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Farm level impact of rural development policy: a conditional difference in difference matching approach

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Abstract

We use a conditional difference-in-difference matching estimator and a 2003-2007 balanced panel drawn from the FADN Italian sample to evaluate the impact at the farm level of the implementation of the first Italian Rural Development Programme (RDP).

We find that, in average, farms receiving at least a RDP payment increased family labor, while they did not increase total labour employed on farm. In addition, they experienced an increase in labor profitability and added value, even though the estimate significance varies accordingly to the matching method used. Our findings, suggest that the implementation of the first RDP produced a positive direct impact on rural GDP, while it did not prove to be effective in terms of rural employment growth.

Keywords: Common Agricultural Policy, Rural Development Policy, conditional diff-in-diff matching

JEL classification: Q12, Q18, C14.

1. INTRODUCTION

The aim of this paper is to assess the impact at the farm level on several relevant variables, namely on-farm structural and economic performance indicators, of the first Italian Rural Development Programme (2000-06 period).

Starting from the reform of the Structural Funds (1988), when a system of monitoring and evaluation in EU regional policies (OECD, 2009a) was originally introduced, the evaluation of EU activities has grown importance over time and it now forms an integral part of the policy process.

The principal aims of these various evaluations may be characterized as supporting decision-making, improving the implementation of policy measures, assisting in resource allocation and enhancing accountability and transparency of public policies (OECD, 1999; EC, 2006).

The evaluation of the Rural Development programmes was initially supported from the European Agricultural Guidance and Guarantee Fund (1999) and later from the Handbook on Common Monitoring and Evaluation Framework (CMEF) (EC, 2006). The CMEF acts as a guide for the evaluation of rural development polices in the programming period 2007-2013.

The CMEF evaluation approach employs a hierarchy of indicators combined with evaluation questions (CEQs)[1], often used for EU-wide policy programmes. A major drawback of the CMEF approach is that, given the heterogeneity of rural areas in the EU, some CEQs bear little relevance to the circumstances of particular Member States or regions. In such cases, there is a danger that answers given are of poor quality or doubtful validity. As a consequence, the question arises whether alternative evaluation approaches can be used to evaluate the effectiveness of rural development measures, i.e. the outcome in relation to the objective(s) of the measure, in specific environments.

In addition to this, alternative methods can be of help in evaluating the impact of RDP or of single measures, i.e. the net effect or changes on specific variables at the farm or territorial level. In an impact assessment study, one of the most difficult issues is the possibility of selection biases. This problem occurs because we would like to know the effect of a treatment, in this case the participation in a RDP, on the participant farms' outcome but cannot observe the outcomes with and without treatment on the same individual farm at the same time. Simply comparing mean outcomes may not reveal the actual treatment effect, as participants and non-participants typically differ even in the absence of treatment (Caliendo and Kopeining, 2008). For example, farmers participating to a scheme may differ systematically from non-participating farmers and the above simple mean comparisons may reflect differences in their characteristics rather than the impacts of participating in the programme. In other words, failure to account for treatment selection biases may lead to biased estimation of the true treatment effect.

A few empirical studies have been looking at the impact of farm and rural policy programmes controlling for the non-random assignment of subjects to treatment, and the selection bias (Lynch and Liu, 2007; Lynch, Gray, and Geoghegan, 2007; Pufahl and Weiss, 2009; Chabé-Ferret and J. Subervie, 2010).

This paper aims to contribute to the literature by providing a micro perspective on the impact of the participation of farms in the first Italian rural development programme on farm employment and profits.

The remainder of the paper is organized as follows. Section two provides overview about the EU rural development policy and its implementation in Italy. Section three presents the data and the propensity score matching (PSM) method, i.e. the semi-parametric econometric approach used to compare the performance of farmers participating and non-participating to the first Italian RDP (2000-2006) by accounting for their inherent differences. Section four presents the estimation results and in section five conclusions are drawn

[1] According to the guidelines in the CMEF handbook (EC, 2006), data for about 160 indicators (of which 83 output indicators, 12 result indicators, 7 impact indicators, 36 objective related baseline indicators and 23 context related baseline indicators) have to be collected and analysed and nearly 140 common evaluation questions (CEQs) have to be answered.

2. BACKGROUND

2.1. The EU´s Rural Development Policy

The EU´s rural development policy evolved from a policy dealing with the structural problems of the farm sector to a policy addressing the multiple roles of farming in society and, in particular, challenges faced in its wider rural context.

