

Article

Does the European Union Start-Up Aid Help Young Farmers to Innovate and to Join Networks?

Anna Carbone ^{1,*}, Felicetta Carillo ² , Pavel Ciaian ³ , Roberta Sardone ², Federico Antonioli ³ and Juan Tur Cardona ³

¹ Department for Innovation in Biological, Agro-Food and Forest Systems, University of Tuscia, 01100 Viterbo, Italy

² CREA-Council for Agricultural Research and Economics, 00187 Rome, Italy; felicetta.carillo@crea.gov.it (F.C.); roberta.sardone@crea.gov.it (R.S.)

³ EU Joint Research Centre Seville, 41092 Seville, Spain; pavel.ciaian@ec.europa.eu (P.C.); federico.antonioli@ec.europa.eu (F.A.); juan.tur-cardona@ec.europa.eu (J.T.C.)

* Correspondence: acarbone@unitus.it

Abstract: The endurance and vitality of European agriculture are threatened by the aging of farmers, together with the lack of generational change. The small share of young farmers also impacts on the innovative capacity and competitiveness of the sector. The Common Agricultural Policy of the European Union started addressing the issue long ago by providing financial aid to help young farmers to start up. Over time, the aid increased and packages of measures were set to reinforce the aid and to promote investments, innovations, and networks at the farm level. While the literature focuses on analyzing the effectiveness of the start-up aid in fostering new entries, this paper assumes an original perspective as it seeks to assess whether this aid has actually promoted innovations and networks in the beneficiary farms. The analysis relies on sample data collected in 2021 in Italy and Poland via interviews of 500 farmers under 40 who had entered the sector both with and without the aid. A probit model estimates whether the beneficiaries have a higher probability to innovate and network. Then, the contribution of the aid to the intensity of the adoption of innovations and networks is estimated via an Average Treatment Effect on the Treated model (ATT). Results suggest that the start-up aid increased the adoption of innovations and networks. The ATT indicates that this positive effect holds even after correcting for self-selection bias. By adopting an original perspective, our analysis suggests that the start-up aid for young farmers goes beyond rejuvenating agriculture by fostering innovation at the farm level and by promoting networking, thus enhancing agricultural change. However, farmer behaviors in the two countries are different, suggesting quite complex patterns for the impact of this measure.

Keywords: Common Agricultural Policy; start-up aid; young farmers; innovation; networks; probit; Average Treatment Effect on the Treated model; Italy; Poland



Citation: Carbone, A.; Carillo, F.; Ciaian, P.; Sardone, R.; Antonioli, F.; Cardona, J.T. Does the European Union Start-Up Aid Help Young Farmers to Innovate and to Join Networks? *Agriculture* **2024**, *14*, 1772. <https://doi.org/10.3390/agriculture14101772>

Academic Editor: Sanzidur Rahman

Received: 11 September 2024

Revised: 29 September 2024

Accepted: 30 September 2024

Published: 8 October 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The reduction in the production base, which encompasses the decrease in the number of farms as well as in the farmer population, together with aging, are considered serious threats to the agricultural sector worldwide [1]. Together with climate change and sustainability challenges—which also contribute to this reduction—such a trend adds pressure to the goal of assuring food security in many areas around the world [1–3]. The problem exists both in developing and developed countries, and it has also been serious in the European Union for many decades [4,5]. Such a situation weakens not only the continuity but also the vitality and competitiveness of the primary sector in the European Union (EU) [6]. Newly formed farms, and especially young farmers, are regarded as actors, which add vigor to the sector thanks to their more pronounced managerial attitude and higher propensity to innovate and to network [7–12].

Both innovating and networking are considered key behaviors for farm economic growth, particularly through enhancing farm performance and competitiveness and for indirectly fostering rural development [13,14].

As such, promoting generational renewal as well as innovation and networking are increasingly regarded as strategic tasks in the context of the EU-RDP (Rural Development Program of the EU). This is evidenced by the progressive reinforcement of the EU-RDP measures for the settlements of young farmers as well as for promoting innovation and supply chain relations and partnerships (i.e., EIP-Agri, the Agricultural European Innovation Partnership) [15,16]. Along the continuous CAP (Common Agricultural Policy) reform process, these measures are becoming more complex and providing higher financial aid to beneficiaries.

The objective of this paper is to analyze whether the EU-RDP measure, which provides financial support to the first settlement of young farmers, has a side effect in terms of promoting innovation and networking behaviors in the years after the young farmers have started their farming activity. Despite the rich literature investigating, on the one side, the determinants of new entries of young farmers and, on the other side, their capacity to innovate, there is a lack of studies analyzing the impacts of the EU-RDP start-up aid on the adoption of innovations by the farmers. The analysis presented in this paper aims to fill this gap.

Such an evaluation seems politically relevant, especially considering that one of the main goals of the CAP is to promote the development of competitive European agriculture which is able to provide farmers with a fair income. The EU-RDP start-up aid targeted to young farmers not only seeks to promote new entries, but also pursues attaining economic sustainability and well-performing farms by stimulating virtuous behaviors and, in particular, adopting innovations and collaborating/cooperating in order to operate on a larger scale. Our analysis addresses the issue by exploring whether and to what extent the EU-RDP start-up aid is related to the adoption of innovations and to enhance farmers' networking capacity. The effects might differ by country or according to other factors such as farm size or farm specialization. The study explores a sample of young farmers settled in two different EU member states (Italy and Poland), including farms of different sizes and with different production specializations (i.e., technical orientations). Specifically, the paper utilizes the results from a survey carried out within the research project "Factors affecting generational turnover in agriculture. Evidence from Italy and Poland", funded by the Joint Research Centre of the European Commission in 2019, which ended in 2022.

The remainder of the paper is organized as follows: Section 2 first recaps the development over time of the EU-RDP start-up measure and its main features and then briefly reviews the literature. The methodology is presented in Sections 3 and 4 presents results, and Section 5 discusses them, while Section 6 concludes.

2. Background and Literature Review

2.1. An Overall Look at the EU Policy to Support the Start-Up of Young Farmers

Eurostat data [17] show that in the UE overall, the share of farmers under the age of 40 is only 11%. The current generational turnover in the European agricultural sector is not sufficient for ensuring its continuity, and the aging of the farmers is undermining its vitality [4,15,18–21].

The EU-RDP start-up aid addresses the issues of excessive aging and scarce generational renewal in EU agriculture [15]. Specifically, it aims at fostering the entrance of young farmers in order to assure continuity and to enhance vitality to the primary sector [4,22]. Newly formed farms are valuable as such because they contribute to contrast/offset closures and to rebalancing the age structure of farmers. Furthermore, many authors affirm that young farmers also add vitality to the sector thanks to their more pronounced managerial attitude and higher propensity to innovate and to network [7,8,10–12,16].

The issue gained attention within the CAP in the early 1980s (Directive 81/528/EEC) when the aid in favor of the modernization and productivity of farms run by young farmers

was introduced. Therefore, the subsequent CAP reforms progressively recognized the centrality of the issue and placed measures in favor of young new entrant farmers within the frame of the rural development policy. Starting with Agenda 2000, the CAP put a real emphasis on generational turnover, and the measures targeted to young farmers were included in the policy covered by the second pillar, where they progressively developed. In that period (2000–2006), the scheme of support for generational turnover (Regulation (EC) 1257/1999) was simply drawn as an aid for the first settlement of a young farmer as the head of a farm, under the condition that adequate professional knowledge and skills were exhibited, plus under the condition that the profitability of the new farm was demonstrated [23].

Significant revisions in the architecture and functioning of the measure occurred within the two following programming periods: 2007–2013 and 2014–2020. The two periods represent the focus of this analysis because the sampled population on which this analysis is based had access to the start-up measure throughout these years. Regulation (EC) 1698/2005 substantially increased the value of the settlement premium and, to support the creation of competitive farms, confirmed the request of young farmers with professional skills and knowledge; it also ensured the elaboration of a detailed business investment plan—describing the territorial context, the objectives and program of interventions, financial investments, services, and necessary training, etc.—which was helpful in assessing the merit of each submission. Even more relevant, the new scheme introduced the so-called “package of measures”, aimed at supporting the young farmers in simultaneously accessing other measures within the RDPs, such as the investments for competitiveness, innovation, environmental sustainability, and the diversification of farm activities, all in eventual combination with the early retirement scheme.

A further significant boost to start-up policies for young farmers came from the CAP 2014–2020 programming period (which is the last relevant for this analysis), when the measure for young farmers (sub-measure 6.1; Regulation (UE) 1305/2013) was placed in the framework of a more extensive package of six sub-measures, more generally aimed at promoting the development of agricultural holdings and enterprises. The main differences introduced were represented by (a) a further increase in the premium (up to a value of EUR 70,000), to be fully paid in five years and which is subject to the correct implementation of the business plan (for the 2000–2006 programming period, the value of the premium was equal to EUR 25,000, increasing to EUR 30,000 in the case of consultancy services; then, in the following period (2007–2013), the basis of the premium was set at EUR 40,000 [23]); (b) the introduction of a youth sub-program as a sort of development of the package of measures, providing an increase in the value of the assigned premium in the case of the integration of multiple measures deemed to support generational change (i.e., investments, off-farm activities); (c) advice and assistance services, cooperation with other enterprises, and so on; d) the participation of the first CAP pillar in supporting the new established young farmers, with the introduction of a mandatory decoupled payment (Regulation (UE) 1307/2013) specifically addressed to enhance the income in the initial period of farm’s management (both MSs have assigned a similar share of the national ceiling for direct payment to this payment: 1% in Italy, elevated up to 2% in 2019, and 1–2% in Poland. However, the method for calculating the annual payment is quite different [24]).

2.2. Factors Influencing the Adoption of Changes at Farm Level

The positive impact of innovation on efficiency, competitiveness, and growth is well assessed in the literature, especially with respect to agriculture, which tends to be slow in the adoption of technical progress due to its small scale, the low education levels, the high average age of farmers, and the prevalence of family farms largely relying on traditional know-how [25–27]. In fact, agriculture enjoys a low rate of innovation, and technical progress is mainly exogenous both on the farm and on the sector level. This is the reason why Fuetsch et al. [25], adopt an extensive definition of innovations in agriculture that encompasses changes introduced at the farm level. For example, diversification activities

introduced by the farmers are usually regarded as innovations. From a slightly different perspective, Huttunen [13] and Läpple et al. [16] affirm that innovation and networking are synergic and that both, besides pushing farm outcomes, are, more widely, capable of fostering rural development.

