrol	662	115	236	9	1,022	1,092	-6.4	1.7	4.1
Trentino	658	82	132	1	873	652	33.9	1.5	4.8
Friuli Venezia Giulia	305	92	131	6	534	441	21.1	0.9	2.0
Liguria	221	62	125	12	420	389	8.0	0.7	1.7
Molise	158	28	46	0	232	230	0.9	0.4	0.9
Aosta Valley	71	11	7	0	89	91	-2.2	0.1	2.9
Italy	45,222	7,366	7,061	310	59,959	55,433	8.2	100.0	3.6
North Italy	8,083	1,694	3,412	221	13,410	12,241	9.5	26.6	
Central Italy	8,843	2,063	1,271	47	12,224	10,807	13.1	10.2	
South Italy	28,296	3,609	2,378	42	34,325	32,385	6.0	63.2	

*Source: SINAB, 2017; *ISTAT SPA 2013*

As concern the agricultural area (Table 5), the result is the same: Sicily, with 345,071 hectares is the most important Region in terms of organic area, followed by Apulia (180,918 hectares) and Calabria (170,290) hectares. These three Regions concentrated the 44.5% of total organic area. As a consequence, organic system are most widespread in the South of Italy where 63.1% of the whole organic surface in Italy is cultivated.

The incidence of organic area on the total of cultivated area in every Region is particularly high in Calabria (31.5% of total agricultural area is organic), followed by Sicily (25.1%), Tuscany and Lazio (both with 18.7%). Veneto is the Region with the lowest incidence: only 2.1% of agricultural area is organic.

Table 5: Organic area in the Italian Regions

	31/12/2014	31/12/2015	2014-15% Variation	% on total	% organic area*
Sicily	303,066	345,071	13.9	23.1	25.1
Apulia	176,998	180,918	2.2	12.1	14.5
Calabria	160,164	170,290	6.3	11.4	31.5
Sardinia	149,947	146,050	-2.6	9.8	12.8
Tuscany	118,630	131,796	11.1	8.8	18.7
Lazio	110,277	111,245	0.9	7.5	18.7
Emilia Romagna	88,899	100,011	12.5	6.7	9.6
Marche	57,030	63,021	10.5	4.2	14.1
Basilicata	48,255	49,904	3.4	3.3	10.1
Umbria	30,875	34,468	11.6	2.3	11.3
Piedmont	31,656	34,136	7.8	2.3	3.6
Lombardy	23,352	29,511	26.4	2.0	3.2
Abruzzo	25,022	29,032	16.0	1.9	6.6
Campania	20,548	19,139	-6.9	1.3	3.5
Veneto	15,773	17,419	10.4	1.2	2.1
South Tyrol	6,413	6,934	8.1	0.5	3.0
Trentino	6,612	6,173	-6.6	0.4	4.9
Friuli Venezia Giulia	3,701	5,149	39.1	0.3	2.4
Molise	4,611	5,062	9.8	0.3	2.9
Liguria	2,902	3,834	32.1	0.3	9.1
Aosta Valley	3,621	2,977	-17.8	0.2	5.6
Italy	1,387,913	1,492,579	7.5	100.0	12.0
North Italy	374,181	404,371	8.1	27.1	
Central Italy	130,997	145,714	11.2	9.8	
South Italy	882,735	942,494	6.8	63.1	

*Source: SINAB, 2017; *ISTAT SPA 2013*

3. DETERMINANTS OF FARMERS' PARTICIPATION IN FOOD QUALITY SCHEMES

3.1 The Farm Accountancy Data Network

The analysis is implemented using the Italian Farm Accountancy Data Network (FADN) dataset for the 3-years period 2013-2015. FADN is a European system of sample surveys conducted every year to collect accountancy data from agricultural holdings, with the aim of monitoring the income and business activities of the EU agricultural system. FADN is the only source of microeconomic data based on harmonized bookkeeping principles. In order to reflect the farming diversity and heterogeneity of FADN's field of observation, the Liaison Agency (responsible for the FADN survey in each Member State) selects the stratified sample on the basis of three criteria: Region, Type of Farming and Economic Size. The Type of Farming is defined in terms of the relative importance of the different activities on the farm, measured as a

proportion of each activity's Standard Output on the farm's total Standard Output[2]. Not all agricultural holdings are included in the FADN sample but just those which, due to their economic size, are considered as "commercially viable". This threshold differs in the Member States: in Italy only holdings with a Standard Output equal to or greater than 8,000 € are taken into account.

