Variation on the effects of the 2003 CAP reform and regional differences in the Italian olive oil sector

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ABSTRACT

This paper analyses the impacts of the 2003 CAP reform on the production of Italian olive oil controlling for the regional differences in olive oil production as well as for the differences between years. Italian olive oil production time series data from the Farm Accountancy Data Network for the 2000-2010 period at regional level is used to examine the effect of the 2003 Fischler reform on the production of olive oil. Production costs and payments received by farmers to support their income are considered. The data were collected at micro level based on a sample of farms representative of the production systems in the country. In order to consider the differences in production among the regions, eight representative regions in terms of surveyed farms are considered: Liguria, Toscana, Umbria, Lazio, Campania, Calabria, Puglia and Sicilia. We found that the most important factors affecting the production of olive oil are the area under olive groves and labour productivity. Results also show no evidence that the level of payments have an impact to the level of production, however, the type of payments has. Future work should explore the impact of the 2003 reform into the technical and production efficiency of the Italian olive oil farmers. It would be interesting to link the measures introduced by the cross compliance and the management practices of the different farms to have a more complete picture of the various parameters influencing the production of olive oil.

1 Introduction

One of the main agricultural economic activities in the Mediterranean basin is the production of olive oil. In terms of volume of production capacity, Europe produces in average the 77% of the world production of olive oil: Spain, Italy and Greece being the major producers. These are also the main consumers of olive oil.

Outside the European Union, olive oil is produced in other Mediterranean countries, namely Tunisia, Turkey, Syria and Morocco as well as in the American continent, Australia and Japan, although in relatively minor quantity in the latter countries.

Based on the data provide by the IOOC, the European production remain stable, in favour of other countries outside the European borders. The provisional data for the season 2013/2014 of the worldwide production is as follows: Europe 76%, Tunisia 2%, Turkey 6%, Syria 5%, Morocco 4% and the others producers countries 7%.

1.1 Olive oil production in the EU countries

Spain is the country with the main olive oil and olive produce (2.8 million of tonnes in 2014) and export worldwide. Italy is the second European producer of olive oil (461,200 tonnes in 2014; 19% of the total EU production); two-thirds of the production is represented by extra-virgin olive oil with 41 Protected Designation of Origin (PDO) and 2 Protected Geographical Indication (PGI) areas, widespread over the whole national territory. Greece devotes 14% of its cultivated land to olive growing. It is the world's main producer of black olives. Moreover, Greece is the third producer of olive oil in the world; in average 350,000 thousand tonnes for the past 5 years, of which 82% is extra virgin.

Olive oil production for Spain, Italy and Greece, has important social impacts not only by being a source of income for the rural economy, but also by creating the most jobs per hectare within agricultural activities, and by maintaining the cultural and environmental heritage (CAP, 2008; Areal and Riesgo, 2012). In some European regions, olive oil is the most important agricultural activity, in terms of employment and percentage of cultivated area. Thus, Greece represents the first European country in terms of cultivation of olives with a 14% of land dedicated to the production of olive groves, followed by Cyprus, Italy and Spain (Mylonas, 2015). In terms of land productivity, Greece and Italy have the highest productivity with an average of 3 tonnes of olives per hectare for olives and olive oil. However, according to the Farm Accountancy Data Network (FADN) database (European Commission: 2012), the highest labour productivity of olive farms is attributed to Spain due mainly to the relatively high level of mechanisation and the relative big areas of olive trees. The Italian olive oil farms are of a small size (about 3 ha) (ISTAT: 2015) and most of them are family run. The olive area in Italy is fragmented and anchored, especially in southern Italy. This has as a result that production costs in the case of the Italian olive oil are higher when compared to other European olive oil producing countries like Spain, which has large production plants and a highly mechanized production system. Olive oil producing farms are on average bigger in Spain (12 ha of olive groves) when compared to Greece (3 ha) and Italy (3 to 5 ha). A common theme for both Italy and Greece is that the sector of olive oil is dominated by relatively small farms with low degree of commercial and professional training.

Taking into consideration the period 2006-2009, the share of family labour in Italy represents the 73% of the total labour productivity (European Commission: 2012). In term of costs, family labour for the Italian farms that produce olive oil, represents the major cost with a percentage of 47%. The Puglia and Calabria regions represent the most important producers of olive oil in Italy with the highest percentage of olive trees (ISTAT: 2015).

1.2 Olive oil consumption

The main producer countries of the Mediterranean basin are also the traditional consumer countries. However, the culture of olive oil is spreading to non-traditional areas of the world, through factors such as promotional campaigns and migration. There are, in fact, countries that over time saw coming within their borders conspicuous colonies of emigrant producing countries, and those that only recently have moved closer to the Mediterranean diet and knowledge of the health qualities of olive oil. In terms of consumption, the three main European olive oil producers are, at the same time, the major consumers (Italy 20%, Spain 18% and Greece 6%). The main consumer outside Europe is USA (10% of the world consumption) with an increasing demand. In ten years (2000 to 2010), its consumption has increased from 170 to 277 thousand tonnes (Mylonas, 2015), remaining the largest market among non-traditional consumers, after Italy. Benefitting from the increased US demand in 2011, Spain remains in first place as supplier, before Italy and Greece. A market with a high potential for EU olive oil production is China where olive oil could represent a luxury good for the Chinese consumers which has increased it consumption in olive oil by 69% since 2008/2009. During the 2012/2013 harvesting year China represented the 2% of the world consumption.