In a sector such as agriculture which faces difficulties in catching up with technical progress, the involvement of young farmers plays a relevant multifaceted role. Hamilton et al. [28] argued that young farmers are more inclined to enact changes and innovations. In the same streamline, Fuetsch et al. [25] analyze the higher propensity to changes in younger farmers. Many other contributions confirm the role of age in the farmers' attitude towards innovation [10,16,29]. All in all, it is generally agreed that young farmers push the adoption of technical progress, thus favoring the modernization of the sector, its productivity, diversification, environmental impact, and so on and so forth. However, if, on the one side, the presence of young farmers positively contributes to the innovation capacity of the sector, then, on the other side, it is also true that many obstacles to innovation, which characterize agriculture, are among the factors that hinder younger farmers from entering the sector. In fact, managers who enter the sector quite often need to boost their farm and change things in order to increase profitability [3,30]. Summing up, it is clear that a sort of vicious circle arises within the primary sector when in need of new entrants that are capable to boost innovation; but, at the same time, the sectoral features, among many other existing barriers, make it difficult to innovate and thus discourage new entries of both younger and older persons.

In light of the above, it is clear how policies aimed at encouraging young people to settle as farm managers have not only merited the contrast between the reduction and aging of agriculture, but can also contribute to speeding up the adoption of innovations and, more generally, to enhancing its economic viability. The debate about the effectiveness of the EU-RDP start-up aid in fostering new entries is ongoing. For example, Gkatsikos et al. [31] affirm that, according to empirical evidence generation, renewal policies support rural economies notably in terms of output production and employment, while benefits are lower in terms of income generation. Differently, Lontakis et al. [22] conclude that the EU-RDP start-up aid has proven to be effective in aiding young farmers' settlement. Relevant to the theme of this paper, these cited authors affirm that a change in the rules for receiving this aid, and particularly the introduction of more selective access requirements, even if coupled with an increase in the support, would result in reduced effectiveness in helping them to innovate after settlement. Their conclusion appears particularly relevant when recalling that the higher attitude and capacity of younger managers to innovate, network, and enhance overall farm efficiency, directly and indirectly, contributes to the rationale of the EU policy for sustaining the entrance of young farmers and frames its overall logic [4].

However, besides policy incentives, many factors can impact the capacity to introduce changes in the farms. At the micro level, characteristics of the farm itself, together with features of the farm manager and of its family can have this effect. Also, the environment in which the farm operates has an impact both at the country and at the local level. A brief review of these factors will help in understanding the rationale of the models' build to perform our analysis, as described in Section 3.

To start with, farm size is commonly acknowledged as a major feature affecting the propensity to innovate [8,10,12,16]. In particular, larger farms enjoy a higher innovation rate due to relatively larger capital availability and scale effects related to fixed costs of the innovation investments [32].

As for being embedded in networks, this has been shown to be beneficial, if not even strictly necessary, for many different reasons. First of all, it allows for efficiency gain through enlarging the farm operational scale [33] and helps building countervailing power via collective actions [34]. This is clearly particularly relevant in highly fragmented sectors, such as agriculture, worldwide. Furthermore, connecting with partners along the chain leads to deeper and long-lasting coordination, which is required for experimenting new products and new ways of producing. This is particularly due to the increasing

segmentation of the production processes and to the many and strong idiosyncrasies which feature in the agricultural sector. In addition, the increasing demand for high-quality products, timely delivery, customized goods, and so on and so forth points to the necessity for strict coordination and stable networks to be formed among the different stakeholders involved in production [3,35,36]. Lastly, it is relevant for the scope of our analysis that farms better embedded in a thick net of relations are also more likely to adopt innovations [14,37]; thus, the two main focuses of the analysis are intertwined and synergic.

Beside the role of the farmers' age, which has been already discussed above, there are other relevant farmers' features which affect their innovation capacity. Dimara and Skuras [12], in particular, consider age together with education as part of the farm human capital that allows for acquiring and processing complex information which paves the innovating process. Education enhances farmers' capabilities to understand the potential of the innovation and to correctly manage the new processes in order to get the most out of it. The increasing complexity of many new technologies, particularly ITs (Information Technologies), probably enhance the role of education in the farmers' propensity to adopt innovative processes. Many authors evidenced farmers' education as a critical determinant of innovation, showing that the most educated ones are more inclined to invest in new products and technologies and enter new markets, networks, and so on [38–40]. All in all, education is seen as a favoring factor in adopting innovations in many contributions on the topic [8,16]. Similar effects have been found to be linked to the degree of experience in managing the farm. Experience in its broad meaning is related to age, but, in a narrower sense, depends on the time spent in the professional position. Ghadim and Pannel [11] and, later on, Sauer [8] pose that experience is among the innovation drivers, and this is especially true in the agricultural sector where idiosyncrasies are pervasive, meaning that informal knowledge and tacit communication are core in building competences, including those that allow generating innovations.

Regarding farmers' gender, and more generally the so-called gender gap among entrepreneurs in different sectors, several studies, looking at different countries and different socio-economic contexts, confirm that females generally exhibit worse performance. However, this is mediated by a series of factors such as limited access to resources and factor endowments, lower education, less pronounced networking capacity, and different motivations and attitudes, also related to the life cycle [41–44].

Also, the motivation to become a farmer may affect the managerial attitudes in the sense that a strong identity as a farmer promotes a proactive behavior in innovating and diversifying farm activities [7,45,46]. Somehow close to this, also the way of acquiring the farm, and particularly family succession versus newly formed farms, may impact the young farmers' attitudes towards introducing changes to the farm activities. However, the sign of this impact remains uncertain as, on the one hand, family succession could imply reluctance to change things that have been traditionally carried out in a certain way; but, on the other hand, the interplay between generations and the experience acquired through time by the past generation may prove to be fertile and to provide a solid base for introducing changes [25].

As for the role of the farmers' family, the presence of family members involved as farm workers and, particularly, the possibility of exchanging views among different generations is regarded as particularly valuable in the decision process that leads to adopting innovations [25]. This enhances the probability to innovate, particularly when considering that innovation requires, among other things, committed and trustworthy persons.

Contrastingly, the involvement of the farmer in off-farm activities may have a twofold impact on innovation. On the one hand, the presence of an off-farm job promotes the possibilities to innovate thanks to a wider network of relationships and easier access to information/knowledge [15]. On the other hand, part-time farmers are found to be relatively less committed to the farm and may be subject to time constraints which then reduce the probability to engage in the complex process of innovation [25,47].

Clearly enough, family income is also regarded as playing a relevant role in the innovation capacity. Ghadim and Pannell [11] affirm that family resources are relevant sources for self-financing investments required to introduce innovations; this is especially true for small family farms with difficult access to credit.

Lastly, as mentioned above, beside internal factors, the external environment where the farm operates, both at the local and at the national level, also has a major role in promoting/preventing the adoption of innovations and external relationships [13]. Among others, this includes aspects such as the stability of the economy, the level of reciprocal trust among stakeholders, and the policy framework, together with the efficiency of the Public Sector that set the operating rules as well as the presence of (dis)incentives to adopt innovations.

3. Methodology

3.1. Empirical Strategy

The objective of the study was to assess whether the EU-RDP start-up aid for young farmers contributes to the introduction of innovations and to enhance networking at the farm level. The underlying hypothesis is that young farmers who benefitted from the start-up aid may be encouraged, via the financial resources received, to innovate and to renew their farms and/or expand their relationships with other economic players within the agricultural system. Further measures were included in the rural development program, which can be associated with the start-up aid boosting investments and hence innovations and networks.

We define innovation as any significant change at the farm level, namely products and services, production process, organization, and trade and networks. These do not necessarily represent a change at the sectoral level, regardless of whether they are technological or organizational. This broad definition aligns with the scope of the policy measure as well as with the condition of the sector as a one with low levels of innovation [27].

The econometric methods adopted estimate whether differences in farm innovativeness and networking exist between beneficiaries and non-beneficiaries of the EU-RDP start-up aid. In our analysis, we use two different approaches.

First, we use a probit model to estimate whether recipients of the EU-RDP start-up aid have a higher probability of introducing innovations and/or joining new networks. Five different regressions are estimated, distinguishing among different innovation and network categories. In all the regressions, as independent variables, we use a dummy representing the farmers' participation in the start-up measure, plus other covariates, as described in Section 3.2, explaining the likelihood of farmers to innovate and network.

Second, we estimate the contribution of the EU-RDP start-up aid to the uptake of innovations and networks by the farmers. The outcome here is the total number of innovations and networks introduced after the start-up. In other words, this continuous variable measures the intensity of the adoption of innovations and/or networking as expressed by the total number of innovations and/or new networks introduced by each farmer.

The core idea of this second approach is based on a widely used measure of treatment effects that can be calculated as a treatment evaluation: Average Treatment Effect on the Treated (ATT) [48].

The approach follows a quasi-experimental design where an observational study has the same purpose of a purely experimental one. However, unlike an experiment, no experimental design method is implemented to maintain a control group [49]. In experimental studies, the sampling design tries to generate a group of treated and control subjects who have the same distributions of the focus characteristics. In this case, it is possible to calculate the treatment effect directly as the difference in the mean results.

In non-experimental studies (as in our case), subjects usually self-select the treatment group, i.e., farmers choose to participate or not in the policy. Farmers will only participate if the additional benefits outweigh the costs of participation. Costs and benefits may differ between individuals depending on the specific characteristics of the farm and of the

farmer. Some of these features, however, may not be fully observed. Thus, treated and control groups could differ not only with respect to their participation status, but also for other characteristics. This situation is also called “sample selection”. Sample selection is a specific form of endogeneity where the endogenous variable is a non-random treatment assignment [50]. The existence of systematic differences between participants and non-participants in the program requires the separation of the “real” effect of participation in the program (causal effect) from the effect of the initial differences in the characteristics of those participating in the policy (selection effect).

We consider as the treatment group those who became farmers using the start-up aid included in the EU-RDP, and we estimate the ATT using the number of innovations/networks introduced as the outcome measure. The self-selection mechanisms in our case derive from the fact that farmers who benefit from the start-up aid could also be more inclined to innovate and to participate in networks for reasons other than the support they have received, thus generating a bias in the estimates.

To account for endogeneity, we implemented a linear regression with endogenous treatment effects, hence using instrumental variables (IVs) in the selection equation (which is a probit) that relate to being a recipient of the start-up aid but not to the number of innovations and networks introduced (i.e., the dependent variable in the other equation). This allows for the identification of the effect (ATT) of being a recipient of the aid on the extent of adopting innovations and establishing new networks.

Data used in the analysis derive from a survey (face-to-face interviews) conducted in two different European countries: Poland (Lodzkie Countee) and Italy (Lombardy Region). The two countries help in depicting different macroeconomic conditions (Italian per capita GDP is more than double that of the Polish one), the different roles of the primary sector (in Poland, the employment rate in agriculture is 2.5 times than that in Italy), and different productive patterns, which are due mainly to climate differences. The survey was conducted between Summer and Fall 2021 and involved more than one thousand farmers belonging to two different age groups: “young farmers” up to 40 years of age and “older farmers”, at least 55 years. Here, we used the “young farmers” group, which accounts for about 500 interviewees, almost equally divided between Italy and Poland.