Agenda 2000 established rural development policy as the second pillar of the EU's Common Agricultural Policy and brought rural development under a single regulation to apply across the whole of the European Union for the period 2000-2006. Besides agricultural restructuring, it addressed environmental concerns and the wider needs of rural areas.

Council regulation 1257/1999 proposed a menu of 22 measures that could be implemented by Member States in their Rural Development Programs. In 2003, the mid-term review of the CAP added new measures to promote quality and animal welfare, and help for farmers to meet new EU standards. The final set of 26 measures can be structured around 3 axes addressing the broad issues of: agricultural restructuring, protecting the environment and countryside; and strengthening the local rural economy and rural communities.

The mid-term review also led to a strengthening of rural development policy via the provision of more EU money for rural development through a reduction in direct payments (‘modulation’) for bigger farms.

The total financial plan for all Rural Development financial instruments amounted to around 64.4 bio euros over the period 2000-2006. Agri-environmental measures covered 45% of total expenditure, followed by Less Favored Areas support (21%), encouragement of adaptation of rural areas (10%), forestry measures (9%), investment in agricultural holding -including setting-up of young farmers and training- (6%), early retirement scheme (5%), processing and marketing of agricultural products (3%) and the others (2%).

Considerable simplification has been introduced in the new programming period 2007-2013 as compared to the previous one. Rural Development is now financed by a single fund: the European Agricultural Fund for Rural Development. The previous 5 types of programming have been reduced to a single one, and there is now a single financial management and control framework instead of three.

The Rural Development policy serves the aims of a) improving the competitiveness of agriculture and forestry by encouraging farmers to structural changes; b) improving the environment and the countryside; c) improving the quality of life in rural areas and encouraging diversification of economic activity.

Emphasis has been put on the potential of Rural development measures to create new working places and better working conditions, hence to contribute to the Lisbon strategy of growth and jobs.

An analysis of the DGAGRI (European Commission, 2009) based on 2000-2006 Farm Accountancy Data Network (FADN) data, inform us that total RD support in the EU-25 corresponds on average to €1337 per Annual Working Unit (AWU) or €61 per ha of Utilized

Agricultura Area (UAA). The support granted under the RD policy is equivalent to 22% of average 'first pillar' direct payments (including national aids). On average in the EU-25, RD farm recipients tend to be bigger farms than non-recipients (40 European Size Unit compared to 31 ESU, 52 ha compared to 24 ha). Their Farm Net Value Added (FNVA) per annual unit of labor (€19436/AWU) is similar to that of non-recipients (€18303/AWU), but their labor profitability is significantly lower, at -€2336/AWU compared to -€179/AWU for non-recipients.

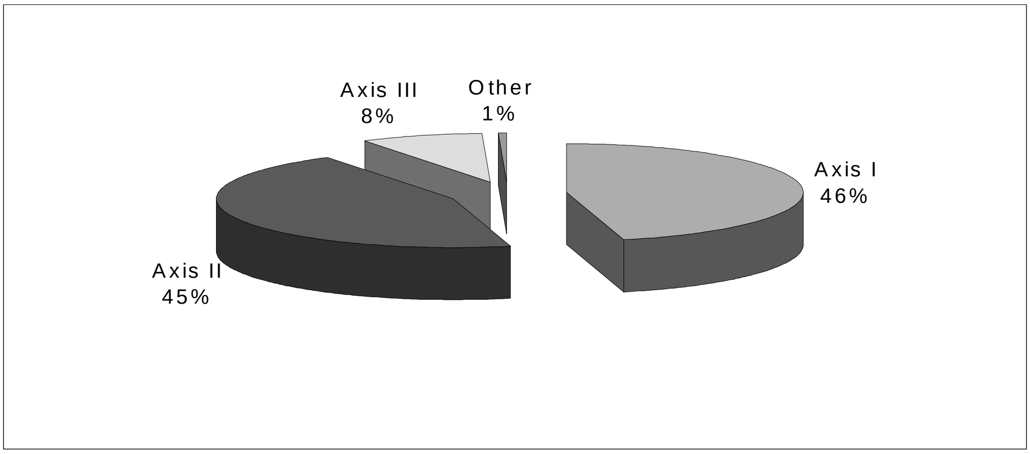
The total direct support received by RD recipients corresponds to 60% of their FNVA: 42% from the 'first pillar' (€8094/AWU, €264/ha, including national aids) and 18% from the 'second pillar' (€3530/AWU, €115/ha). This means that without any direct support, all other things being equal, the amount available to remunerate the production factors of RD recipients would otherwise be 60 % lower. In comparison, the direct support received by non-recipients (€ 4 743/AWU, € 286/ha) represents only 26 % of their FNVA.