Each farm surveyed in FADN is classified in a specific category according to specific certification schemes. There are three certification levels in Italian FADN: farm level, process level and product level. In this analysis, only farms with organic certification (farm level) and PDO/PGI-DOC/DOCG certification (process level) have been considered. As concern geographical indication, the Italian denomination used for wine (DOC – Denominazione di Origine Controllata; DOCG – Denominazione di Origine Controllata e Garantita) have been treated as PDO/PGI marks.

In this analysis, not all the farms surveyed in each year have been selected but duplicate cases have been deleted from the dataset. The analysis included 8,774 farms.

Table 6 describes the variables used in the LOGIT model.

The dependent variable is a dummy that assumes a value of 1 in case of participation in a Food Quality Scheme: PDO/PGI scheme or Organic farming. 17.0% of surveyed farms are engaged in the PDO or PGI scheme while 11.6% of them are classified as organic farming.

In order to analyse the determinants, the independent variables are classified into 4 groups:

- Localization: farms have been classified following different criteria. Two of them are socio-economic (less favoured area and inner areas), other two concern the altitude (mountain and hilly areas) and one is geographical (south of Italy, including the island). The inclusion of the farms in Inner Areas has been on the basis of the classification used in the Italian Strategy for Inner Areas, that focuses mainly on the distance of the single municipalities from the centres where the main services are available (health, education and transport). This is a specific classification which has been applied in other analysis based on the Italian FADN (Marongiu and Cesaro, 2016, 2017), where all the holdings are geo-referenced on the basis of the municipality.
- Farm features: four Type of Farming (TF) are considered together with two variables concerning the specialization and diversification of activities. The specialization includes those farm strategies based on the cultivation of different crops or on the combination of crop and livestock (in FADN there are 4 specialized Type of Farming and 3 mixed Type of Farming). The diversification can be defined as the reallocation or recombination of farm resources away from its original farming activity in order to generate another form of income (agro-tourism, accommodation, on farm processing, etc.). As concern the farm size, the hectares of Utilized Agricultural Area represent the structural dimension while the Economic Size is represented in terms of Standard Output. Small farms are those farms who has less than 25,000 € of SO.
- Farmer features: the age of the entrepreneurs and the level of education are considered two important characteristics of the farmers. 40 years is considered the threshold to be considered as young farmers while the lowest level of education is considered until the secondary school. 44.2% of the farmers have a high education.

[2] The Standard Output of an agricultural product (crop or livestock) is the average monetary value of the output at farm-gate price in euros per hectare or head of livestock.

- External characteristics: the representation of the "food culture" in the Region is represented by then number of traditional food as indicated by the Italian Ministry of Agriculture in a specific list. Food with PDO, PGI and STG are not included in this list. The number of establishment, bedrooms and bed places is considered a variable linked with the tourism: the use of labels in a given territory is considered strictly linked with the development of the territory. As economic factor, the Gross Domestic Product per inhabitant can be considered correlated with the presence of quality schemes. The population density is reported at municipality level and it is considered as a proxy for the urbanisation degree.