The national samples represent the different local conditions within the two areas. The different farm sizes (in terms of output values) and different production specializations (arable crops, tree crops, livestock, and mixed production) are included in line with the production characteristics of the two areas.

The sampling strategy was mixed and different in the two countries. In Italy, a random extraction of farms was obtained starting from the list of clients of a large private agency based in Lombardy which provides services and technical assistance to farmers. Before extraction, the list was stratified according to farm size and technical orientation. The refusal rate resulted in negligible values after the third contact. In Poland, the Village Headmen of the study area provided the complete lists of farmers. Also in this case, before random extraction, the lists were stratified according to farm size and technical orientation. When the contacted farmer refused the interview (likely motivated by the fear of COVID-19, as, in that period, the pandemic was still very widespread and severe), the next on the list was contacted.

The first model was applied to the aggregated overall sample, while the second model was run both with the aggregated sample and with the two Italian and Polish subsamples separately, allowing for comparisons between the two countries.

3.2. Econometric Techniques and Variables Used

3.2.1. The First Model

To start with, we estimate the probability of introducing innovations and joining networks for both groups of farmers. Table 1 lists the large spectrum of innovations and networks considered and shows how they have been grouped in categories.

Table 1. Content of the variable innovation and networks (Inn and Net) and of its subcategories.

Subcategories of All Innovations and Networks	Detailed Description of Individual Innovations and Networks
(1) <i>Inn&Net-All Innovations and Networks</i>	Includes all the categories listed below: (2)–(5)
(2) <i>Products and Services</i>	New varieties/races Processing of raw materials/agricultural produce Agritourism and education services Care services to individuals Selling contracting services Producing renewable energies Producing services to the Public Sector (e.g., green areas, roads, etc.)
(3) <i>Production Process</i>	Precision farming New machinery and equipment New buildings/infrastructures Innovations for environment protection/sustainability Organic or Biodynamic agriculture PDO/PGI quality schemes
(4) <i>Organization and Trade</i>	IT for managing products and stocks IT for accounting Innovations for increasing farm human capital Contractor services IT for trading/selling goods Direct sale
(5) <i>Networks</i>	Contract with providers for buying inputs Contract with contractors for machinery or associated services Contracts for workers supply Supply chain contracts Joining a limited liability society with other farms for specific purposes Contract for selling output Non-occasional collaboration with nearby farms Participate in any producers' associations

Source: Our elaborations on survey data.

We run the same model for each time the dependent variable changes in order to account for the different types of innovations/networks. In other words, we perform five probit regressions. Each regression has the same independent variables, while, as dependent variables, we use five dummies which represent innovations in the following categories: (1) all the (considered) categories of innovations and networks; (2) product and service; (3) production process; (4) organization and trade; and (5) new network established. The dependent variable of each model is dichotomous and takes a value of one if the farmer has introduced at least one innovation/network in the stated category, and zero otherwise (i.e., in case no innovations at all, in any category, has been adopted). These regressions are calculated on different sub-samples, each time excluding farmers who introduced any categories of innovations/networks except the ones considered in the dependent variable chosen for the specific model. This selection aims to create comparable groups of innovators and non-innovators.

Formally, we have the following:

$$P_r(I_i = 1|X_i) = \alpha + \beta X_i + \varepsilon_i \quad (1)$$

where I_i is the dichotomous variable which takes a value of 1 if the farmer has introduced at least one innovation or network and is 0 otherwise; X_i is the set of independent variables; and ε_i is the error term.

The control regressors used as independent variables (Table 2) are widely supported by most of the literature, briefly reviewed in Section 2, which explores the push factors of adopting innovations and of networking. For all regressions, we computed a robust

variance estimator. The collinearity of each independent variable was diagnosed, and no collinearity was found (VIF (variance inflation factor) < 5).

Table 2. The independent variables used in the probit models and in the outcome equation.

Label	Description	Type of Variable
Start-Up	Beneficiary of the EU RDP start-up aid	Dummy (1 if beneficiary)
OtRDPm	Beneficiary of other policy measures financing farm investments	Discrete (Number of support measures received)
HighEducation	The farmer has at least a university degree	Dummy (1 if university degree or higher)
AgrEdu *	The farmer has an education in agriculture	Dummy (1 if agricultural studies)
Motivation	Reasons why the interviewee became a farmer	Dummy (1 if motivations were strong and positive as opposed to inertia/lack of alternatives)
FamilyResp	There are family members involved in farm management with shared responsibilities	Discrete (Number of family members involved)
PT	Share of working time of the farmer spent on farming activities	Ordinal (1 if <50%; 2 if 50–99%; 3 if =100%)
FarmHouse	The farmer's house is in or near the farm	Dummy (1 if the house is in/near)
FarmIncome	The share of family income from farming	Continuous (%)
AWU	Measure of the workforce utilised by the farm	Discrete (Number of standard working units: total working days/220)
PRXNetworks	The farm was already embedded in networks before start-up	Discrete (Number of pre-existing networks)
Country	The Country where the farm operates	Dummy (1 if Italy; 0 if Poland)

* Included only in the outcome equation.

The variable assessing whether other public supports was used, both from the RDP or released at the national/regional level, allowing us to obtain additional insights on the relationship between public aid and innovations and networks.

Following previously discussed evidence, we included a dummy variable representing whether the farmer has obtained a university degree.

The variable motivation for becoming a farmer (a dummy) was included as follows: the farmer is defined as motivated if he has actively chosen to become a farmer and/or his studies were oriented to agriculture. The opposite holds in case he just remained in the family's activity, he was under family pressure for making this choice, or there were no other options.

The variable indicating the number of family members with whom the farmer shares the responsibility of the farm was included, taking into account the farm's managerial complexity which could positively influence the introduction of innovative investments in the farm.

Also, the share of working time spent on farming activities by the farmer may impact any innovations and networks introduced. The effect of part-time work may be positive thanks to stimuli, resources, competencies, and networks from the off-farm job.

We also include the location of the family house (whether in or near the farm or in a different place) to see possible impacts on innovation/network. We somehow expect that living in the farm may lower innovation/networking in two ways. Farmers choosing to live inside the farm may attach more relevance to the farm as a place of living rather than for its role as an economic activity. In addition, living inside the farm implies more remoteness and fewer communication occasions (e.g., informal, face-to-face), which are usually regarded as push factors for networks and innovations. However, as we did not find insights on this issue in the explored literature, we are open to different outcomes which may stem from the data.

Farm size is here measured by an ordinal variable measuring the total number of workers (in AWU—annual working units), including family and non-family members working in the farm.

Importantly, the possible effects of financial involvement in the farm, as proxied by the share of family income coming from the farm, is also assessed.

We also included one variable assessing the existence of previous networking relationships in which the farm was already embedded before the young farmer started as the manager. We pose that this may contribute to explaining the number of new networks introduced by the young farmer. The relationship could work in opposite directions: it could be positive in case that synergies arise, or negative, with pre-existing relations making new ones useless (as a sort of saturation effect). We use an ordinal variable measuring the total number of networks in which the farm was already involved when the young farmer entered the farm.

Finally, we use a country's dummy (assuming a value of 1 for Italy) in order to account for different macroeconomic conditions, structural and institutional features, and any other local fixed effects. In addition, since, generally, the same localization generates imitative behaviors in adopting technologies and in other organizational arrangements, this dummy accounts for all of these factors.

3.2.2. The Second Model

As the next step of the analysis, we implemented a linear regression with endogenous treatment effects to account for the endogeneity bias. Several tests confirmed the endogeneity of the treatment variable, and the likelihood ratio test indicates that we can reject the null hypothesis of no correlation between the treatment-assignment errors and the outcome errors.

Specifically, we use the endogenous treatment-regression model that performs the control-function estimate [51] in one step. The `etregress` command of STATA has been used to estimate the average treatment effect and the other parameters of a linear regression model, augmented with an endogenous binary treatment variable. Of the different options available in STATA, a control-function estimator has been selected. Formally, the endogenous treatment-regression model is composed of an equation for the outcome y_j and of another equation for the endogenous treatment t_j .

Equation (2) estimates the outcome levels through the endogenous variable, including other covariates, while Equation (3) estimates the probability of being treated to correct the endogeneity. The correction is here made by the inverse Mill's ratios as per the Heckman model [48].

$$y_i = x_j\beta + t_j\delta + \epsilon_j \quad (2)$$

$$t_j = \begin{cases} 1, & \text{if } w_j\gamma + u_j > 0 \\ 0, & \text{otherwise} \end{cases} \quad (3)$$

x_j are the covariates used to model the outcome, t_j is the endogenous treatment variable, w_j are the covariates used to model the treatment assignment, β and δ are the coefficients, and ϵ_j and u_j are the error terms.

This technique makes the covariates x_j and w_j unrelated to the error terms.

Then, contextually, the procedure performs two regressions.

(1) The linear regression is performed as the outcome equation that we are interested in, where the dependent variable is the number of innovations and networks introduced by farmers and, as independent variables, the same variables included in the previous model are included (see Table 2 for the names and descriptions of the independent variables in Section 3.2.1).

(2) The probit estimation performed by the procedure renders the parameters of the selection equation (the likelihood that the farmer receives the EU-RDP start-up aid); this acts as the instrumental equation used to solve the endogeneity problem of the beneficiary variable of the EU-RDP start-up aid included in the main regression. The dependent variable of the selection equation is a dummy, taking a value of 1 if the farmer benefited from the EU-RDP start-up aid and of 0 otherwise. It is worth pointing out that this regression aims to verify if systematic differences exist between the characteristics of the

so-called policy beneficiaries and non-beneficiaries, in order to make corrections seeking to solve the problems of the endogeneity of our variable of interest.

As regressors, we use the variables described below and listed in Table 3.

Table 3. The control variables used as IVs in the selection equation.

Label	Description	Type of Variable
Gender	Gender of the farmer	Dummy (1 if the farmer is male)
Married	Marital status of the farmer	Dummy (1 if the farmer is married)
Education	Highest school degree obtained by the farmer	Ordinal (from 1 -no school titles- to 6 -bachelor or higher)
Income	Family income by classes	Ordinal (8 classes from less than 7500 to more than 100,000 Euros/year)
Rent	Farmland rented	Continuous (%)
Inherited	The farm was inherited from the family previous generation	Dummy (1 if the farm was inherited)

Farmer's education is included as it could influence both the choice to adhere to the start-up aid and the inclination to innovate and network; in this case, we use an ordinal variable ranging from 1 to 6 according to the education level attained (see Table 3). Similarly, other characteristics of the farmer, such as gender and marital status, were included to explore their possible impact on receiving the start-up aid. The economic status of the family of the farmer, measured through an ordinal variable measuring income by classes (see Table 3), allows us to proxy the need for external capital when starting-up and, thus, may be related to the probability of applying for the aid. Another variable was included considering whether the young farmer received the farm from the family. This captures the possible different needs of public support of those who received the farm via a family transfer (e.g., the farm was inherited or donated) as compared to those who newly bought or rented it. Finally, the variable indicating the share of farmland being rented is a proxy for the effect of not-owning part of the productive inputs on accessing the start-up aid.