1.3 Olive oil international trade

Despite the global economics and the international financial crisis, the international trade of olive oil remains strong. As it is possible to observe in Fig. 1 the world production of virgin olive oil increased over years, in order to meet the increasing international demand. The world production of olive oil passed from 0.14 million of tonnes in 1961 to 3.5 million of tonnes in 2012.

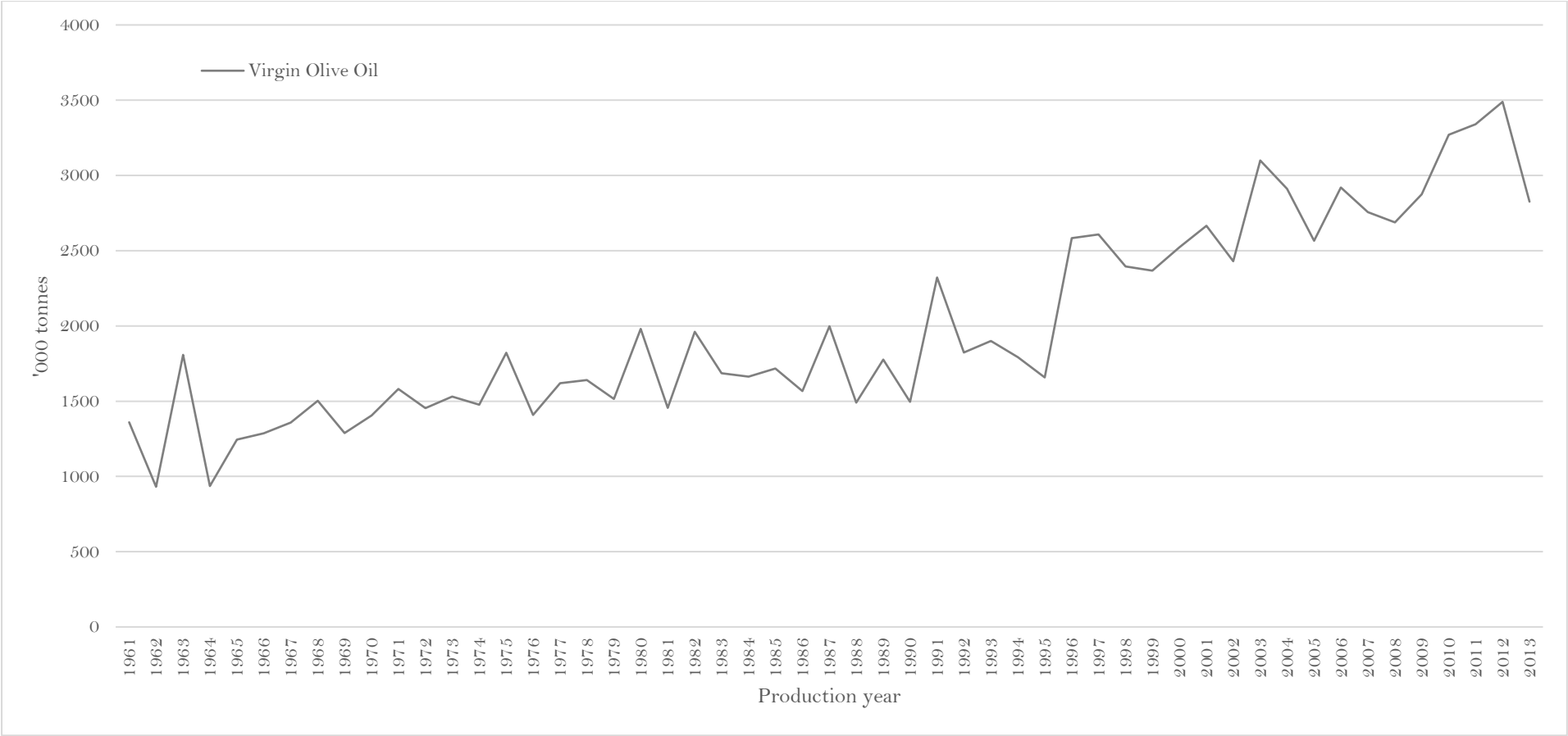

Fig. 1: World production of virgin olive oil. Source FAOSTAT, accessed 02 September 2015

The global exports of virgin olive oil according to data retrieved from FAOSTAT have increased sensible during the period 1961-2012. As it is possible to observe in Fig. 2, the exportations passed from 0.20 millions of tonnes in 1961 to 1.7 million of tonnes in 2012.

Regarding worldwide exports Europe is the main exporter in the world (79%) accounting for 621,000 thousands of tonnes of olive oil while Spain is the main net exporter of olive oil within Europe. During the season 2013/2014, Spain's average share of world exports was 50%, followed by Italy with 40%, Portugal with 9%, Tunisia with 8%, Turkey with 4% and Greece with 1%.

The level of importation shows the same trend of increasing. The world olive oil import have more than double from 0.22 million of tonnes in 1961 to 1.8 million of tonnes in 2012.

In particular, USA is the country with the highest percentage on average on imports for virgin olive oil (39%) followed by Brazil and Italy (9% each). At European level, Italy is the first importer (78% of the European importation). Italy imports from North Africa (Morocco and Tunisia), but also from European Countries (Spain and Greece). The big manufacturing companies in Italy are buying bulk olive oil in order to produce a branded product for the final consumers. According to Mylonas (2015), these companies are able to dominate the market due to the combination of different strategies such as a strong brand name, fine quality and at the same time large quantities.