Table 6: Description of the variables used in the LOGIT model

Variable	Description	Unit of measure	Mean
Dependent variables: participation in Food Quality Schemes			
PDO_PGI	Participation in PDO or PGI scheme	Dummy	yes = 17.0%
ORG	Organic farming	Dummy	yes = 11.6%
Independent variables			
Localization			
lfa	1 if the farm is located in Less Favoured Areas (totally)	Dummy	yes = 52.5%
inn_areas[3]	1 if the farm is located in Inner Areas	Dummy	yes = 47.7%
inner_flat[3]	1 if the farm is located in the flat areas of Inner Areas	Dummy	yes = 8.3%
mount	1 if the farm is located in mountainous areas	Dummy	yes = 20.0%
hilly	1 if the farm is located in hilly areas	Dummy	yes = 47.5%
south	1 if the farm is located in south and islands	Dummy	yes = 35.9%
Farm features			
crops	1 if farm is specialized in arable crops	Dummy	yes = 26.9%
hort	1 if farm is specialized in horticulture	Dummy	yes = 6.2%
perm	1 if farm is specialized in permanent crops	Dummy	yes = 27.4%
liv	1 if farm is specialized in livestock	Dummy	yes = 22.0%
spec	1 if farm is specialized or mixed	Dummy	yes = 87.5%
diver	1 if the farm diversificates the activities	Dummy	yes = 10.5%
farm_size	Utilized Agricultural Area (UAA)	Standardized	0.0
econ_size	1 if farm is more than 25,000 € SO	Dummy	yes = 73.3%
Farmer features			
less_40	1 if the farmer has less than 40 years	Dummy	yes = 15.8%
edu	1 if the farmer has a medium-high education	Dummy	yes = 44.2%
External characteristics			
dens_m[1]	Population density	inhabitants/kmq	240.0
tr_food[2]	Traditional food in the Region	n.	265
tour_est[1]	Establishment, bedrooms, bed-places	n./kmq	0.4
GDP_in	GDP per inhabitant in the Province	Standardized	0.0

Source: Italian FADN database, Eurostat[1], Italian Ministry of Agriculture[2], Strategy for Inner Areas[3]

3.2 Determinants of farmers participation in PDO and PGI scheme

Table 7 shows the results of the application of LOGIT model to all the variables considered in the analysis.

Table 7: Estimates for the PDO and PGI participation scheme

	B	E.S.	Wald	Sig.	Exp(B)	p
	Localization					
lfa	-0.4145	0.0818	25.6558	0.0000	0.6607	***
inn_areas	-0.1431	0.0837	2.9251	0.0872	0.8666	*
inn_flat	0.5268	0.1654	10.1442	0.0014	1.6936	***
mount	0.5937	0.1462	16.4947	0.0000	1.8108	***
hilly	1.0279	0.1043	97.1968	0.0000	2.7953	***
south	-0.4267	0.1113	14.6864	0.0001	0.6527	***
	Farm features					
crops	0.0265	0.2386	0.0123	0.9117	1.0268	
hort	0.0899	0.2909	0.0954	0.7574	1.0940	
perm	3.1204	0.2183	204.2896	0.0000	22.6545	***
liv	0.4157	0.2341	3.1540	0.0757	1.5154	*
spec	-1.8612	0.2274	67.0115	0.0000	0.1555	***
diver	0.1285	0.1039	1.5295	0.2162	1.1371	
Zfarm_size	0.0798	0.0336	5.6357	0.0176	1.0831	**
econ_size	0.8567	0.0854	100.7068	0.0000	2.3553	***
	Farmer features					
less_40	-0.0426	0.0962	0.1964	0.6576	0.9583	
qualif	0.1484	0.0717	4.2906	0.0383	1.1600	**
	External characteristics					
dens_m	-0.0003	0.0001	7.1983	0.0073	0.9997	***
tour_est	0.5074	0.0766	43.8976	0.0000	1.6609	***
GDP_in(z)	0.3236	0.0532	36.9588	0.0000	1.3821	***
Intercept	-2.6147	0.1449	325.7833	0.0000	0.0732	***
Hosmer-Lemeshow	Chi-squared		43.234	0.0000		***

Source: elaboration on Italian FADN database and Eurostat;
*Level of significance: *** p<0.01; ** p<0.05; * p<0.10*

Since the beginning, the EU Regulation 2081/92 on geographical indications mentions as one of the main objective the generation of higher incomes and more employment to remote and/or less favoured regions. The subsequent version, EU Regulation 510/2006 confirm this objective by stressing on the benefits for the rural economy and local development, promoting diversification of products having certain characteristics and mentioning also the need to retain population in remote and less favoured regions. The impact of geographical indications on rural development will be proportional to their uptake by local economic actors and when agriculture and food are important sectors of the local economy. Some authors acknowledged that their impact can be limited (Callois, 2004) or that this impact on the condition for economic development range from being insignificant (when producers are well organized or if there is little competition) to significant (when, for instance, the development of geographical indication is coordinated with other economic activity such as tourism) (Gay et al., 2007, London Economics, 2008).