2.2. The first Italian Rural Development Programme 2000-06

For the implementation of the rural development policy in Italy, 51 different regional programmes.

The Centre-North Regions had one RDP for rural development measures funded mainly through Pillar 2 of the CAP. They may, in principle, contain all the 26 rural development measures. In the South, that is in Objective 1 regions, the RDPs cover only the 8 "accompanying measures" (early retirement, less favoured areas, agri-environment, afforestation of agricultural land, 2 quality measures and 2 meeting standards measures) while the remaining "non- accompanying measures" are integrated into the Objective 1 programmes, that is into the Regional Operational Programmes (ROP) under the Community Support Framework.

Figure 1. Expenditures by axis



Source: own elaboration

The financial resources of the 49 different Rural Development Programmes were mainly concentrated on the measures aiming at enhancing agricultural competitiveness (i.e.

investments in agricultural holdings (12.6%), the setting-up of young farmers (5.8%), improvement of processing and marketing of farm products (6.5%)) and sustainability (i.e. new agri-environmental measures (18.5%), compensatory allowances (6.7%). While policy measures devoted to measures promoting non agricultural rural development (diversification of economic activities, infrastructures and services) covered less than the 10% of total resources (Fig. 1).

It is also interesting to note the time profile of expenditures and their distribution by measure. In the early years of the programme only a little amount of funds were used, in addition most of the expenditures were related to the agro-environmental payments (70%) – mainly due to the continuation of the payment started under the EU Reg. 2078/92. In the last two years of the programming period the expenditures increased and at the same time the amount of resources devoted to the agro-environmental payments reduced to 20% of the total expenditures.

According to the OECD Italian RD policy continued to: 1) target agricultural competitiveness as the main priority for spending; 2) result in low quality interventions because regions were targeting some measures based on speed of spend; 3) be insufficiently innovative in the area of rural economic diversification; 4) limit the potential for scaling-up development capacity and shared learning by dedicating relatively few resources to integrated rural development planning tools (like LEADER and ITPs); 5) lack co-ordination at the regional and central levels; and thus 6) lack a discernable rural vision (OECD, 2009c).

3. DATA AND METHODOLOGY

3.1. Data

The analysis is based on a panel of more than 3000 Italian family[2] farms drawn from the 2003-2007 FADN sample.

The Italian FADN survey started to be conducted on statistically representative sample drawn from the census in 2003. The sample is stratified according to criteria of geographical region, economic size (ESU) and farming type (FT). The field of observation is the total of commercial farms, that is farms with an economic size greater than 4 ESU (4,800 euro). The sample size of each FADN wave is fixed at 17,000 farms (commercial) by a specific EC regulation (Reg. (EC) 60/1997).

We then extracted a 5 waves balanced panel of farms containing only those holdings for which information where collected in both 2003 and 2007.

Given the available data and the model requirements, the 2003 wave information are used to define the pre-treatment control variables, while the 2007 wave information are used to define our outcomes. Finally, the 2004-2007 waves are used to identify farms receiving or not the RDP payments. More in detail, in the dataset 341 farms (corresponding to 13.32% of total

2 We define sole ownership farms as family farms. This is consistent with what usually done by DGAGRI.

observations) received at least a payment from RDP over the 2004-2007 period[3]. These farms represent the treatment group, while farms not receiving RDP payments in the 2004-2007 period represent the control group.

Table 1 informs about the descriptive statistics in the sample.

The inspection of these data reveals that the mean 2003-2007 differences in outcome variables of the untreated are lower than in the untreated. More in detail over the period labor units, both total and family, employed in treated farms have grown much more than in the untreated group. The same kind of consideration applies to corrected value added, i.e. net of compensatory allowance received in year 2007. In the case of land, both cropped and total, as well as of unitary profits participant farms show in increase in size in contrast to the decrease observed in the non participant farms.