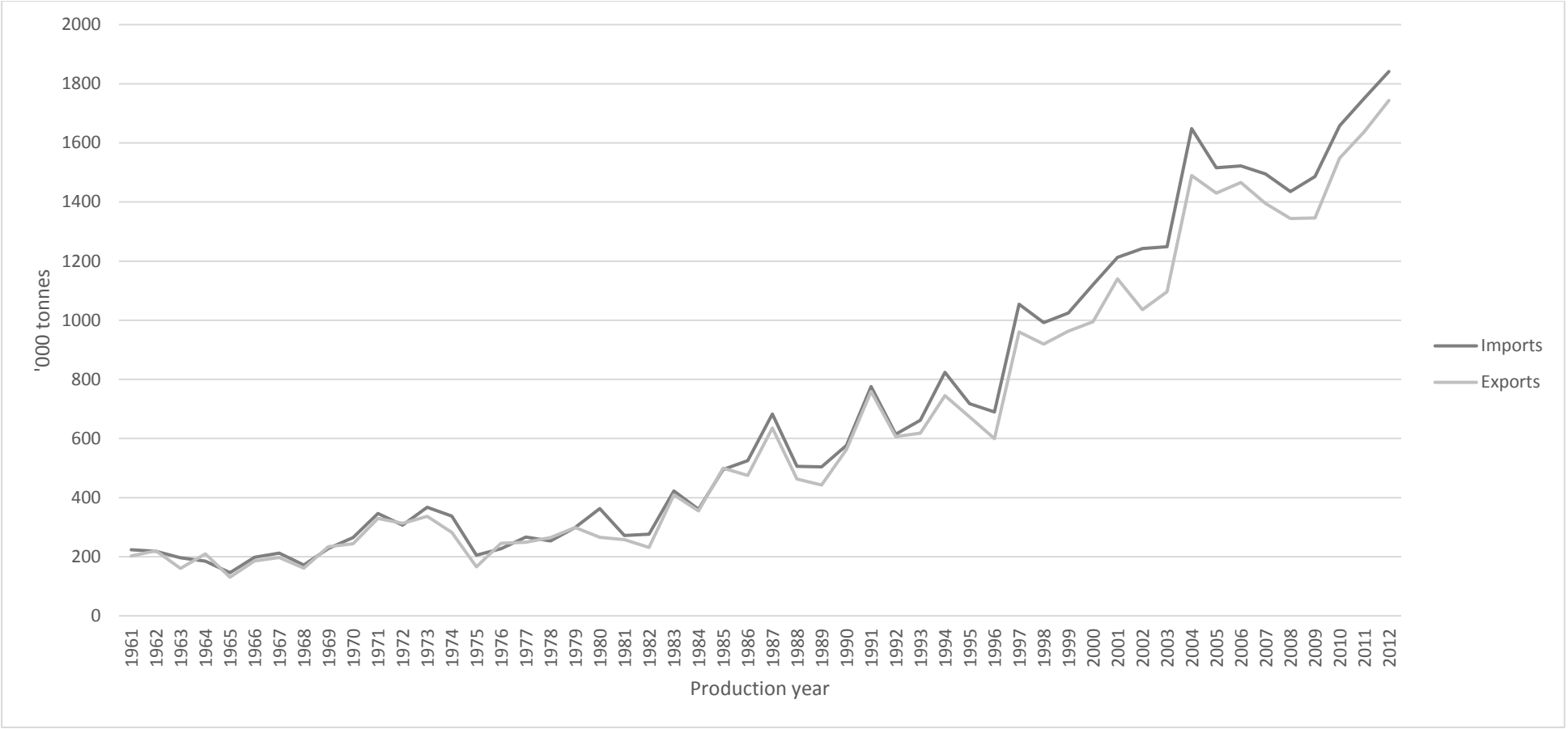

Fig. 2: World imports and exports of virgin olive oil. Source FAOSTAT, accessed 02 September 2015

1.4 The Italian virgin olive oil production sector

In Italy, olive oil production represents one of the most important agricultural activities in terms of income generated and employment. In the last decade a turn to a more qualitative production has been promoted for the Italian olive oil sector. In fact, Italy has the most Protected Denominations of Origin (PDO) and Protected Geographic Indications (PGI) that any other EU olive oil producing country. In particular, 42 PDO and 2 PGI (Toscana and Tuscia) are counted. In order to underline the importance of the production of olive oil in Italy it is worth to mention that Italy has the highest number of olive varieties (more than 500 varieties). The production of virgin olive oil for Italy, as is shown in the Fig. 3, remained at the same level during the production years of 1992 to 2013. The mean production of virgin olive oil during this period is 565 '000 tonnes (The mean production since 1961 is 518.66). During that period of 21 years 3 major reforms of the Common Agriculture Police took place, the 1992 reform (the MacSharry reform) introducing price cuts and compensatory payments, surplus reduction, income and budget stabilisation. This was followed by the Agenda 2000 which is emphasising on rural development. Finally the 2003 cap reform was aiming for a European Agriculture sector which is more market oriented, decoupled payments, is introducing a cross compliance scheme as well as measures to protect the environment and take into consideration consumer concerns.