According to the model result and in line with other analysis based on Italian FADN (Scardera and Viganò, 2008), the location in totally less favoured areas influences negatively the farm participation to PDO/PGI quality schemes. This means that in areas with the worst agricultural conditions, local economic actors are

not encouraged to uptake for PDO/PGI label quality. Considering the classification of municipalities in Inner Areas on the basis of the distance from hubs and of socio-economic criteria, the negative coefficient shows a negative influence on the decision to participate to PDO/PGI quality schemes. But if remote areas are close to flat areas, less isolated and served by adequate infrastructures, confirm other analysis (Santini et al., 2015) that consider the territorial continuity and the consequent strategic connection, as an important asset. Certified operators are present in most part of the municipalities classified as Inner Areas (52.6%; ISTAT, 2016) and this is an important signal that confirm the contribution of geographical indications in maintaining and strengthen the presence of agricultural activities in an important part of Inner Areas. The positive sign of population density, used to measure the remoteness, supports even more this hypothesis. The population density is reported

As concern altitude, hilly areas and mountains are the most suitable to develop PDO/PGI quality schemes. According to other studies (Santini et al., 2015; Van de Pol, 2017) it is not proven that there is more uptake of the quality scheme in mountain areas but in case of Italy the model result reflects the typology of products under PDO/PGI labelling in Italy. This is an important result, especially considering the contents of Regulation EU 1151/2012 on quality schemes for agricultural products and foodstuffs. One of the most important new features introduced by this regulation concern the strengthening of the role and responsibility of the producers in the monitoring, promotion and communication process. In particular, in addition to regulating PDOs, PGIs and TSGs, the new Regulation provides for the creation of optional quality terms relating to the characteristics of one or more categories of products. The first optional quality term established by the Regulation is “mountain product”, which could be an additional driver in the development of the traditional products in mountain areas.

As previously stated, 523 different wines have been produced under the PDO/PGI quality scheme and 278 food productions in 2015. The production of quality wine, despite the high number of labels distributed in all the Italian territory, is concentrated in few regions: Veneto, Piedmont and Tuscany produced 60% of the Italian PDO wine. In this regions, vineyards grown in hilly areas particularly suited for producing Prosecco DOP, Asti DOP, Conegliano Valdobbiadene DOP, Chianti DOP, Amarone della Valpolicella DOP (37.2% of total production value in bulk in 2015; ISMEA, 2015). Concerning food products, the most represented category is the grouping of fruits, vegetables and cereals (38.1% of PDO/PGI labels in 2015; ISMEA, 2015) followed by cheese (18.3%), oil and fats (15.5%) and meat products (14.4%). In the grouping of fruit and vegetables, the most important PDO/PGI production is represented by apples: the apple *Alto Adige* (PGI) and the apple *Val di Non* (PDO) represents 87.1% of total certificated production in terms of quantity and 80.0% in terms of production value. Apple is cultivated from hills until more than 1,000 m above sea level in mountains. The characteristics of FADN sample reflects this distribution: in the 3-year period, 57.1% of farms participating to PDO/PGI quality scheme are located in hilly areas (25.0% in flat areas, 17.8% in mountains) while permanent cultivations (mainly grapes and apples) are cultivated in the 65.7% of farms. Cereals, oilseed and protein crops are cultivated in the 6.5% of farms while dairy farming interests 9.5% of suerveyed farms.

Concerning the localization, southern farmers (including the island) are less likely to engage in PDO/PGI policies, if compared to central and northern Italy. In the FADN sample, 53.1% of farms engaged in PDO/PGI policies are located in the northern Italy and 21.5% in the central Italy.