4. Results

4.1. The Sample

Based on the scope of the analysis, the focus variable is the number of innovations and networks introduced after starting-up. Figure 1 shows how this feature frames the two sub-samples and makes it clear that among them, there are some differences which also explain why in the subsequent analysis, whenever possible, they have been kept separate. In particular, Figure 1a makes it clear that overall, young Polish farmers are more innovative and network more and that this is true for both groups of the so-called treated (those who benefitted from the EU-RDP start-up aid) and of the so-called untreated (those who did not receive the aid). Figure 1b shows the values of innovations by detailed typologies; here, we see that Polish beneficiary farmers in particular established new networks, while Italian ones have been more inclined to introduce process innovations.

Table 4 illustrates some descriptive statistics. The table shows that the share of those who received the start-up aid is relatively high but very different between the two countries, at 82.8 in Italy and 29.15 in Poland. The share of farms that received other public funds (OtRDPm) is high in both countries, at 94.8 in Italy and 75.3 in Poland. The other variables selected for the models frame the sample as follows: the two sub-samples differ with respect to gender, as Italian farmers are almost all males (94.0%), while one-third of Polish farmers are female. The two groups also differ significantly in education levels, with almost all (96.4%) the Italian farmers who attended agriculture-oriented studies and with Polish farmers who largely did not (only 6.9% did). The farms were mainly inherited from the families, with a share of 70.8% in Italy and 92.3% in Poland. In both sub-samples, the personal motivation for starting his/her activity as a farm manager is described as positive and proactive (as opposed to a somehow inertial attitude) in more than two-thirds of cases

(69.6 and 70.8%, respectively). However, while almost one out of two (51.4%) farmers are full-time in Poland, this share rises to 96.4% in Italy. Also, the share of farmland rented is much higher in Poland (20.8%) compared to Italy (2.8%). Both variables may suggest a more severe constraint related to available agricultural land at the farm level in Poland. The size of the farms in terms of labor is similar in the two subsamples, at 3.5 and 3.9 AWU. As for the involvement of family members in the farm, this is much higher in Italy, where on average there is one family member sharing management responsibilities, while in Poland, this figure drops to 0.6. Clearly enough, the two subsamples also differ concerning family income; while almost all the Italian subsamples declared a higher family income (between EUR 25 and 80 thousand, i.e., they fall in upper income classes in the variable we built), in Poland, the family income remains much lower (under EUR 40 thousand for almost all the interviewees, i.e., in the lower income classes of our variable). Lastly, in both countries, the family lives in a house either on the farm or near it (74.4% in Italy vs 89.4% in Poland).

4.2. Results of the First Model (Probit)

The results of the first step of our analysis are reported in Table 5. As we can see in column 1 (Inn and Net), the coefficient of the start-up variable is positive and significant, indicating that beneficiaries of the EU-RDP start-up aid are more likely to be innovative compared to those who did not receive the aid provided by this policy. When we estimated the effects of the start-up measure for each type of innovation and network (as classified in Table 1), the coefficients remained positive and significant in the following three cases out of four: innovations in the production processes, in organization and trade, and in networks (columns 3, 4, and 5). Only the coefficient for the introduction of new products and services is not significant (column 2).

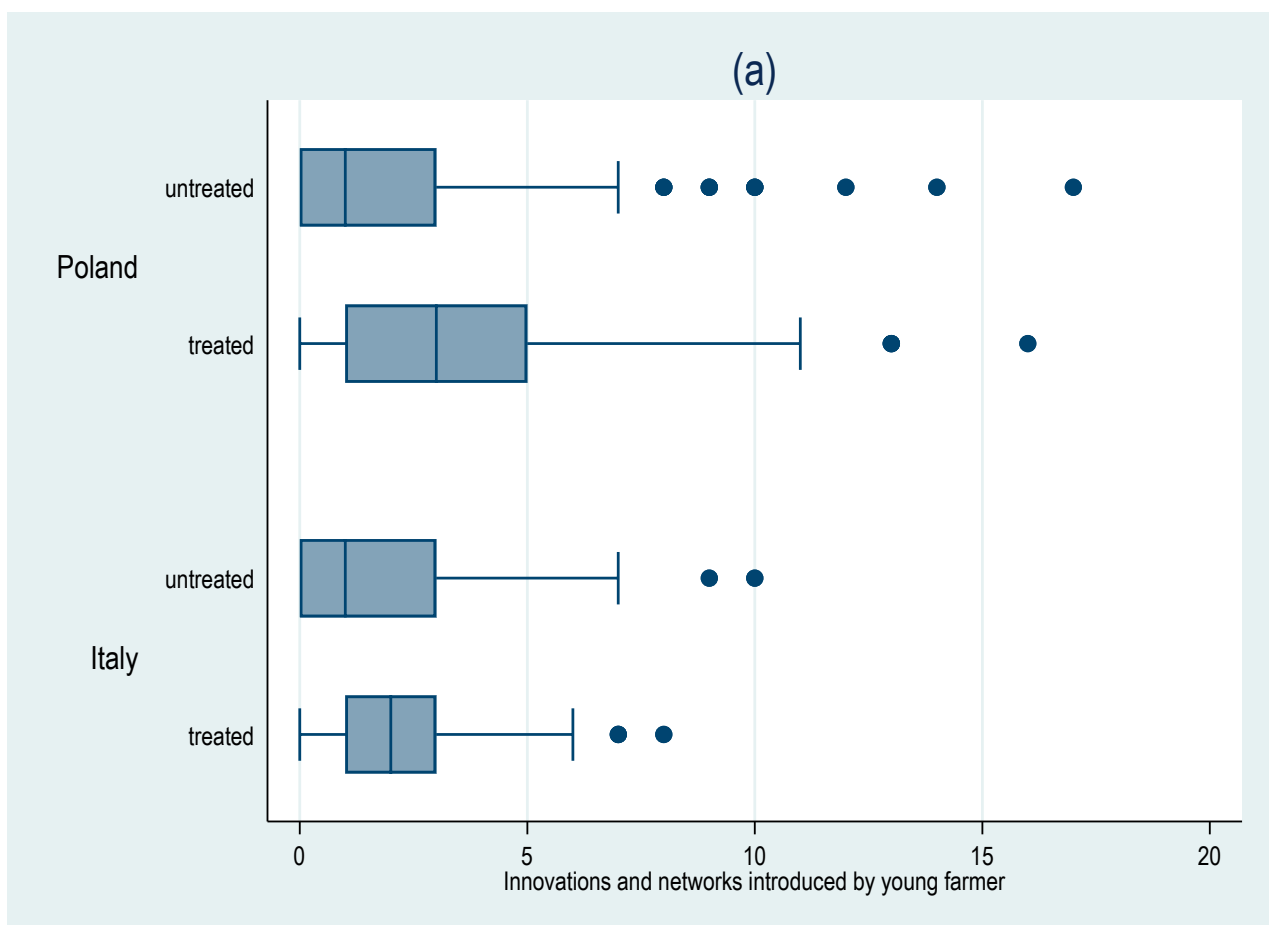


Figure 1. Cont.

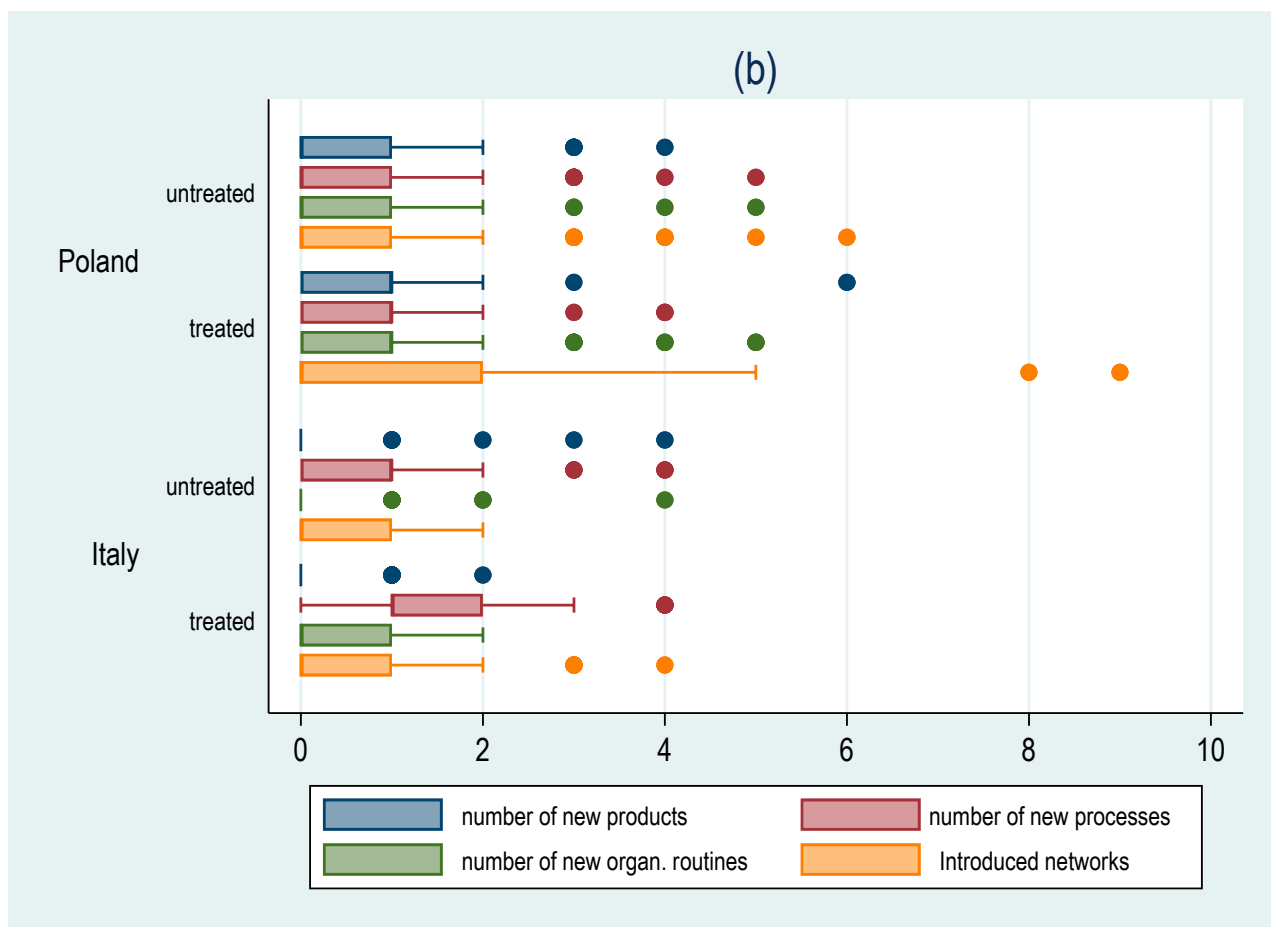


Figure 1. Innovations and networks introduced after receiving the start-up aid. (a) refers to All Inn&Net considered altogether; (b) the 4 subcategories are considered separately. Source: our elaborations on survey data.