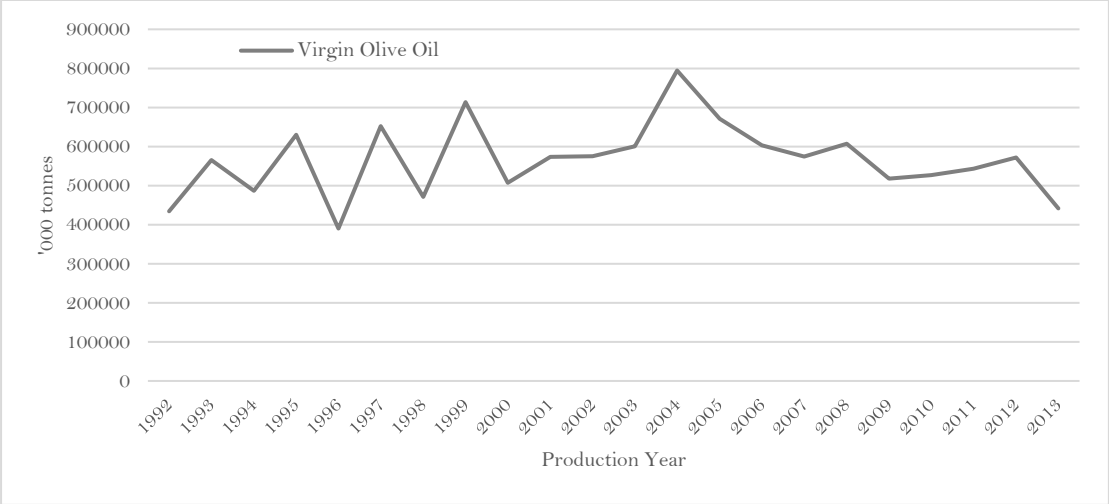

Fig. 3: Italian production of virgin olive oil. Source FAOSTAT, accessed 02 September 2015

During the years of 2000 – 2010, production costs for the Italian virgin olive oil producers had increased per ton, however, a steady and significant increase on producer prices has increased margins over the period by +22% and +96%[1]. In addition, an improvement in production techniques is indicated by the fall (90% in 2000 to 71% in 2009) in the share of the family labour productivity. However, as it is reported by the FADN (European Commission: 2012), total labour productivity fell, but family labour productivity remained stable. Due to the favourite trends on price and margins, income for the Italian virgin olive oil producers rose slightly or stabilised over the years of 2000-2010.

As regards trade, Italy is a significant net importer of virgin olive oil. The level of imports has shown high variability during the last decade but however, there is no evidence of a clear trend. In relation to

[1] Difference between the three year average 2000-2002 and the three year average 2007-2009

exports a positive trend can be observed with a constant increase in Italian olive oil exports during the last decade as it can be observed in Fig 4.