Overall the data give the impression that the participation to RDP has produced positive effects in terms of structural change and of economic performance in treated farms.

[3] Some RDP payments are paid for a 5 year period, as a consequence the support granted under the 2000-2006 programme could last till 2010.

Table 1: Descriptive statistics

Type	Variables	Treated (obs. 341)		Untreated (obs. 2220)	
		Mean	Std. Dev.	Mean	Std. Dev.
Outcomes (2003-2007)	Δ FAWU	0.077	0.608	0.003	0.592
	Δ AWU	0.320	2.229	0.153	2.082
	Δ Labor profitability	301.73	3418.28	-12.26	800.00
	Δ UAA	0.961	22.152	-0.375	12.460
	Δ TAA	5.777	74.608	-0.454	14.208
	Δ Corrected added value	21039.83	97320.28	3953.16	78770.87
Covariates (2003)	Age of the operator	1948.90	13.75	1952.68	13.22
	Male operator	0.760	0.428	0.807	0.395
	North-West	0.217	0.413	0.195	0.396
	North-East	0.158	0.366	0.241	0.428
	Centre	0.220	0.415	0.180	0.384
	South	0.279	0.449	0.289	0.453
	Islands	0.126	0.332	0.095	0.294
	Plane	0.196	0.398	0.359	0.480
	ESU < 8	0.161	0.368	0.196	0.397
	FT olive	0.079	0.270	0.071	0.256
	FT wine	0.050	0.218	0.067	0.249
	FT field crops	0.279	0.449	0.374	0.484
	FT fruit and citrus	0.073	0.261	0.095	0.294
	FT livestock	0.229	0.421	0.154	0.361
	Environmental protected areas	0.065	0.246	0.030	0.170
	Pluriactive family	0.079	0.270	0.150	0.357

Source: own elaboration
Note: labor profitability is the profit to family labor unit ratio

3.2. The model

We are estimating the causal effect of a payment from RDP on various farms' outcomes (AWU, FAWU, Labor profitability, UAA, TAA and corrected added value). Ideally, we like to compare the outcomes of farms participating in RDP (the treatment group) to the same farms not participating (the control group) to determine the average treatment effect (ATEj):

$$ATE_j = E\left(Y_j^1 \mid D=1-Y_j^0 \mid D=0\right)=E\left(Y_j^1 \mid D=1\right)-E\left(Y_j^0 \mid D=0\right) \qquad (1)$$

where the subscript j indicates the 2007 outcomes analyzed. (Y^1_j| D=1) is the outcome of treated Y^1_j if farm has received a payment (D=1), and (Y^0_j |D=0), the outcome of untreated (Y^0_j) if farm has not received a payment from RDP (D=0).

However, as we can observe each farm only in one state, the outcomes for treated had they not been treated is an unobserved counterfactual. To solve this puzzle, micro-econometricians proposed to estimate the average treatment effect on the treated (ATT_j):

$$ATT_j = E\left(Y_j^1 - Y_j^0 \mid D = 1\right) = E\left(Y_j^1 \mid D = 1\right) - E\left(Y_j^0 \mid D = 1\right) \tag{2}$$

That is, the mean effect of receiving a payment from RDP rather than not on the farms that received a payment from RDP (the impact of treatment on the treated). In any case, Y^0_j |D=1 is not observable and, as Becker and Ichino (2002) underlined, since in observational studies assignment of subject to the treatment and control groups is not random, the estimation of the effect of treatment may be biased because of the existence of confounding factors[4].

An unbiased estimate of ATT can be obtained if treatment satisfies the Conditional Independence Assumption (CIA):

$$\left(Y^0 \perp D\right) \mid X \tag{3}$$

The outcome of untreated is independent of the treatment conditional on some set of observed covariates X. In other words, according to CIA, conditioning on a suitable set of covariates, it is possible to remove all systematic differences in outcomes in the untreated state.