Table 4. Descriptive statistics of the sample.

Variable	Measure	All Sample	Poland	Italy
Country	%		49.7	50.3
Start-Up	%	56.1	29.2	82.8
OtRDPm	%	14.9	24.7	5.2
Gender	%	80.4	66.7	94.0
Married	%	44.5	52.2	36.8
Education	average level	5.2	4.8	5.6
HighEducation	%	41.1	14.2	67.6
AgrEdu	%	52.0	6.9	96.4
Motivation	%	70.2	70.9	69.6
Inherited	%	81.5	92.3	70.8
PT	%	74.0	51.4	96.4
Income	average class	3.8	2.6	5.0
FarmIncome	%	79.3	62.0	96.2
FamilyResp	average number	0.8	0.6	1.0
FarmHouse	%	81.9	89.5	74.4
AWU	average number	3.7	3.9	3.5
Rent	%	11.7	20.8	2.8
PRXNetworks	average number	0.6	0.3	1.0

Source: Our elaborations on survey data.

Table 5. The results of the first step of the analysis (probit models).

Variables	(1) Inn&Net	(2) Products and Services	(3) Production Process	(4) Organisation and Trade	(5) Networks
Start-Up	0.63 ***	0.22	0.74 ***	0.64 ***	0.82 ***
OtRDPM	0.76 ***	1.03 ***	0.83 ***	0.87 ***	0.77 **
HighEducation	0.33 *	0.42 *	0.40 **	0.43 *	0.13
AWU	0.15 ***	0.23 ***	0.15 ***	0.10 ***	0.23 ***
Motivation	0.13	0.06	−0.07	−0.12	0.23
Family	0.25 *	0.26 *	0.32 **	0.23*	0.26 *
PT	0.04	0.08	0.13	0.21	0.18
FarmIncome	−0.00	−0.00	−0.00	−0.00	−0.00
FarmHouse	−0.16	−0.10	−0.10	−0.45 *	−0.25
PRXNetworks	−0.08	−0.04	−0.05	0.05	−0.28 **
Country	0.19	−0.75 **	0.22	−0.28	0.30
Constant	−0.54	−1.00 **	−1.01 **	−0.52	−1.56 ***
Observations	494	266	411	268	286

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: Our elaborations.

The positive effect of policies in fostering innovation is further confirmed by the coefficient of the variable OtRDPM, which accounts for aid received under other EU-RDP measures as well as under different policies.

As for the effect of farmers' educations, this is positively associated with innovations, while only the coefficient for newly introduced networks is insignificant. At the same time, the involvement of family members in farm management helps the innovation process in all the areas explored, although the significance level is at 10%. A positive effect on the capacity to innovate is also observed for farm size (measured by the number of AWU utilized); as expected, other things being equal, larger farmers are more innovative. Finally, we highlight that the country where the farm is located shows that Italian farms are less likely to adopt innovations in the products and services category (column 2).

Figures 2 and 3 show, respectively, the average marginal effects of the first regression (column 1 of Table 5) and the margins of the start-up variable on the different types of innovations and networks (columns 2–5 of Table 5) in the cases where the coefficients are significant. Particularly in Figure 3a, we can see that receiving the EU-RDP start-up aid increases the likelihood that a farmer will introduce Inn and Net by 16.6% as compared to non-beneficiaries. In the case of process innovations, the rise in the probability of innovating is approximately 20% (Figure 3b), while for organizational innovations, the probability increases by approximately 21% (Figure 3c). Finally, participation in the start-up measure increases the probability of introducing new networks by about 25% (Figure 3d).

4.3. Results of the Second Model (ATT)

The second stage of the analysis further explores the impact of policies on farm innovations, now utilizing a measure of innovation and networking as the dependent variable, calculated as the number of innovations and networks introduced after the farmer was settled. We use the endogenous treatment-regression model that simultaneously performs two different equations, as described in the Methodological Section. Table 6 reports the results of the main equation (or outcome equation), while Table 7 reports the coefficients estimated by the selection equation. The regressions are applied to the entire sample (column 1 of Table 6), as well as to the Polish and Italian subsamples separately (columns 2 and 3 of Table 6).

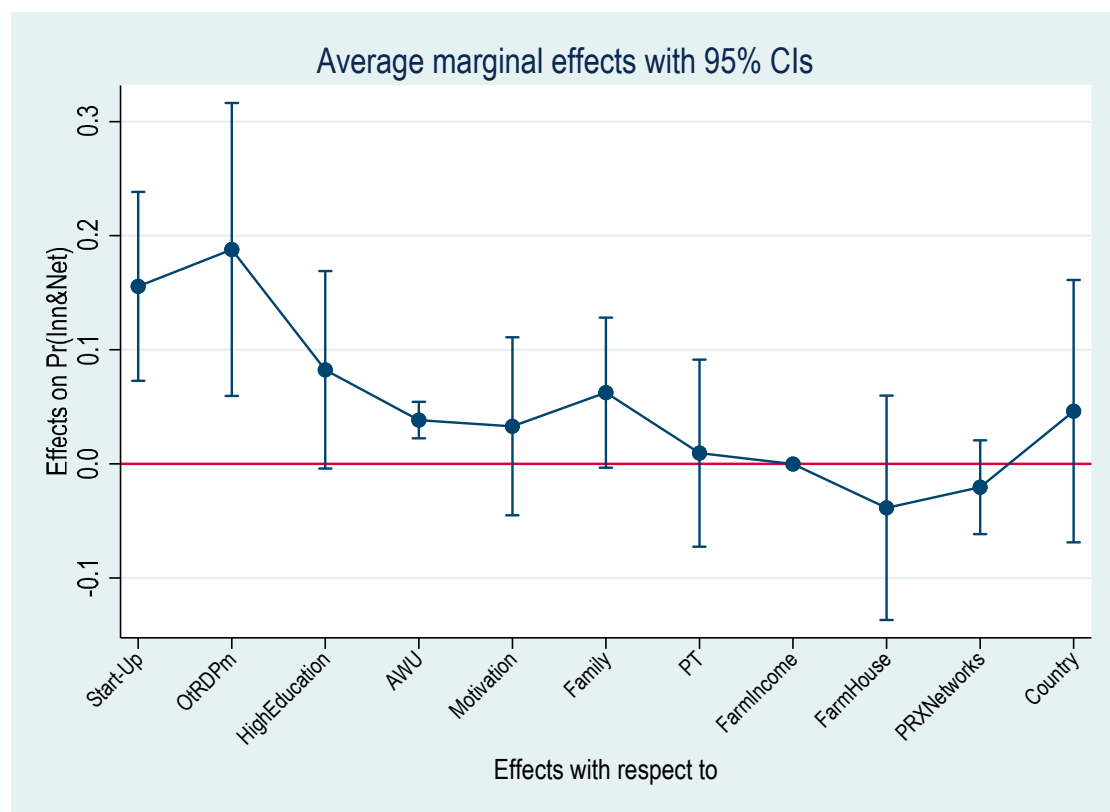


Figure 2. The average marginal effects on innovations and networks. Source: our elaborations.

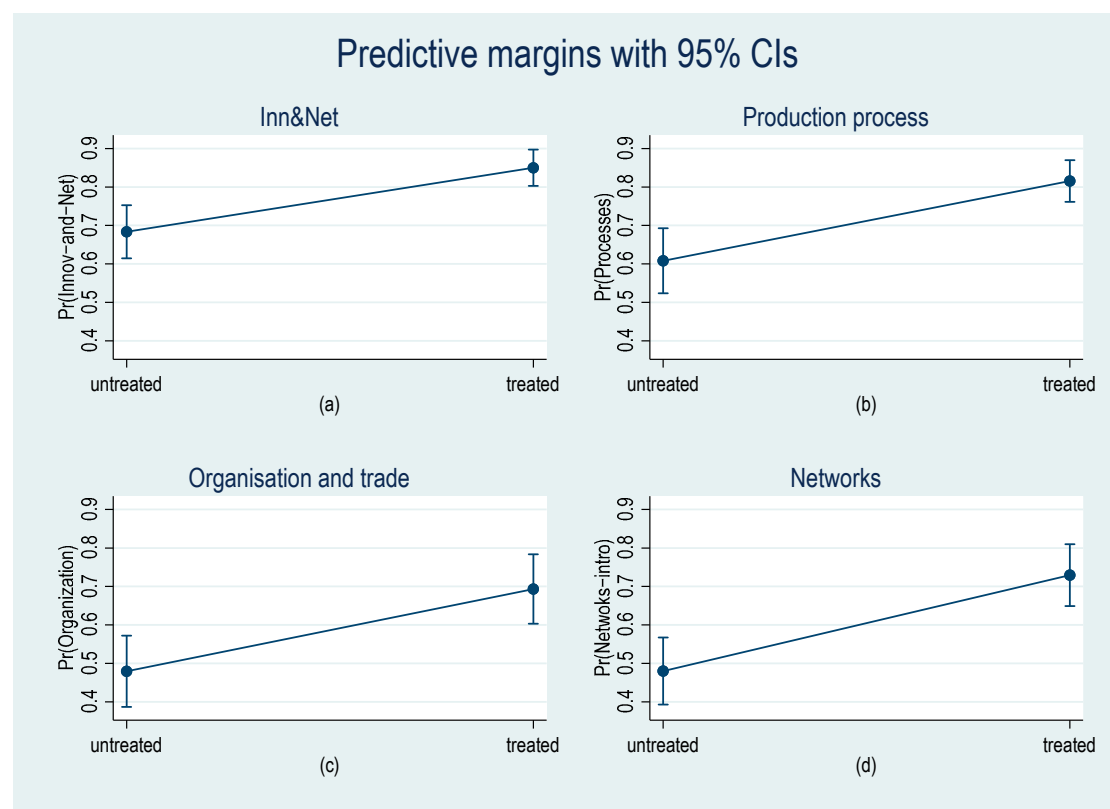


Figure 3. The margins of the start-up variable on innovation for the different innovation categories: (a) shows the margins for Inn&Net; (b) for Production Process; (c) for organization and Trade; (d) for Networks. Source: our elaborations.

Table 6. Results of the outcome equation.