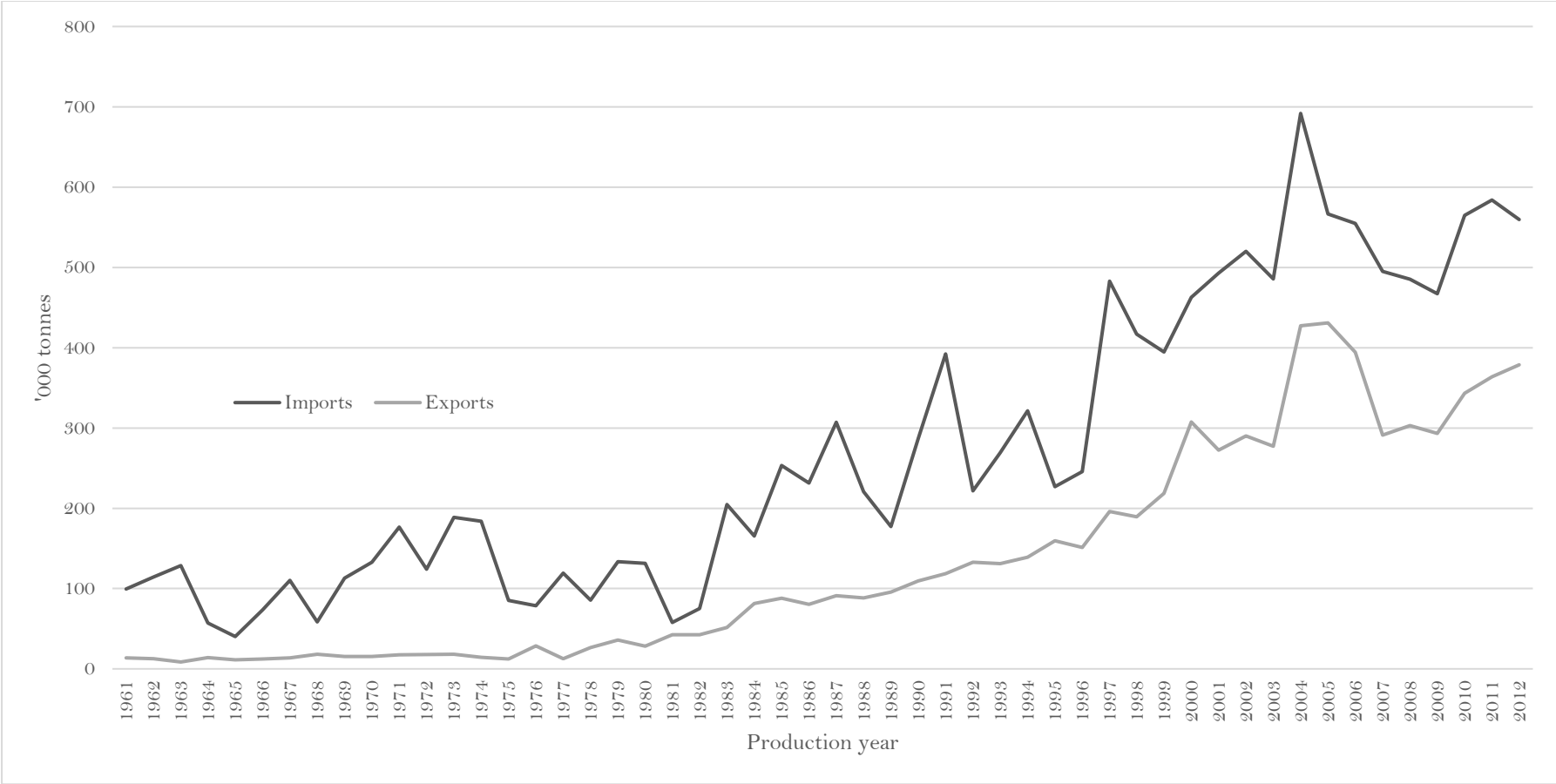

Fig 4: Italian imports and export of virgin olive oil

2 Background of the study

The reform of 2003 had introduced a radical rebuilding of the support policy for the Italian virgin olive oil sector by introducing a scheme of decoupled income support to farmers and also introducing the cross compliance[2] of agricultural production. Decoupled payments are received by olive oil produces in Italy after the harvest of 2004/2005. Thus, the main objective of this study is to explore the impacts in the Italian Olive Oil sector from 2005 onwards. The 2003 Fischer reform sets the major change in the Common Agricultural Policy from a qualitative point of view up to that date, since it has introduced a mechanism of payment with the aim of promoting food quality and incentivize the communication between producers and consumers (Carbone and Sorrentino, 2006).

The main change in the CAP reform was that the direct payments were 'decoupled' and included in the single payment. However, this policy was rather flexible since it allowed member states to apply it at a national or regional level with payments being flat payments, historic payments or a combination of both. In the case of the olive oil sector 60% of the production-linked payments for the reference period were converted into new entitlements to the single farm payment scheme. Member States retained the rest for the granting of an additional direct payment for low output and marginal olive groves and for olive groves with environmental and traditional value as well as for quality policy[3]. The Italian Government opted for a fully decoupled historic model with financial support associated with quality, traceability, market, and environmental aspects. The new policy for the olive-growing sector started in the olive years 2005/2006 (Ministry of Agriculture, 2005).

As evidence by Casieri et al. (2008) the CAP reform, in a form of unique payment, can represent an advantage for the farms due to the subsidies that is fixed and not related to the production, as was in the past. However, as the authors underline, for the olive oil producers this is only theoretic due to the characteristic of the olive tree. In fact, the biological cycle of the olive tree and the long time necessary for the new plants to be productive as well as the Italian normative (LEGGE 14 febbraio 1951, n. 144) that forbid expanding the number of olive trees, make rigid the production of olive oil.

As argue by Goodwin and Mishra (2006) the decoupled payments are not really able to affect the production. The study, using farm level data demonstrate that the introduction of direct payment doesn't bring important distortions in the production.

In the past, various efforts have been made in the literature to present the effects of the decoupling payment in the CAP. The literature refers to analyse the effect of the decoupling at different regional level and in most of case in specific agricultural product or for specific countries. Previous literature found that the impacts of CAP reform are diverse. Thus, whereas the CAP reform was found to have a limited effect on farm structure, the use of the land, investment (Lobianco and Esposti, 2006) an insignificant effect on farmers' off-labour participation (Corsi and Salvioni, 2012), it was also found that the effect of the reform on investment was dependent on the structure of the farm with positive effects

[2] Cross-compliance is a mechanism that links direct payments to compliance by farmers with basic standards concerning the environment, food safety, animal and plant health and animal welfare, as well as the requirement of maintaining land in good agricultural and environmental condition

[3] http://europa.eu/rapid/press-release_IP-03-1514_en.htm

on investment for big farms (Viaggi et al., 2009). Also, Severini and Tantari (2012) found that decoupling payment contribute to farm inequality. Regarding the effect of decoupling on productivity Kazukauskas et al. (2014) found a positive relationship between the decoupling payment and productivity using farm data from Ireland, Denmark and Germany. Finally, Nordin (2013) found that the CAP subsidies given to grassland had a significant impact on the Sweden employment despite the increase in costs associated with the cross-compliance requirement.

Pérez Hernàndez et al. (2006) studied the effect of the CAP reform in the olive oil sector in Jaen, a Spanish region famous for the production of olive oil, with the aim of measure the effect of the decoupling on the farms margin and the effects of a reform of the Common Organization of the Market (CMO) on the olive tree farming. The authors found that in the perspective of a reform of the CMO, the effect of the changing in agricultural subsidies will depend on the production level of the olive trees. In details, in case of year with low production, the aids will be less than the coupling subsidies. In addition, the authors' evidence that is necessary to keep the subsidies, especially for the farms located in semi-desert lands.

A recent work conduct by Tocco et al. in 2014 studied the effect of the CAP on the labour allocation. The authors implemented a bivariate probit model with selection using micro data from the European Union Labour Force Survey (EU- LFS) and the FADN database from 2005 to 2008. The results of the study underline the fact that the topic about the subsidies in agriculture is complex. In addition there are differences between the New Member States (in this case Poland and Hungary) and the Old (France and Italy). In particular, while for the new members CAP had a positive impact on the survival of the farms, for France and Italy the results were not significant. The study shows that there are not relevant discrepancies between the coupled and decoupled subsidies and it needed further research at this point.

