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Direct selling and alternative evolutionary patterns in the Italian agri-food systems

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Abstract

In the last twenty years the study of alternative food networks (AFNs) gained growing attention and many scholars argue that this is part of a deep transformation of our agri-food systems towards sustainability (Goodman, 2003; Sonnino and Marsden, 2006; Tregear, 2011). In this paper, we study the on-farm and regional factors affecting the farmer's choice to partecipate to AFNs in Italy. Differently to previous studies (Aguglia et al., 2011) we use data on the entire farms' population, in Italy which is available from the Census of Agriculture carried out by Istat (Istituto Nazionale di Statistica) in 2010 (about 1,653,000 farms). The research questions that this paper follows to answer are then: among the whole universe of Italian farms, which are those that started the transition? Which farm and/or farmer characteristics' increase the probability to operate on AFNs? Which regional context do positively affect the spread among farmers of a direct marketing with consumers? Some preliminary results are presented at the end of the paper.

Keywords: Alternative food networks, direct selling, linear probability models, Italy

1. Introduction

In the last twenty years the study of alternative food networks (AFNs) gained growing attention as some scholars argue (Goodman, 2003; Sonnino and Marsden, 2006; Tregear, 2011) that it is appropriate to reflect critically on the results of these lines of research and consider what should be the focus and directions of future developments. AFNs are described as forms of food provision considered to bein contrast–thereforethe adjective "alternative" - to conventional types of food production and distribution system, which have come to dominate markets both in developed and developing countries. The latter are characterised by strong economies of scale reliant on industrialised methods of food production and processing, large distribution and consumption networks, while AFNs relies on mechanisms as farmers' markets, community supported agriculture, direct sale in the farm, informal groups of consumers, community gardens, vegetable box scheme, etc.

A first problematic feature in AFN research is a tendency to bifurcate agri-food systems into two antagonistic type, namely “alternative” and “conventional” food systems. There are a few case studies (Murdoch and Miele, 1999; Straete and Marsden, 2006; Jarosz, 2008) demonstrating that clear boundaries between them do not exist and therefore “in the context of the evolutionary dynamics of alternative food networks, the conventional dichotomy between standardized and localized food does not thoroughly reflect the present reality of the food sector” (Sonnino and Marsden, 2006, p. 184).

The AFNs can be considered as innovation systems (Randelli and Rocchi, 2017) offering an additional market option to farmers, which can operate on both alternative and conventional networks (Mastronardi et al., 2015). Furthermore, both alternative and conventional networks have a role to play in the sustainable transformation of agriculture. In isolation, none of these two agri-food systems would necessarily lead to sustainable transformation of mainstream markets because AFNs tend to be stuck in their high quality, low-market penetration niches, while conventional food systems have a tendency to react to cost pressures by lowering the quality standards of their products (Sonnino and Marsden, 2006; Hockerts and Wüstenhagen, 2010).

The present study goes beyond the dichotomy between conventional and alternative which are patterns of the same agri-food system: dominant and incumbent the first, innovative and emerging the latter. Furthermore, it argues that the sustainable transformation of agriculture is not going to be brought about by alternative or conventional food networks alone, but instead that their interaction and co-evolution is essential (Hockerts and Wüstenhagen, 2010). The challenge posed by the co-evolution between conventional and alternative food systems goes beyond a more intense integration of studies and it requires a stronger understanding of the competitive space in which both are embedded. This would allow to uncover the evolution at the niche level of competitive (network of) farmers and their ability in creating a new spatial organizational structure able tocompete with the more standardised production systems. In this sense we propose to study the agri-food system as a competitive space where conventional and alternative food systems coexist, although with different set of quality, embeddedness and commercial networks.

A second problematic feature of AFNs research is an unclear theoretical perspective and a large focus on specific case studies of AFNs. The shift from a de-localized conventional food system to a re-localized alternative food system is not a linear process, as it involves experimentation, learning processes, new spaces, new capabilities, new policies, adjustment and reconfigurations. In addition, the geographical dimension of the transition changes the background of every process and the transitionshapes differently in every region (Coenen and Truffer, 2012; Sage and Goldberg, 2012). In order to reveal the dynamics and mechanisms that move towardsa re-localization of food

systems,this paper suggests to draw the analysis upon recent evolutionary economic geography (EEG) literature (Boschma and Martin 2010).