	(1)	(2)	(3)
Variables	All Sample	Polish Sample	Italian Sample
Start-Up	1.94 ***	3.11 ***	−1.59 ***
OtRDPm	1.26 ***	1.08 ***	0.7
HighEducation	0.11	−0.33	0.14
AgrEdu	0.14	1.23 *	−1.33 **
AWU	0.23 ***	0.21 ***	0.27 ***
Motivation	−0.68 ***	−0.78 **	−0.01
Family	0.90 ***	1.08 ***	0.19
PT	0.37	0.29	0.28
FarmIncome	0.000	0.000	0.02
FarmHouse	−0.70 ***	−1.46 **	−0.41
PRXNetworks	−0.13	0.26	−0.21 **
Country	−1.38 ***		
Constant	0.6	1.08	1.79
Observations	492	242	250
athrh	−0.47 ***	−0.82 ***	1.05 ***
lnsigma	0.75 ***	0.95 ***	0.58 ***
rho	−0.44	−0.67	0.78
sigma	2.11	2.6	1.79
lambda	−0.93	−1.74	1.4
LR test of indep. eqns. (rho = 0): chi2(1)	13.71 ***	12.25 ***	6.78 ***

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: Our elaborations.

Table 7. Results of the selection equation.

	(1)	(2)	(3)
Variables	All Sample	Polish Sample	Italian Sample
Education	0.43 ***	0.33 **	0.26 **
Inherited	−0.19	0.18	0.26
Gender	0.60 ***	0.61 ***	0.81 ***
Married	−0.69 ***	−0.40 **	−0.13
Income	0.23 ***	0.19 **	−0.07
Rent	−0.01 ***	−0.01 ***	−0.02 ***
Observations	493	242	250

Significance levels: *** $p < 0.01$, ** $p < 0.05$. Source: Our elaborations.

The results of the correlation tests, which inform us about the goodness of the model, evidenced that the coefficients are all significant. The likelihood ratio test indicates that we can reject the null hypothesis of no correlation between treatment-assignment errors and outcome errors. Specifically, the estimated correlation between the treatment assignment and outcome error (Rho) indicates that unobservable variables that raise observed innovativeness occur together with unobservable variables that lower participation in the policy measure.

We can see that, when we apply the model to the entire sample (column 1, Table 6), if other conditions are equal, the coefficient of the start-up variable is positive and statistically significant. This suggests that the policy intervention correlates with the introduction of innovations and with establishing new network relationships. In particular, the marginal difference in terms of outcome (number of innovations and networks) due to the EU-RDP start-up aid is approximately 2, meaning that, on average, two types of innovations or networks are introduced by the beneficiary farmers. As shown in Figure 4, the margin estimated for the beneficiaries' group is about 3.4, while for the other group, it is 1.4.

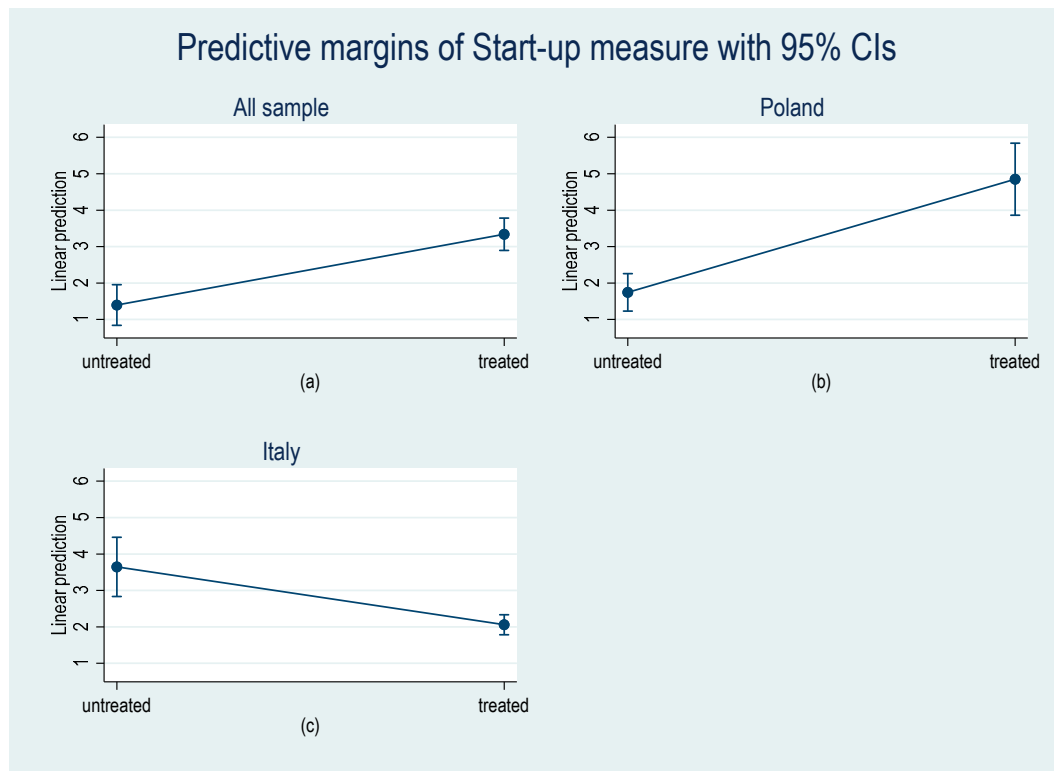


Figure 4. Margins of the start-up variable for the entire sample (a) and for the two sub-sample separately: (b) Poland and (c) Italy. Source: our elaborations.

However, when we split the regression for the two countries, the effects are opposite. It is positive for Polish farmers and negative for Italian ones. As shown in Figure 4, the margin estimated for the Italian non-beneficiary farmers is 3.6, while for the beneficiaries, it is about 2, indicating that the second introduced 1.6 innovations less. On the contrary, the margin associated with Polish beneficiary farmers is 4.9, while it is 1.7 for the others.

Indeed, results for the entire sample show that the country variable (dummy = 1 if Italy) is negative and significant, suggesting a smaller propensity to innovate among young Italian farmers as compared to the Polish ones subject to the other covariates included in the model. Different circumstances could explain this evidence. First, Polish firms, which have been exposed to competition forces and have entered into global markets more recently, in the last decade or so, have needed to make larger efforts for innovations, as was also confirmed by the exceptional efforts recently made by the Polish Government in this direction [46]. Italian agriculture adopted innovations during a longer time span even in previous decades, so there was not such an urge to fill the gap. In addition to this, in recent times, the overall innovation capacity of the Italian economy has slowed down [52,53], and this may also reflect in the agricultural sector.

It is also interesting to illustrate in short the estimations of the coefficients relative to the other variables included in the model, showing their relations with innovations and networks.

Overall, it is worth pinpointing that the profiles of the innovative farms in the two countries are pretty different. „ Different from expectations and from the results provided by the probit run at the first step, we can see that the education level of the young farmer has no effect on the number of innovations and networks introduced after settlement, and this is true for both subsamples. However, while Polish farmers who attended agriculture-oriented studies are more innovative than those who did not, in Italy, the opposite is true.

Other variables included in the model have an impact on the number of innovations and networks introduced after settlement. The involvement of other family members in farm management significantly increases the Polish young farmer's ability to innovate and participate in networks, while this does not happen in Italy. On the other hand, in Poland, we found a negative effect of both a strong motivation to become a farmer and of living on/near the farm, while, again, this does not happen in Italy. So, our guess that isolation negatively impacts the propensity to innovate and to network is only partially confirmed. As for the motivation to become a farmer, it may be argued that being a farmer as a life choice goes far beyond the economic rationale of it and has more to do with a conservative attitude that is more inclined to follow traditions than to break it and innovate.

The coefficient of the variable relating to the pre-existing relationships of the network is not significant when estimating the model for the entire sample. However, it is significant and negative for the Italian farms, partially confirming that new networks established after settlement somehow compensate for the previous scarcity of embeddedness.

There are some aspects for which the two subsamples behave similarly. The size of the farm, proxied by work units, has significant and positive coefficients in both countries, confirming that large farms innovate more and participate more in networks. The share of the working time devoted to the farm as well as the share of family income from the farm do not affect the outcome variable in Italy or Poland.

As described in the Methodological Section, the selection equation models the farmer's choice to join the EU-RDP start-up measure to solve the endogeneity of our variable of interest. The results of these estimates also provide additional insights that are worth highlighting (Table 7).

As for the coefficient of the education level of the farmer, this is positive and statistically significant in both subsamples. This means that education increases the probability of the farmer to receive the EU-RDP start-up aid (it is worth pinpointing that education has also been found as a push factor of new entries, among other features, by Sroka et al. [54]). Male farmers also enjoy an increased probability of receiving the aid both in Poland and Italy, while being married has a negative impact only for Italian farmers; in other words, unmarried men have a higher probability of joining the policy scheme. The family income level is active in selecting adhesion to the policy only in Poland, where higher income levels push towards using the policy, while this is not so in Italy.

The variable measuring the share of rented farm land has a significant negative coefficient in both countries, evidencing that those who join the measure mainly rely upon owned land. Last but not least, our estimates show that newly formed farms have no higher probability to enjoy the financial aid provided by the start-up measure than those received by inheritance or by family donation. The result holds both in Italy and Poland.

5. Discussion

The core result of our estimates is the positive effect of the start-up aid on the innovation and networking capacity of the young beneficiary farmers. This positive impact emerges both in terms of a higher probability to innovate and network and in terms of the intensity of the changes adopted. By disentangling different categories of innovations, we found a positive impact of the aid on the introduction of new processes, new organizational routines, and new forms of coordination/relationships with other firms and chain stakeholders. This can be due to the aid provided by the measure itself but can also be related to the many encouragements to combine this aid with other incentives included in the rural development program (i.e., the so-called package of measures), which increase

the overall financial aid received. The positive effect of policies in fostering innovation is further confirmed and reinforced by the positive impact of aids received under other EU-RDP measures, as well as by different policies also granted at the National level.

Nevertheless, when the national sub-samples are split, relevant differences between the two countries emerge. First, Polish young farmers are more innovative than Italian colleagues, regardless of whether they received public financial aid. Second, the positive impact of the EU-RDP start-up aid, and of other forms of start-up aids, holds only for the Polish farms. In Italy, the opposite is true; young farmers who received this aid are less innovative than those who did not.

As for the overall higher innovative attitude of Polish young farmers, this may be partly related to the exceptional efforts recently made by the Polish government in this direction in the overall economy [55]. Furthermore, it should also be taken into account that the Polish economy entered in global markets and has been exposed to competition forces in relatively recent times; so, it can be argued that firms are still catching up with competitors and are in need of making larger efforts in innovating. Differently, Italian agriculture adopted innovations over a longer time span, so there was not such an urge to fill gaps. In addition to this, it must also be said that in recent times, the overall innovation capacity of the Italian economy has slowed down [54,55], and this also reflects in the agricultural sector.