The objective of this paper is to explore differences at a regional and country level of the introduction of decoupled payment in the Italian olive oil sector. From an economic/production perspective we would not expect variation in the production of olive oil post and ex ante the 2003 reform. This would be mainly due to the fact that the production of olive oil is the only source of income for rural and decentralized parts of the Italian country side. Moreover, since olive farms for olive oil are long term establishments any changes in the number of trees to increase production will require data for more than a decade. However, a model is developed in this paper to test this assumption.

3 Materials and methods

3.1 FADN data used in the study

Production and input costs data for the Italian olive oil farmers at regional level were obtained from the EU olive oil farms report of the European Commission (2012) based on the database of FADN[4]. The report, analyses structure, costs of production, margin and income indicators. Data covers 10 years, from 2000 to 2010 and represents the 53% of specialised farms [5]of the total EU-27 olive grove area and 73% of the total olive oil production. The aim is to potentially capture and consider the seasonality of the olive tree. In particular, the olive oil is subject to a seasonality in production due to the biological cycle of the plants (the biological cycle is almost two years) (Rezitis and Sassi: 2013).

The data were collected at micro level based on a sample of farms representative of the production systems in the country. In order to consider the differences in production among the regions, eight representative regions in terms of surveyed farms are considered: Liguria, Toscana, Umbria, Lazio, Campania, Calabria, Puglia and Sicilia. For each region a dummy variable was introduced in the model. In addition, costs that are able to influence the technical efficiency of the farms were taken into consideration. Production costs are categorised into specific costs and farming overheads. In particular, specific costs include fertiliser, crop protection, fuel, water and other specific costs. In addition, farming overheads is the sum of the costs for building and machinery upkeep, energy, contract work, and other direct costs. Table 1 and 2 present the descriptive statistics of the production costs per region.

Table 1: Descriptive statistics of olive oil production costs per region: average values of 2000-2010 period. Values in €/t olive oil

REGION	**PRODUCTION COSTS**						
	Fertiliser	**Crop Protection**	**Fuel**	**Water**	**Other**	**Total**	**Overhead Costs**
LIGURIA	*M* = 380.22, *S.D.* = 92.18	*M* = 165.11, *S.D.* = 83.50	*M* = 144.33, *S.D.* = 45.16	*M* = 59.97, *S.D.* = 41.00	*M* = 687.78, *S.D.* = 207.17	*M* = 1437.41, *S.D.* = 359.24	*M* = 559.56, *S.D.* = 214.31
TOSCANA	*M* = 285.70, *S.D.* = 60.56	*M* = 144.40, *S.D.* = 37.93	*M* = 390.60, *S.D.* = 116.18	*M* = 11.92, *S.D.* = 17.37	*M* = 1050.70, *S.D.* = 262.54	*M* = 1883.32, *S.D.* = 278.05	*M* = 1238.20, *S.D.* = 316.20
UMBRIA	*M* = 308.40, *S.D.* = 119.18	*M* = 116.40, *S.D.* = 27.42	*M* = 311.80, *S.D.* = 70.37	*M* = 9.24, *S.D.* = 14.09	*M* = 734.80, *S.D.* = 179.47	*M* = 1480.64, *S.D.* = 303.86	*M* = 514.30, *S.D.* = 85.66
LAZIO	*M* = 182.30, *S.D.* = 70.83	*M* = 182.30, *S.D.* = 70.83	*M* = 289.00, *S.D.* = 139.36	*M* = 7.03, *S.D.* = 8.44	*M* = 441.30, *S.D.* = 150.75	*M* = 1052.83, *S.D.* = 295.45	*M* = 436.80, *S.D.* = 120.10
CAMPANIA	*M* = 169.78, *S.D.* = 58.41	*M* = 131.22, *S.D.* = 62.53	*M* = 295.89, *S.D.* = 106.83	*M* = 12.51, *S.D.* = 12.75	*M* = 250.11, *S.D.* = 85.69	*M* = 859.51, *S.D.* = 201.79	*M* = 421.44, *S.D.* = 88.78
PUGLIA	*M* = 190.50, *S.D.* = 62.65	*M* = 88.80, *S.D.* = 24.17	*M* = 88.80, *S.D.* = 24.17	*M* = 19.78, *S.D.* = 7.11	*M* = 380.40, *S.D.* = 68.55	*M* = 885.78, *S.D.* = 211.18	*M* = 611.10, *S.D.* = 114.60
SICILIA	*M* = 191.20, *S.D.* = 12.49	*M* = 85.40, *S.D.* = 28.47	*M* = 171.60, *S.D.* = 24.80	*M* = 24.84, *S.D.* = 22.63	*M* = 409.30, *S.D.* = 91.84	*M* = 882.34, *S.D.* = 116.91	*M* = 313.10, *S.D.* = 67.24

M = Mean, S.D. = Standard Deviation

[4] The FADN is a European system of sample surveys that take place each year and collect structural and accountancy data relating to farms. The aim is to monitor the income and business activities of agricultural holdings and to evaluate the impacts of the Common Agricultural Policy (CAP)

[5] Farms specialised in olive oil production cover producers of olives for oil, olive oil and mixed producers of both olives for oil and olive oil

Olive oil farms from Calabria produce on average more than other regions thanks to a better yield, but prices are relatively low, as in Puglia. The share of family labour is low (59%) compared other regions, in particular Lazio (92%). Their family labour productivity (quantity produced by family work unit) is higher than in other regions, enabling them to reduce the total cost per tonne significantly. Due to this, and despite the lower price, they generate a positive net economic margin, so their production method and organisation is profitable (Source: European Commission: 2012).