The variables concerning the farm characteristics confirm what already explained: PDO/PGI involvement is more suited in the Type of Farming of permanent cultivation and livestock sector. The negative coefficient sign concerning the specialization is very interesting: it seems that farms more specialized are less incentived

to participate to food quality schemes respect the mixed ones. This result is interesting because another objective included in the promotion of rural economies is the diversification of agricultural production.

With regard to the farm size, it seems that in the Italian case, bigger farms are more likely to engage in geographical indication: the positive sign of the coefficient related to the farm size (in terms of hectares) and the economic size (in terms of value of Standard Output) indicate that the participation to quality schemes requires a certain dimension. As concern the economic size, it is necessary to specify that FADN collect information from the "professional" farms: this means that smallest farms are not included in the survey. In all the considered Type of Farming, the average size in terms of hectares is highest in the farms involved in PDO/PGI schemes than in those outside them. There could be a probable explanation considering the small dimensions of Italian farms: following the results of last Agricultural Census of ISTAT (2010), the average surface of Italian farms is 7.9 ha, lower than the European average (EU-27) equal to 12.6 ha. As pointed out in other analysis, in regions where there is a lot of small scale farms and farmers are not much market oriented, the use of label is low (De Pol, 2017). In the Italian case, this positive correlation makes sense. In fact, most of the farms working in the traditional systems related to the typical production labelled as PDO/PGI are represented by small-medium size units that implement their marketing policies mainly in the local market, where the PDO/PGI label have not a specific informative role or a specific credence attribute. In these cases, other aspects seem to be important, as the reputation of the producer or the direct sale to the consumers. On the other hand, the farms involved in longer sales channels consider the labelling as an efficient informational source about the quality and origin of traditional products and as an instrument to avoid as much as possible, misuse and unfair competition. In any case, the upset of a PDO/PGI label is the result of a complex evaluation of the costs to receive the certification and the benefits obtained by PDO/PGI status. In particular, with regard to the costs, beside those concerning the application for the certification, there is another important aspect related to the drafting of the product specification that, often specifies low relevant characteristics of the quality, resulting in an increase of the costs, not compensated by the revenues. As a consequence, it can happen that the producer's efforts are not incorporated in the final prize, reducing the meaning of high quality of traditional production for the consumers. The success of the PDO/PGI scheme in the promotion and maintaining the added value in the territory is strictly linked to their capacity to transmit such high quality to the final price, in order to justify a different behaviour of the consumers. Sometimes specific marketing actions are necessary.

The farmer characteristics highlights the importance of the higher education of farmers. The variable concerning the age is not representative (even if it is remarkable to note that 20.4% of farmers involved in PDO/PGI scheme has less than 40 years) while the education seems to influence in a positive way the participation to quality schemes.

Looking to the external characteristics, the number of establishment, bed and bed-places, used as a proxy of the touristic infrastructures, seem to have a positive influence on the uptake of PDO/PGI. This confirms the idea that producers are more likely to use the geographical denomination labels in order to promote the products in touristic areas. Differently from other analysis, in the Italian sample there is a positive correlation between the GDP per inhabitants and the participation to FQS. With this respect, the richness of the territory seems to be a determinant.

3.3 Determinants of farmers participation in organic farming scheme

The estimation of the determinants of farmers'participation in organic farming scheme is carried out by applying the same LOGIT model as that defined for the PDO/PGI. Table 8 shows the result of the estimation. All the variables are significant, except the variable related to the localization of farms in inner areas, in the South of Italy and the population density.