As for the opposite outcomes of the EU-RDP start-up aid found for the two countries, this may be explained by different lines of reasoning. The conceptual starting point is that the farmers' decision to apply for the measure follows their evaluation of the costs and benefits associated with participating. The value of these costs and benefits mainly depend on individual features, both related to the farm and to the farmer, but also depend on the features of the agricultural sector and on the overall economic and institutional context of each country.

In our case, the first relevant difference between Italy and Poland, as already mentioned, is the much higher income level of the first. As for the primary sector, it is worth noting that the rate of employment in agriculture in Poland is 2.5 times higher than in Italy, and that the share of very small farms (economic size of less than EUR 4000 per year) is much higher in Poland than in Italy (respectively, 48% and 30%) [56]. These farms are commonly considered as subsistence farms and/or residential farms. Their much higher share in Poland may explain two outcomes simultaneously: (a) why income levels are positively associated with the probability to receive the aid, in case low-income levels may create a barrier even only to applying to the start-up aid, acting as a self-selection mechanism; (b) why non beneficiaries face more difficulties in financial changes and thus are less innovative than beneficiaries of the aid.

In Italy, the situation is somehow reversed with better-off young entrepreneurs who are more likely to enjoy their own resources both for starting up and for introducing innovations after settlement; while those who need public aid for starting-up seem to have also fewer own resources available for innovating after installing. Now, considering that in Italy, the bureaucracy around the RDP tends to be complex and that the time required to go through the procedures are quite long, it is clear that costs associated with receiving the aid may discourage applications from those who do not have a strong need for this public aid to start their farming business. Sympachova et al. [46] also find that the administrative burden to access EU aids act as an entry barrier.

Furthermore, Italian Regional Administrations have been found to apply low selectivity criteria in implementing this measure [18]. For example, somehow, loose evaluations of the business plans presented by applicants can explain the much higher share of beneficiaries in the Italian sample as well as their weak capacity to transform and innovate the new farms. Similar results about the reduced capacity of the Italian beneficiaries of the EU-RDP start-up aid to innovate are found by Licciardo et al. [23] and by Dwyer et al. [4]. Moreover, Licciardo et al. [23] argued that the application context makes it difficult for

the policy to meet the needs of those who attempt to really create competitive businesses. Similar arguments are made by Figurek et al. [57].

Similar results in terms of the uneven impacts of the measure across member states (MSs) are reported in Dwyer et al. [4], who connected this variability both to different practical implementations of the measure and to deep socio-economic and cultural differences among MSs which frame the context in which farmers operate, contributing to shaping different farmers' behaviors.

6. Conclusions

Looking to the future, the findings of our analysis help in depicting some policy implications. Certainly, the choice to continue to foster new entries in the agricultural sector can be regarded favorably with respect to its ability to enhance innovative behaviors.

Therefore, the many different options available in the current 2023–2027 CAP can be regarded with favor. These range from the additional direct aids paid for 5 years after settlement to the financial support granted for material and immaterial investments and to the priority also given to beneficiaries in accessing different interventions. As for the request to submit a business plan showing the entrepreneurial project on which the start-up is based, this can contribute to enhancing the effectiveness of the aid in terms of innovation capacity. In addition, the recent introduction of a new measure called cooperation for settlement can also play a positive role in enhancing the overall impact of the interventions for generational change. This measure aims to foster the growth of the managerial and entrepreneurial skills of the young people attempting to enter the agriculture field by promoting coaching and cooperation between the elderly (who are the beneficiaries of the support) and the young farmers. The core idea is to promote a gradual transition in the management of the farm business so as to ease the take-over processes.

All in all, the question of if the margins available so far for tailoring the start-up aid—within the broader framework of measures addressing young farmers—based on specific local conditions, need further expansions or if new modulation instruments need to be activated remains open so far.

Assuming a wider perspective, as has been recalled above, generational renewal as well as the capacity to innovate are multidimensional issues. As such, they not only rely on specifically focused interventions but are also deeply affected by wider policies that involve, for example, education services and professional training, retirement schemes and the pension system, the rules for accessing land, and credit. From this perspective, the enforcement of sound strategies for improving living conditions in rural areas (as it has been emphasized, for example, in Polish RDP) can contribute to improving the more general conditions that may attract newcomers and prevent people leaving, adding effectiveness to the measure, especially in consideration of the many aspects involved in the decision of starting a farm [3,30].

The new strategic plans of the CAP for the period 2023–2027 can significantly push towards a more complex, sound, but, at the same time, more tailored intervention. This is thanks to the new model of governance which allows for the coherent and synergistic programming of all the measures available in both CAP pillars.

Of course, other EU and national policies do play a role in setting the scene for the start-up measure to be fully effective [58]. Again, the dimension of national specificities emerges as decisive, suggesting that policy makers' attention shall be focused on strengthening a governance that is able to bring coherence to objectives and actions promoted by both CAP and national policies.

Lastly, it is worth pinpointing that while our study it is not focused on the primary goal of the EU-RDP start-up aid, which is its capacity to attract young people to the sector, it shed some light on the issue. In particular, we refer to its partial lack of selectivity with respect to the provenance of the farm (i.e., whether it comes from the family previous generations). However, the way the farm was acquired does not change the probability of receiving the aid. This means that the measure is not able to target newly formed farms.

This outcome adds evidence to results affirming that, as a matter of fact, the measure seeks to foster the entry of young members of families who are already active in agriculture more than assuring the entry of farmers from outside the sector [59].

Finally, some weaknesses in data used that require further enquiries must be underlined. These especially stem from the following: (1) the analysis covers only two EU member states; (2) within each study country, only relatively small areas are analyzed; and (3) the samples collected are representative of the farms' economic sizes and technical orientations; however, other dimensions may be relevant that could not be included in sample stratification. One very last aspect that must be underlined is that, to the best of the authors' knowledge, there are no studies so far investigating the same topic. This, adds originality to the work but makes it not possible to compare our results with previous ones.

Author Contributions: Conceptualization, A.C., F.C. and R.S.; methodology, A.C. and F.C.; formal analysis, F.C.; investigation, A.C., F.C. and R.S.; data curation, A.C., F.C., P.C. and R.S.; writing—original draft preparation, A.C., F.C. and R.S.; writing—review and editing, A.C. and R.S.; supervision, P.C., F.A. and J.T.C.; project administration, R.S.; funding acquisition, A.C. All authors have read and agreed to the published version of the manuscript.

Funding: The research reported in this publication uses data and develops the analysis funded by the Joint Research Centre of the European Commission, Seville, CONTRACT NUMBER—938455-2019—IT, title “Study on drivers and constraints of intergenerational change in EU agriculture and on the role of farmers' participation in food supply chains”. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Funding Institution.

Institutional Review Board Statement: Not Applicable.

Data Availability Statement: Data may be obtained from the Joint Research Centre of the European Commission, Seville, upon request and after authorization.

Acknowledgments: The authors wish to thank the referees for their valuable suggestions which helped improving the first version of the paper.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Borda, A.J.; Sárvári, B.; Máté Balogh, J. Generation Change in Agriculture: A Systematic Review of the Literature. *Economies* **2023**, *11*, 129. [CrossRef]
2. FAO; IFAD. *United Nations Decade of Family Farming 2019–2028*; Global Action Plan: Rome, Italy, 2019.
3. Zmija, K.; Fortes, A.; Nganwani, T.M.; Sumane, S.; Nsobire Ayambila, S.; Zmija, D.; Satola, L.; Sutherland, L.A. Small farming and generational renewal in the context of food security challenges. *J. Food Secur.* **2020**, *26*, 100412. [CrossRef]
4. Dwyer, J.C.; Micha, E.; Kubinakova, K.; Van Bunn, P.; Schuh, B.; Maucorps, A.; Mantino, F. Evaluation of the Impact of the CAP on Generational Renewal, Local Development and Jobs in Rural Areas; European Commission, Unit C.4—Monitoring and Evaluation. 2019. Available online: <https://op.europa.eu/en/publication-detail/-/publication/4bd0b0a2-0503-11ea-8c1f-01aa75ed71a1> (accessed on 4 September 2024).
5. European Court of Auditors. *EU Support to Young Farmers Should Be Better Targeted to Foster Effective Generational Renewal*; Special Report No 10, 2017. Available online: https://www.eca.europa.eu/Lists/ECADocuments/SR17_10/SR_YOUNG_FARMERS_EN.pdf (accessed on 9 September 2024).
6. Volkov, A.; Balezentis, T.; Morkunas, M.; Streimikiene, D. Who benefits from CAP? The way the direct payments system impacts socioeconomic sustainability of small farms. *Sustainability* **2019**, *11*, 2112. [CrossRef]
7. Morris, W.; Henley, A.; Dowell, D. Farm diversification, entrepreneurship and technology adoption: Analysis of upland farmers in Wales. *J. Rural Stud.* **2017**, *53*, 132–143. [CrossRef]
8. Sauer, J.; Moreddu, C. *Drivers of Farm Performance: Empirical Country Case Studies*; OECD Food, Agriculture and Fisheries Papers, No. 143; OECD Publishing: Paris, France, 2020.
9. Carillo, F. Young Farmer and Farm Performance. *Politica Agric. Int.-Int. Agric. Policy* **2014**, *1*, 43–53.
10. Diederer, P.; Van Meijl, H.; Wolters, A.; Bijak, K. Innovation adoption in agriculture: Innovators, early adopters and laggards. *Cah. D'economie Sociol. Rural.* **2003**, *67*, 29–50. [CrossRef]
11. Ghadim, A.K.A.; Pannell, D.J. A conceptual framework of adoption of an agricultural innovation. *Agric. Econ.* **1999**, *21*, 145–154. [CrossRef]
12. Dimara, E.; Skuras, D. Adoption of agricultural innovations as a two-stage partial observability process. *Agric. Econ.* **2003**, *28*, 187–196.