Unfortunately, there may be systematic differences between treated and untreated outcomes, even after conditioning on observables, because of unobservable factors and/or level differences in outcomes. To solve these problems, Heckman, Ichimura and Todd (1997) suggest a conditional difference-in-difference matching estimator (CDID)[5], for which both before and after treatment outcome information is used. Specifically, let t1 represent a time period after the treatment start date and t0 a time period before the treatment. The CDID (see Pufahl and Weiss 2009 for an application) compares the conditional before and after outcomes of treated with those of untreated:

$$E\left(Y_{t_1}^1 - Y_{t_0}^0 \mid D = 1, X\right) - E\left(Y_{t_1}^0 - Y_{t_0}^0 \mid D = 0, X\right)$$

Rosenbaum and Rubin (1983), to reduce the estimation bias in the estimation of treatment effects with observational data, proposed the Propensity Score Matching (PSM) method. PSM method has two main advantages when compared with standard econometric techniques. First, it preserves us from making strong assumptions on functional form, like linearity and additivity of regressors, that characterize standard econometric models. Second, PSM is based on the idea that the bias is reduced when the comparison of outcomes is performed using treated and control farms who are as similar as possible. This is allowed applying the matching procedure based on the propensity score, i.e. the conditional probability of receiving a treatment given pre-treatment characteristics:

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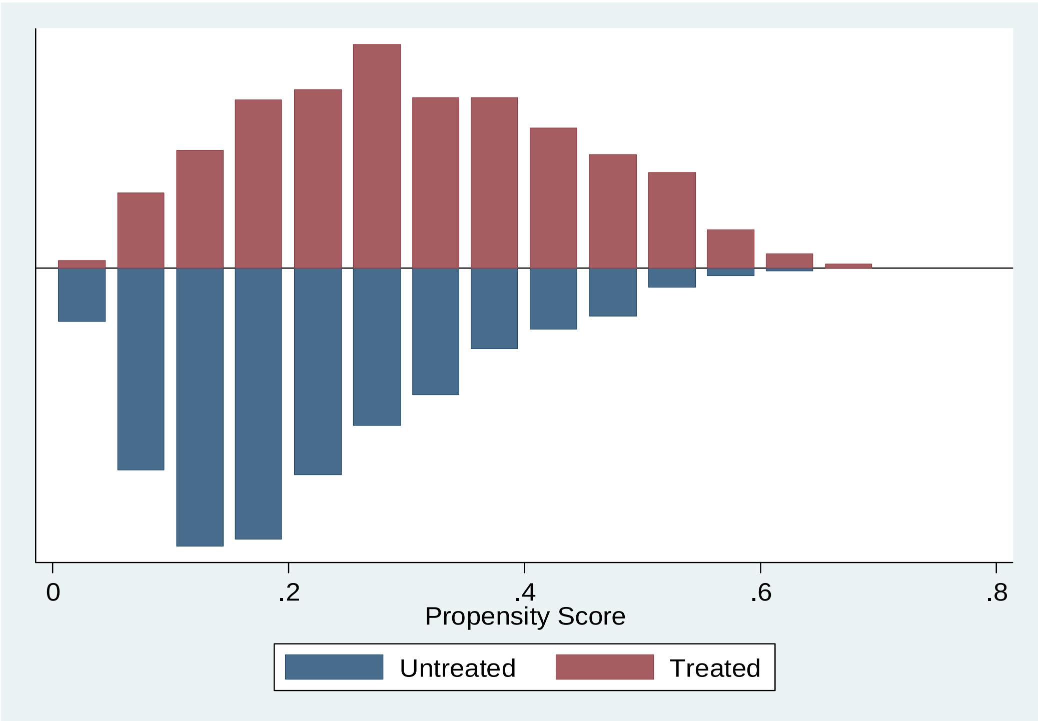
[4] ATT corresponds to the ATE only if the occurrence of conviction is unrelated to outcomes.
[5] While CDID solves the problem of time-invariant unobservable factors, time variant unobserved heterogeneity possibly remains unidentified.

$$p(X) \equiv \Pr(D=1 \mid X) = E(D \mid X) \tag{4}$$

When observations with the same propensity score have the same distribution of observable characteristics independently of treatment status[6], the balancing property is satisfied[7] and, hence, the common support condition holds. Moreover, satisfying the balancing property means that exposure to treatment may be considered to be random and therefore treated and control units should be on average observationally identical (CIA or selection on observables).

To better examine the common support condition the propensity scores of the examined group are plotted in Figure 2.

Figure 2. Propensity score histograms by treatment status.



Source: own elaboration on FADN data.

In the graph, the top histogram reports observations that received a payment from RDP, while the bottom histogram represents those not receiving a payment from RDP. The horizontal axis defines intervals of the propensity score and the height of each bar on the vertical axis indicates the fraction of the relevant sample with scores in the corresponding interval.