Table 8: Estimates of the determinants of participation in organic farming scheme

	B	E.S.	Wald	Sig.	Exp(B)	
	Localization					
lfa	0.4102	0.0876	21.9328	0.0000	1.5071	***
inn_areas	0.0507	0.0885	0.3278	0.5669	1.0520	
inn_flat	0.3560	0.1860	3.6628	0.0556	1.4276	*
mount	0.5869	0.1626	13.0302	0.0003	1.7984	***
hilly	0.6277	0.1314	22.8070	0.0000	1.8733	***
south	0.1747	0.1125	2.4120	0.1204	1.1908	
	Farm features					
crops	0.4627	0.2756	2.8190	0.0932	1.5883	*
hort	-0.7809	0.4292	3.3099	0.0689	0.4580	*
perm	1.6702	0.2669	39.1541	0.0000	5.3134	***
liv	0.9078	0.2727	11.0787	0.0009	2.4787	***
spec	-1.1607	0.2781	17.4267	0.0000	0.3133	***
diver	0.7792	0.1053	54.7838	0.0000	2.1797	****
farm_size	0.1711	0.0300	32.5521	0.0000	1.1866	***
econ_size	0.2593	0.0890	8.4955	0.0036	1.2960	***
	Farmer features					
less_40	0.2252	0.0881	6.5298	0.0106	1.2526	**
qualif	0.7694	0.0778	97.7681	0.0000	2.1584	***
	External characteristics					
dens_m	0.0001	0.0001	0.5211	0.4704	1.0001	
tour_est	-0.6306	0.1547	16.6188	0.0000	0.5323	***
GDP_in(z)	-0.3627	0.0617	34.5505	0.0000	0.6958	***
Intercept	-3.4100	0.1812	354.1856	0.0000	0.0330	***
Hosmer-Lemeshow	Chi-squared		13.514	0.0950		*

Source: elaboration on Italian FADN database and Eurostat;
*Level of significance: *** p<0.01; ** p<0.05; * p<0.10*

Differently from the geographical denomination PDO/PGI, the localization of farm in the most disadvantaged areas (less favoured areas) affects in a positive way the adoption of organic production techniques while the variable related to the inner areas is not significant. As remarked in determinant estimates done for the PDO/PGI, the proximity to the main roads and urban hubs affects positively the adoption of organic agriculture. The variable *inn_flat* includes those territories classified as inner areas but located in flat areas so, probably, not far from road and communication infrastructures.

The positive and significant coefficient of the variable linked to the altitude (*mount* and *hilly*) reveals a higher probability to uptake organic practices in these two areas as opposed to the flat ones, where a more intensive agriculture is typically carried out. This result is confirmed by the Farm Structure Survey (FFS)

2013 carried out by ISTAT (National Institute of Statistics): 63.2% of the whole organic surface is cultivated in hilly areas, 20.5% in mountains and 16.3% in flat areas.

Although the variable related to the localization of farms in the South of Italy is positive, it is not significant at 0.10. The result does not reflect the situation in Italy because the largest extension of organic area is cultivated in three Southern regions (Sicily, Calabria and Apulia), where is concentrated 46.6% of the whole organic surface in Italy (Table 5). In addition it is important to remark that the group of organic farms belonging to the FADN sample include producers of organic products, used in the other gainful activities (as agro-tourism), delivered to Cooperatives or sold in direct markets. Only few of them process the raw materials in the farm. Even if the p-value is not significant, the positive sign reflects in a certain way a duality between the South of Italy, where most part of organic farmers are producers (62.6% of producers and 40.9% of processors in 2015; Rete Rurale Nazionale, 2017) and the North and Central Italy, more focused on the processing. Only in the last years, there has been a change in this trend, with an increase in the number of processors in the Southern Italy (+15.1% during the period 2014-2015).

Looking to the farm features, and specifically to the Type of Farming, it seems that in the FADN sample is more likely to apply organic techniques in those farm specialized in arable crops, permanent crops and livestock. These results are aligned with the productive framework of the organic sector in Italy, pointed out in the SINAB database (National Informative System on Organic Agriculture): 41.5% of organic surface is cultivated with arable crops, 28.6% with permanent pastures and grasslands, 24.4% with permanent crops (olive: 180,000 hectares; fruit: 88,000 hectares; vineyards: 84,000 hectares).