3.2 The olive oil production model: Assessing the impact of decoupled payments

A Cobb-Douglas production function is estimated for olive oil production systems in particular the equivalent linear form of the function is as below:

$$log(y_{ti}) = \beta_0 + \beta_1 log(Price.kg_{ti}) + \beta_2 log(Olive.Grov.Ha_{ti}) + \sum_{i=3}^{7} \beta_i Region_{ti} + \beta_3 log(Labour.AWU_{ti}) + \beta_4 log(Spec.Cost_{ti}) + \beta_5 log(Overhead.Cost_{ti}) + \beta_6 D.Paym_{ti} + \beta_6 Paym_{ti} + u_t \quad [1]$$

where y_t is the olive oil production in year *t*; $Price.kg_t$ is the producer price received by region in euros, in year *t;* $Olive.Grov.Ha_t$ is the olive grove area per region in year t; $Labour.AWU_t$ is the total labour input per annual working unit per region in year t: $Spec.Cost_{ti}$ is the sum of all the specific costs as these are defined in the previous section per region in year t; $Overhead.Cost_{ti}$ is a variable representing the sum of all the overhead costs as these are defined in the previous section per region in year t; $Paym_{ti}$ is a continuous variable representing the coupled and decoupled payments received by olive oil farmers per region in year t, the amount of the payment is expressed in euros, and is used to observe differences during the passage from the old CAP (1992 reform and Agenda 2000) to the new 2003 CAP reform; finally, $D.Paym_{ti}$ is a dummy variable used to ponder the possible effects of the decoupled payments in our model (Coupled payment = 1 and 0 otherwise) (Fischler reform implementation). Furthermore, the variable $Region_{ti}$ represents the different olive oil production regions in Italy taken into consideration in the model (the reference region in the model is Sicilia).

Table 2 presents the variations in yield of olive oil and the amount of payment per region and macro area. The differences in yield and payments between the Italian regions are evident. The yield of olive oil is higher in the South. This is mainly related to the climatic conditions of this part of the country. In Southern Italy, the mild climate allows greater growth of the plants and consequently a high productivity. In addition, since the payment is related to the production, the amount of payment is related direct to the yield.

Table 2: Yield of olive oil per region (t/ha) and support payments received by olive oil farmers during the 2000 – 2010 period

	LIGURIA	TOSCANA	UMBRIA	LAZIO	CAMPANIA	PUGLIA	SICILIA	CALABRIA
	YIELD OLIVE OIL (T/HA)							
MEAN	0,74	0,35	0,44	0,55	0,79	0,64	0,79	1,30
MIN	0,62	0,25	0,28	0,38	0,61	0,52	0,63	0,91
MAX	1,03	0,45	0,67	0,80	0,90	0,81	0,98	1,91
	SUPPORT PAYMENTS RECEIVED OVER THE 2000 – 2010 PERIOD (€/AWU)							
MEAN	1474,44	1784,60	2620,5	1962,20	2574,56	6830,70	3210,20	4666,30
MIN	1035	1125	1410	945	1320	5706	1674	1700
MAX	1926	2450	3466	3676	3795	9327	4956	7568

In Table 3 descriptive statistics of the variables used in the Cobb-Douglas production function are presented. Note that all individual input production costs are aggregated in to two major categories (i.e. Specific Costs and Overhead Costs). These are defined specifically in section 3.1

Table 3: Descriptive statistics of the variables used in the Cobb-Douglas production function per year

	PRODUCTION OF OLIVE OIL (TONNES)		PRICE OF OLIVE OIL (€/KG)		AREA OF OLIVE GROVE (HA)		TOTAL LABOUR - AWU		SPECIFIC COSTS		OVERHEAD COSTS	
YEAR	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
2000	2.50	0.80	5.09	2.55	4.5	1.07	0.97	0.35	926.99	418.87	458.88	202.92
2001	2.92	0.98	4.79	2.49	5.17	1.47	0.97	0.32	986.73	464.91	473.67	270.61
2002	3.30	1.72	5.24	2.79	5.12	1.96	1.06	0.23	1012.68	587.74	448.75	304.53
2003	2.68	1.14	5.57	2.49	4.62	0.92	1.06	0.28	1115.90	407.06	583.38	478.42
2004	3.08	1.12	5.19	2.13	4.25	1.28	1.02	0.22	1192.79	535.30	482.25	269.07
2005	3.02	1.48	5.50	1.90	4.25	0.71	0.98	0.27	1214.14	417.47	530.25	279.15
2006	2.84	1.10	5.72	2.40	4.00	0.76	1.04	0.35	1228.33	484.87	583.62	353.00
2007	2.69	1.43	6.08	2.40	4.12	0.83	1.11	0.26	1424.51	546.49	609.88	410.98
2008	2.81	1.24	6.10	2.26	3.62	0.74	1.02	0.28	1091.78	386.76	587.12	400.86
2009	2.72	1.17	6.33	2.47	3.75	0.71	0.97	0.32	1055.92	520.3	580.50	425.06

Mean and S.D. represents the average value and variance between the regions in the same year

4 Results and discussion

Using panel data a Cobb-Douglas production function of virgin olive oil has been estimated. The model controls for differences among the regions, the years as well as for differences in the type of payments.