[6] For a complete discussion on matching methods, see Dehejia and Wahba (2002).
[7] If the balancing property is not satisfied this means that the two groups are too different in terms of observables and additional information would be needed.

Fortunately, the figure shows that in all cases the overlapped region is quite wide and it is not needed to eliminate a relevant number of observations.

Obtaining a specification that satisfies the balancing property does not assure us that we are credibly addressing the possible "selection on unobservables". In other words, it means that bias generated by unobservable confounding factors could be not completely eliminated. The extent to which this bias is reduced depends on the quality and richness of information on which the propensity score is computed. We are confident that information available from the RICA dataset and that we use quite well satisfy those requirements.

Matching may be implemented with a variety of different methods. All methods construct an estimate of the expected unobserved counterfactual for each treated observation by taking a weighted average of the outcomes of the untreated observations. What differs is the specific form of the weights. In order to check that our results are not driven by the kind of PSM technique chosen, we use two widely used methods that deal very differently with the trade-off between bias and variance: Gaussian Kernel Matching and Nearest Neighbor Matching. The first is a non-parametric matching estimator that uses weighted averages of all farms in the control group to generate the counterfactual outcome. One major advantage of these approaches is the smaller variance which is achieved because more information is used. A drawback of these methods is that also observations that are bad matches may be used. Gaussian Kernel matching can be seen as a weighted regression of the counterfactual outcome on an intercept with weights given by the Kernel weights. Weights depend on the distance between each farm from the control group and the treated observation for which the counterfactual is estimated (see Smith and Todd, 2005). The second method is the most straightforward matching estimator. A farm from the comparison group is chosen as a matching partner for a treated farm that is closest in terms of propensity score[8].

4. MAIN RESULTS

As well known, PSM technique requires a first step, in which the probability of receiving a treatment is estimated with respect to pre-treatment control variables to remove systematic differences between treated and untreated observations. In our application of PSM, we first fitted a logit regression in which the dependent variable equals one if the farm was treated, i.e. it received at least one payment over the 2004-07 period, zero otherwise.

We tried alternative specifications of the logit model, for example we tried to exploit the information about the type of farming (FT) or the regional location of the farm but the balancing test failed. The specification used in this paper (table 2) is the most complete and robust specification that satisfied the balancing property. The logit model correctly classify 87.13% per cent of observations. In general, farms located in environmentally protected area and those specialized in breeding animals are more likely to benefit of RDP payments. The probability of

[8] For a detailed discussion, see Caliendo and Kopeining (2008)

participation decreases when the agricultural family is pluriactive, that is when some members of the household work off farm, when operators are young and when they are female, when the farm is specialized in the production of field crops and when it is located in the plain.

We then matched participants and non-participant observations by two PSM techniques as discussed earlier. The standard errors of the impact estimates are calculated by bootstrap using 500 replications for each estimate.

The estimated average treatment effect on the treated based on two matching algorithms, namely the Gaussian Kernel Matching (GKM) method and nearest neighborhood Matching (NNM) method, are reported in table 3. Our analysis reveals that participation in RDP has a significant positive causal impact on family labor, while it does not have a significant impact on other structural indicators such as total labor units and farm land, either total and cropped. In addition, farms that participated in the RDP present a better economic performance than non participant farms. It is interesting to note that in the case of corrected value added, i.e. net of RDP payments, the average treatment effect on the treated is significant in the case of the CDID estimator based on the GKM while it is not significant in the case of NNM. This difference is possibly due to the less information used in the first method. In previous paragraphs we already mentioned that NNM is the most straightforward matching estimator, as a consequence the signal given by this estimator may be more reliable than the one produced by the GKM.

Finally, the increase in unitary profits is positive and significant both in the case of the estimator based on the Gaussian kernel matching and that of the nearest neighbor matching. More in detail, this variable measures the family farm income per unit of family labor, where the family farm income is obtained by deducting from added value the remunerations paid to external factor, hence it is the sum of wages, rent paid and cost of own factors (labor, land and capital). In other words, the ratio informs of the hypothetical remuneration/earning distributed to the family member participating to the farm work under the assumption of linear distribution of total family farm income.