Compared to mixed farming systems, the specialization seems to have a negative effect on the probability to adopt organic techniques but this result is not supported by clear evidences. On the other hand, the diversification shows a positive influence on the decision to uptake organic methods. This is confirmed by the FSS survey: compared to the agricultural farms as a whole, organic farms have a higher level of diversification. 28.1% of them has at least another one gainful activity (agro-tourism, recreational activity, renewable energy production, etc.) against the 7.7% of agriculture as a whole. In other analysis based on the FADN data (Rete Rurale Nazionale, 2017), the incidence of the other gainful activities on the total gross saleable production in conventional farms is 4.2% while in organic farms raises until 8.2%. According to Coldiretti, the organic farms have on average an annual income one third higher than conventional farms. This make possible the integration of different activities and the increase of the agricultural income.

A further information about the characteristic of organic farms can be provided by the variables linked to the farm size, that seems to be an important determinant: both of them (economic dimension and hectares) are positives and significant, underlying the importance of the dimension in the adoption of organic techniques. In the FADN sample, conventional farms has an average UAA equal to 32.8 hectares while in the organic farms the UAA is 44.7 hectares. This finding is supported by FSS 2013 which show that the average surface in the organic sector is higher compared the whole Italian agriculture: organic farms have an UAA equal to 28.4 hectares (21.1 ha in the North; 31.2 hectares in the Central Italy; 29.6 hectares in the South) while the Italian average is more or less equal to 8 hectares. Other analysis based on the FADN elaboration suggest the same results (Rete Rurale Nazionale, 2017).

The probability to decide the adoption of organic practices in the farm is most likely if the farmers is young and if he has a high education level. This aspect has been already pointed out in other analysis. About 22% of organic farms is managed by a farmer aged between 20 and 39 years old while the percentage is equal to 9% in the Italian farms as a whole. According to Coldiretti, they have a high level of education (generally

they are graduated), they make use of computers and other electronic utilities, their farms have a great diversification of crops and they sell organic products in many ways (e-commerce included).

The coefficient related to the population density is not significant and does not explain the decision to apply or not for organic methods. The number of accomodations (considered as a proxy of the tourist numbers in the area) and the richness of the population in terms of GDP per inhabitant are negatively correlated. This could be explained considering that the adoption of organic techniques do not depend directly by the local market but it is sometimes a consequence of an ethical choice and that in Italy, the high demand of organic products is not concentrated in the Regions where the production is the highest. The total turnover in 2015 for organic products has been equal to 2,660 million euros, (+15.0% if compared to 2014). About one third of this turnover comes from the large retailers: 35.8% of this turnover is realized in the North-Western Italy, 29.4% in the North-East, 24.0% in Central Italy and Sardinia and 9.4% in the South Italy. Another one third comes from specialized shops. Only 13% is commercialized through HO.RE.CA. sector while 8% in traditional shops. 14% of turnovers comes from other channel (small local markets, direct sales, e-commerce, etc.) (RRN, 2017).

3.4 Summary of the results

The findings of the analysis show that PDO/PGI uptake is lower in less favoured areas. These results are confirmed by using other measures of 'remoteness', such as population density. On the other hand, PDO/PGI uptake is higher in Italian mountainous areas. Moreover, the majority of farms participating in PDO/PGI quality schemes are located in hilly areas and in farms with permanent cultivations (mainly grapes and apples). With regard to localization, farmers in the South of Italy (including the Islands) are less likely to engage in PDO/PGI policies, when compared to Central and Northern Italy. Moreover, larger farms are more likely to engage in geographical indications. By the same token, regions with a high share of small scale farming and low market orientation exhibit a low likelihood to engage in the quality label. Farmer characteristics also highlight the importance of higher education of farmers. Looking to the external characteristics, the touristic infrastructures have a positive influence on the uptake of PDO/PGI.

Differently from the engagement in PDO/PGI, the localization of the farm in the most disadvantaged areas (less favoured areas) is positively related to the adoption of organic production techniques. There is also a higher probability to take up organic practices in hilly and mountainous areas. Oragnic farming is more present in farms specialized in arable crops, permanent crops and livestock. Organic farms on average also seem to have larger dimensions (both in economic size and in hectares). Younger and well-educated farmers are more likely to engage in organic farming. Finally, the extent of the tourist sector and GDP per capita in the region are both negatively correlated to organic farming.

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Internet resources

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