Table 4: Estimates of the Cobb-Douglas production function controlling for the difference between regions and years

Variables	Coefficient	Std. Error
Intercept	3.92	0.53***
Olive oil Price (€/kg)	-0.09	0.20
Are of Olive Grove (ha)	0.43	0.13**
Total Labour - AWU	0.65	0.15***
Production Specific Costs (€/t olive oil)	0.13	0.07.
Overhead Costs	-0.40	0.07***
Toscana	-0.08	0.15
Liguria	-0.15	0.13
Umbria	-0.17	0.12
Lazio	-0.22	0.07**
Campania	-0.08	0.04*
Puglia	0.20	0.12.
Calambria	0.01	0.08
Payments (1 = coupled, 0 otherwise)	-0.17	0.06**
Support Payments (€/AWU)	0.00	0.00

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Multiple R-squared = 0,88, Adjusted R-squared = 0.71, F-statistic = 33.94, p-value < 0.001

One of the most important input costs in olive oil production systems in Italy is labour. According to the results it is also one of the factors that have a positive impact into the production of olive. We could expect that a 1% increase in labour when all other variables are kept constant in the model, increases olive oil production by 0.65% ($\beta_3 = 0.65,\ p - value < 0.001$) . In addition, increasing the area used for olive grove by 1% will increase the production of olive oil by 0.43% ($\beta_2 = 0.45,\ p - value < 0.01$). Furthermore, production specific costs have an also small but positive impact on the production of the Italian olive oil ($\beta_5 = 0.13,\ p - value < 0.1$) On the other hand, an increase in overhead costs by 1% will reduce production of olive oil by 0.40% ($\beta_6 = 0.40,\ p - value < 0.001$). The olive oil price received by the Italian olive oil farmers has a negative impact to olive oil production however, it is not statistically significant.

Considering the variables directly related to the direct payments received per region and per year it is possible to observe that the payment expressed in amount has not impact on the production of olive oil. This can be mainly explained by the fact that financial support for the Italian olive oil sector is associated with quality, traceability, market and environmental aspects. Hence, the 2003 reform created incentives for a greener production and better quality of the final product. However, there is evidence that production of olive oil was less by 17% during the years of coupled payment when these are compared to the period of coupled payments ($\beta_{14} = -0.17,\ p - value < 0.01$). Hence, the model indicates a positive relationship between decoupled payments and production. This contradicts the conclusions of Godwin and Mishra (2006), who supported that the decoupled payments are not really able to affect the production of olive oil. Moreover, the latter confirms the objective of cross compliance. In other words, the difference captured by the dummy variable between the pre 2005 (Fischler reform implementation) and the post 2005 period can be explained by the incentives created to farmers for a more efficient and productive system.

Statistically significant differences in production of olive oil when we control for the 2000-2010 period are observed for Lazio, Campania where production of olive oil is less that the reference region Sicilia and Puglia where production of olive oil is more than Sicilia ($\beta_9 = -0.22,\ p - value < 0.001, \beta_{10} = -0.08,\ p - value < 0.01\ and\ \beta_{11} = 0.20,\ p - value < 0.1$ respectively). The latter can be supported by the fact that Sicilia over the last three years of the period under consideration, showed positive trends in terms of labour efficiency, yield and improvement of production methods. The area of origin seems to be an important driver for the production of olive oil. In fact the Italian territory is high heterogeneous with respect to climate, soil, natural factors. To be consider the diversity in terms of skills, reputation, tradition and so forth. From the results these aspects are likely to emerge. This lead to the conclusion that, in the olive oil sector, the region of origin is an important aspect to be considered. In line with the previous literature (Kazukauskas et al.:2013, Tocco et al.: 2014), in general terms, the area of origin play an important role.

5 Conclusions

The 2003 reform of the Common Agricultural Policy is marked as the passage from the coupled to the decoupled payments and represents one of the major European Union Reforms in the agricultural sector. The main objective of this reform was not to increase yield but to support the quality of the olive oil produced in Europe as well as to introduce management practices that will improve the environmental performance of olive oil farms (Cross Compliance scheme).

Based on the data provided by the Farm Accountancy Data Network (FADN), a Cobb-Douglas production function was estimated in order to study the impact of the reform on the Italian production of olive oil, and differences in trends among the regions. As expected increasing the area under olive groves as well as improving labour productivity have positive impacts on the production of olive oil.

Results showed no evidence that the level of payments have any impact to the level of production, however, the type of payments has. This can either be explained by the incentives introduced toward to a more efficient, responsible and quality olive oil production or through the fact that production conditions were more favourable during the 2005-2009 period. Further research is required in order to decompose this effect.

It is important to underline how the current analysis of the Italian olive oil production demonstrates the complexity of the sector. A more detailed model will be required in future efforts that will be able to take into account the seasonality of the crop, the different regional characteristics, the type of crop as well as other managerial characteristics influencing production. In particular it is necessary to increase the availably of the data in order to look further back in time and to include, in the study, more recent years.

Also, it will be interesting to distinguish between Least Favourable Areas (LFA) with the remaining areas of Italy in order to observe if there are differences of the effect of decoupling payment on the production of olive oil in areas where coupled payments were able to maintain production and support local livelihoods. As a consequence, will be worth to expand the analysis at farm level, based on the availability of the FADN- RICA database.

After all, if possible, develop a paradigm which could be used for similar analysis to the remaining EU countries and try to answer the question of the relationship between environmental performance (Cross Compliance) and decoupled payments.

In addition, future work should explore the impact of the 2003 reform into the technical and production efficiency of the Italian olive oil farmers. It will be interesting to link the measures introduced by the cross compliance and the management practices of the different farms to have a more complete picture of the various parameters influencing the production of olive oil.

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