Table 2: results of the logit regression

	Coeff.	Std. Err.	
Age of the operator	-0.021	0.005	***
Sex of the operator	-0.264	0.144	*
North-West	-0.193	0.217	
North-East	-0.504	0.233	**
Centre	-0.264	0.217	
South	-0.477	0.207	**
Plane	-0.787	0.155	***
ESU < 8	-0.224	0.167	
FT olive	-0.026	0.244	
FT wine	-0.459	0.285	
FT field crops	-0.518	0.160	***
FT citrus	-0.334	0.250	
FT livestock	0.108	0.172	
Environmental protected areas	0.808	0.263	***
Pluriactivity	-0.622	0.216	***
Intercept	40.419	8.945	***
Number of obs	2561		
LR chi2(15)	114.86		
Prob > chi2	0.000		
Pseudo R2	0.057		
Log likelihood	-959.82		

Source: own elaboration

Table 3: Average Treatment Ettect (ATT) of the treated

	Gaussian Kernel Matching			Nearest Neighbour Matching		
	ATT	Std. Err.	t	ATT	Std. Err.	t
Δ FAWU	**0.066**	0.036	1.830	0.034	0.056	0.604
Δ AWU	0.148	0.124	1.186	0.024	0.198	0.120
Δ Labor profitability	**324.392**	179.246	1.810	**314.846**	189.233	1.664
Δ UAA	1.249	1.174	1.063	1.415	1.598	0.886
Δ TAA	6.144	4.239	1.449	6.344	4.011	1.582
Δ Corrected added value	**17643.697**	5821.995	3.031	11911.344	8789.928	1.355

Source: own elaboration

5. CONCLUSIVE REMARKS

The interest in impact assessment of agricultural and rural development policies is growing partly due to the increasing competition on the use of diminishing public funds.

Under these circumstances it becomes important to evaluate the effectiveness as well as the net impact of policies on relevant or targeted variables.

A key issue in policy evaluation is the establishment of a baseline or counter-factual scenario to determine “additionality”, i.e. the additional net impact that specific policy measures have variables of interest.

PSM can provide a tool to identify whether significant and causal differences in outcome variables occur between farms receiving or not RD support.

In the case of participation in the first Italian RDP, the comparison of mean differences in outcome variables of treated against non treated farms suggests payments have produced the expected results. Namely, the support favored structural change and improved the economic performance in participant farms in respect to what happened in non participant farms. More in detail, on average, labor units, both total and family, employed in treated farms have grown much more than in the untreated group. The same kind of considerations applies to corrected added value, i.e. added value net of compensatory allowance received in year 2007. In addition, land, both cultivated and total, as well labor profitability in participant farms have shown an increase in contrast to the decrease observed in non participant farms.

The *ex-post* evaluation of the effectiveness of RD policy in meeting the targeted objectives is less optimistic when we analyse the causal impact on outcome variables after removing all systematic differences in outcomes in the untreated state. When we look at the conditional difference-in-difference matching estimator of the average treatment effect on the treated, that is when we take into account the effect of both observables and unobservable factors affecting the differences in outcomes, we find that farms participating in the RDP increased the number of family labor units employed on farm, while no significant changes have been estimated in the case of total labor units. These results suggest that family labor has been substituted to external labor force. In other words, the participation in RDP did not produce an impact on rural employment, or at least it did not create a direct impact on this variable. In contrast, participation in RDP appears to have been effective in terms of GDP growth in rural areas, or at least the direct impact, that is the impact on the growth of agricultural added value, appears to be positive.

Overall, it appears that the net impacts on on-farm emplyment estimated through the conditional difference-in-difference matching approach are much lower than the impact suggested by the comparison of simple means.

As for economic performance, the difference-in-difference matching approach confirms treated farms perform better, either in terms of value added or of unitary profits, of non participant farms. These results suggest that farms participating in RDP in order to improve their economic sustainability used cost reduction strategies. In future work it could be of interest to analize if the substitution of family to off-farm labor can be interpreted as a form of self-exploitation (accepting returns to owned labour and land lower than the market wage and rent) to cope with external economic pressures and survive economic crisis.

Given we seek to identify the causal effect of treatment after only few years from implementation, our study is a short term impact evaluation of the Rd policy. Our future work could go in several directions. A natural extension is to update the analysis in order to capture the long standing effect of RD policy. In addition, we intend to disentangle the causal impact of specific policy measures contained in the RD plans such as, for example, single agri-environmental measures. A further direction of research is to enlarge the set outcome variables to evaluate the enviromental impact of specific policy measures.

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