13. Huttunen, S. Revisiting agricultural modernisation: Interconnected farming practices driving rural development at the farm level. *J. Rural Stud.* **2019**, *71*, 36–45. [CrossRef]
14. Koopmans, M.E.; Rogge, E.; Mettepenningen, E.; Knickel, K.; Šūmane, S. The role of multi-actor governance in aligning farm modernization and sustainable rural development. *J. Rural Stud.* **2018**, *59*, 252–262. [CrossRef]
15. Zagata, L.; Sutherland, L.A. Deconstructing the ‘young farmer problem in Europe’: Towards a research agenda. *J. Rural Stud.* **2015**, *38*, 39–51. [CrossRef]
16. Läpple, D.; Renwick, A.; Thorne, F. Measuring and understanding the drivers of agricultural innovation: Evidence from Ireland. *Food Policy* **2015**, *51*, 1–8. [CrossRef]
17. Eurostat. Farmers and the Agricultural Labour Force-Statistics. 2022. Available online: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farmers_and_the_agricultural_labour_force_-_statistics (accessed on 9 September 2024).
18. Carbone, A.; Subioli, G. The Generation Turnover in Agriculture: The ageing Dynamics and the EU Support Policies to Young Farmers. In *The Cap after the Fischler Reform: National Implementations, Impact Assessment and the Agenda for Future Reforms*; Henke, R., Severini, S., Sorrentino, A., Eds.; Ashgate: Farnham, UK, 2011; pp. 375–390.
19. Carillo, F.; Carillo, M.R.; Venittelli, T.; Zazzaro, A. Aging and succession on Italian farms. *Politica Agric. Int.-Int. Agric. Policy* **2013**, *1*, 39–55.
20. European Parliament, Directorate General for Internal Policies, Policy Department B: Structural and Cohesion Policies, Agricultural and Rural Development. Family Farming in Europe: Challenges and Prospects. Depth Analysis. 2014. Available online: [https://www.europarl.europa.eu/RegData/etudes/note/join/2014/529047/IPOL-AGRI_NT\(2014\)529047_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/note/join/2014/529047/IPOL-AGRI_NT(2014)529047_EN.pdf) (accessed on 9 September 2024).
21. Schuh, B.; Brkanovic, S.; Gaugitsch, R.; Gorny, H.; Münch, A.; Kirchmayr-Novak, S.; Andronic, C.; Badouix, M.; Dwyer, J.; Kubinakova, K.; et al. Evaluation Support Study on the Impact of the CAP on Territorial Development of Rural Areas: Socioeconomic Aspects: Final Report. 2021. Available online: <https://op.europa.eu/en/publication-detail/-/publication/08e60401-71a0-11eb-9ac9-01aa75ed71a1/language-en> (accessed on 9 September 2024).
22. Liontakakis, A.; Sintori, A.; Tzouramani, I. The role of the start-up aid for young farmers in the adoption of innovative agricultural activities: The case of aloe vera. *Agriculture* **2021**, *11*, 349. [CrossRef]
23. Licciardo, F.; Zanetti, B.; Gargano, G.; Tarangioli, S.; Verrascina, M. Rural Development Policies Supporting Generational Renewal. Some Evidence from the Italian Experience. *Politiche Soc.* **2022**, *1*, 89–112.
24. Wieliczko, B.; Kurdyś-Kujawska, A.; Herda-Kopańska, J. *Mechanisms and Impulses Influencing Development of Agriculture and Rural Areas*; Monographs of Multi-Annual Programme 2015–2019; Institute of Agricultural and Food Economics: Warsaw, Poland; National Research Institute: Warsaw, Poland, 2017.
25. Fuetsch, E. Innovation in family farms: The roles of the market, the family, and farm performance. *J. Small Bus. Strategy* **2022**, *32*, 83–103. [CrossRef]
26. Nuvolari, A.; Russo, E. *Technical Progress and Structural Change: A Long-Term View*; No. 2019/17; LEM Working Paper Series: Pisa, Italy, 2019.
27. García Álvarez-Coque, J.M.; Alba, M.F.; López-García Usach, T. Innovation and sectoral linkages in the agri-food system in the Valencian Community. *Span. J. Agric. Res.* **2012**, *10*, 18–28. [CrossRef]
28. Hamilton, W.; Bosworth, G.; Ruto, E. Entrepreneurial younger farmers and the “young farmer problem” in England. *Agric. For.* **2015**, *61*, 61–69. [CrossRef]
29. Lobley, M.; Potter, C. Agricultural change and restructuring: Recent evidence from a survey of agricultural households in England. *J. Rural Stud.* **2004**, *20*, 499–510. [CrossRef]
30. Coopmans, I.; Dessein, J.; Accatino, F.; Antonioli, F.; Bertolozzi-Caredio, D.; Gavrilescu, C.; Gradziuk, P.; Manevska-Tasevska, G.; Meuwissen, M.; Peneva, M.; et al. Understanding farm generational renewal and its influencing factors in Europe. *J. Rural Stud.* **2021**, *86*, 398–409. [CrossRef]
31. Gkatsikos, A.; Natos, D.; Staboulis, C.; Mattas, K.; Tsagris, M.; Polymeros, A. An Impact Assessment of the Young Farmers Scheme Policy on Regional Growth in Greece. *Sustainability* **2022**, *14*, 2882. [CrossRef]
32. Aboal, D.; Mondelli, M.; Vairo, M. Innovation and productivity in agricultural firms: Evidence from a country-wide farm-level innovation survey. *Econ. Innov. New Technol.* **2018**, *28*, 616–634. [CrossRef]
33. Klerkx, L.; Aarts, N.; Leeuwis, C. Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment. *Agric. Syst.* **2010**, *103*, 390–400. [CrossRef]
34. Galbraith, J.K. Countervailing power. *Am. Econ. Rev.* **1954**, *44*, 1–6.
35. Ponte, S.; Gibbon, P. Quality standards, conventions and the governance of global value chains. *Econ. Soc.* **2005**, *34*, 1–31. [CrossRef]
36. Carbone, A. Food supply chains: Coordination governance and other shaping forces. *Agric. Food Econ.* **2017**, *5*, 3. [CrossRef]
37. Foster, A.D.; Rosenzweig, M.R. Learning by doing and learning from others: Human capital and technical change in agriculture. *J. Political Econ.* **1995**, *103*, 1176–1209. [CrossRef]
38. Akimowicz, M.; Del Corso, J.P.; Gallai, N.; Képhaliacos, C. Adopt to adapt? Farmers’ varietal innovation adoption in a context of climate change. The case of sunflower hybrids in France. *J. Clean. Prod.* **2021**, *279*, 123654. [CrossRef]
39. Serebrennikov, D.; Thorne, F.; Kallas, Z.; McCarthy, S.N. Factors influencing adoption of sustainable farming practices in Europe: A systemic review of empirical literature. *Sustainability* **2020**, *12*, 9719. [CrossRef]

40. Caffaro, F.; Cavallo, E. The effects of individual variables, farming system characteristics and perceived barriers on actual use of smart farming technologies: Evidence from the Piedmont region, northwestern Italy. *Agriculture* **2019**, *9*, 111. [\[CrossRef\]](#)
41. Fisher, M.; Lewin, P.A.; Pilgeram, R. Gender differences in the financial performance of US farm businesses: A decomposition analysis using the Census of Agriculture. *Appl. Econ. Perspect. Policy* **2023**, *45*, 1233–1253. [\[CrossRef\]](#)
42. Adinolfi, F.; Capitanio, F.; De Rosa, M.; Vecchio, Y. Gender differences in farm entrepreneurship: Comparing farming performance of women and men in Italy. *New Medit* **2020**, *19*, 69–82. [\[CrossRef\]](#)
43. Coleman, S. Gender, Entrepreneurship, and Firm Performance: Recent Research and Considerations of Context. In *Handbook on Well-Being of Working Women*; Connerley, M., Wu, J., Eds.; International Handbooks of Quality-of-Life; Springer: Dordrecht, The Netherlands, 2016; pp. 375–391. [\[CrossRef\]](#)
44. Watson, J. Networking: Gender differences and the association with firm performance. *Int. Small Bus. J.* **2012**, *30*, 536–558. [\[CrossRef\]](#)
45. Mailfert, K. New farmers and networks: How beginning farmers build social connections in France. *Tijdschr. Voor Econ. Soc. Geogr.* **2007**, *98*, 21–31. [\[CrossRef\]](#)
46. Šimpachová Pechrová, M.; Šimpach, O.; Medonos, T.; Spěšná, D.; Delín, M. What are the motivation and barriers of young farmers to enter the sector? *AGRI-S-Line Pap. Econ. Inform.* **2018**, *10*, 79–87. [\[CrossRef\]](#)
47. McBride, W.D.; Daberkow, S.G. Information and the adoption of precision farming technologies. *J. Agribus.* **2003**, *21*, 21–38.
48. Heckman, J.J.; Vytlačil, E.J. Econometric evaluation of social programs, part I: Causal models, structural models and econometric policy evaluation. *Handb. Econom.* **2007**, *6*, 4779–4874.
49. Guo, S.; Fraser, M.W. *Propensity Score Analysis: Statistical Methods and Applications*; SAGE Publications: Thousands Oaks, CA, USA, 2010; ISBN 978-1-4129-5356-6.
50. Antonakis, J.; Bendahan, S.; Jacquart, P.; Lalive, R. On making causal claims: A review and recommendations. *Leadersh. Q.* **2010**, *21*, 1086–1120. [\[CrossRef\]](#)
51. Maddala, G.S. *Limited-Dependent and Qualitative Variables in Econometrics*; Cambridge University Press: Cambridge, UK, 1983.
52. Bratti, M.; Conti, C. The effect of immigration on innovation in Italy. *Reg. Stud.* **2018**, *52*, 934–947. [\[CrossRef\]](#)
53. Targetti Lenti, R. The Italian Economy 1961–2010: From Economic “Miracle” to Decline. In *Italy and Japan: How Similar Are They? A Comparative Analysis of Politics, Economics, and International Relations*; Beretta, S., Berkofsky, A., Rugge, F., Eds.; Springer: Milan, Italy, 2014; pp. 185–204. [\[CrossRef\]](#)
54. Sroka, W.; Dudek, M.; Wojewodzic, T.; Król, K. Generational changes in agriculture: The influence of farm characteristics and socio-economic factors. *Agriculture* **2019**, *9*, 264. [\[CrossRef\]](#)
55. Derlukiewicz, N.; Mempel-Sniezyk, A.; Mankowska, D. Development of innovation economy-activity of local government in Poland. *Eur. Res. Stud. J.* **2021**, *24*, 175–195. [\[CrossRef\]](#)
56. European Commission. Agricultural Statistical Factsheet-Italy & Poland. 2021. Available online: https://agriculture.ec.europa.eu/cap-my-country/performance-agricultural-policy/agriculture-country/eu-country-factsheets_en (accessed on 9 September 2024).
57. Figurek, A.; Morphi, K.; Thrassou, A. A Sustainable Risk Management Model and Instruments for Young Farmers in EU Agriculture. *Sustainability* **2023**, *16*, 283. [\[CrossRef\]](#)
58. Beck, M.; Van Bunnem, P.; Bodart, S.; Münch, A.; Gorny, H.; Badouix, M. *Research for AGRI Committee—Rural Areas—Levels of Support and Impact on Competitiveness of Farms*; European Parliament, Policy Department for Structural and Cohesion Policies: Brussels, Belgium, 2024.
59. Sutherland, L.A. Who do we want our ‘new generation’ of farmers to be? The need for demographic reform in European agriculture. *Agric. Food Econ.* **2023**, *11*, 3. [\[CrossRef\]](#)

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.