In this paper, we study the on-farm and regional factors affecting the farmer's choice to participate to AFNs in Italy. Differently from previous studies (Aguglia et al., 2011; Bonanno et al., 2014; Corsi and Novelli, 2016) we use data on the entire farms' population in Italy which is available from the Census of Agriculture carried out by Istat (IstitutoNazionale di Statistica) in 2010 (about 1,653,000 farms). The Census Questionnaire asks the respondents to quantify the share of different marketing channels, including on-farm and off-farm direct selling to consumers.. We use this information to detect farmer's participation to AFNs. In fact, the direct interaction between producers and consumers is described in the literature as a typical feature of AFNs (Sonnino and Marsden, 2006; Donald et al., 2010), grounding the processes of delocalization of food, fostering the creation of networks and assuring the emergence of alternative convention of quality based on trust and embeddedness. In fact, in each AFN such as farmers' markets, community supported agriculture, direct sale in the farm, informal groups of consumers, community gardens, vegetable box scheme, etc., exist a direct link between consumers and farmers.

The use of the full census allows us to have information on every single farm in Italy selling on AFNs. This amount of information will be used to evaluate which factors are likely to drive the transition towards alternative forms food supply chain. The availability of the full universe of Italian farms offers an unique opportunity to pinpoint the key determinants of this transition.

From this perspective, we will test two set of variables. The first considers on-farm characteristics both in terms of structural features (such as farm size, farm type and utilization of hired work)and offarmer's subjective characteristics (such as, age, sex and education). The second group of variables addressesthe geographical, social and economic context where the farm is located.

Inthe literature,a set of hypotheses on the drivers affecting the participation to AFNs has already been tested.Within a profit maximizing behavior the choice of direct marketing could be expression of strategies to reduce risks in farm management (Farmer and Betz, 2016) or to reduce disguised unemployment of family labour (Aguglia et al., 2011). Also the nature and the diversification of farm produce can affect the probability to directly market to consumers. In an empirical analysis on Piedmont, a region in Northern Italy, Corsi and Novelli (2016) find evidence of the different impact of farm characteristics on farms belonging to different Farm Types (according with the European classification): for example the physical size of the estate may show a positive or a negative impact on the probability to directly sell on-farm, depending on Farm Type; moreover, the typology of output affects the choice between on-farm and off-farm forms of direct selling to consumers.

Also context variables have been already used to explain the participation to AFNs (Gatrell et al., 2010). Bonanno et al. (2014) hypothesize economies of agglomeration in the development of alternative market outlets (such as Farmers Markets), as the context where farmers operate may reduce theirstart-up costs in accessing a new marketing channel. Due to the availability of better infrastructures and services and given the growing interest of urban consumers toward the socalled relocalization of food and the possible impact of tourism flows, also the proximity to urban areas has been proposed as a factor affecting the choice of direct selling, (Aguglia et al., 2011; Corsi and Novelli, 2016).

In the cited studies the context variables are included as proxies of factors affecting production costs (as in the case of the distance from urban market outlets) or market opportunities (increasing demand in most urbanised areas) within a theoretical framework where farmers decisions are only driven by utility (or profit) maximization at the individual level. In other words, context variables describes only the competitive space of farmers without any reference to the possible impact of *geographical* location. Despite the focus on the new geographies of food has increased in the literature (Gatrell et al., 2011), the lack of a spatial perspective on AFNs has endured (Dansero and Puttilli, 2014). While the majority of studies shares a focus on the way in which food supply chains are subject to increasingly pervasive changes in the organisation of their social, economic, environmental, cultural and spatial set-up, it is still not clear which typology of geographical context actually fosters the development of AFNs.

In a study on organic producers in Washington State (USA) Sage and Goldberger (2012) address the influence of geographic drivers in the farmers' decision to join the organic sector. They find a geographically dependent distribution of motivations linked to different "conventions of quality" (Rosin and Campbell, 2009), with the prevalence of the Green/Civic convention (based on direct interaction between consumers and producers through direct selling and Farmers' Markets development) in the North Eastern district of Seattle, where a localized process of collective learning and transition is going on. In this paper we argue that geography plays an important role in determining a region’s production possibilities and the existence of feasible markets available to a producer. In our view, geography is not only a factor of differentiation of competitive space, but also a driver of different trajectories in the regional development. Also the empirical setting of the analysis reflects our focus on the geographic determinants of farmers' choice: in fact, we estimate our model adopting a multi-level approach (including municipality, province and regional level) that allows us to better capture, beside the impact of on farm characteristics, also the influence of the geographic context where each firm operates. Moreover, we pay a great attention on the spatial

dimension of data including in the regressions also spatially lagged variables, acknowledging that the characteristics of the neighbouring areas are also important.

The research questions that this paper want answer are then: among the whole universe of Italian farms, which are those, operating on AFNs? Which farm and/or farmer characteristics increase the probability to join AFNs? Which regional context and characteristics positively affect the diffusuin among farmers of alternative forms of marketing with direct interaction with consumers?

The paper is structured as follows: section 2introduces the theoretical framework and the hypotheses to be tested with the model; section 3 presents the data and the methodology; section 4 reports the results of the econometric analysis; section 5 provides some final remarks.

2. Theoretical framework

2.1 The role of knowledge

In recent years, EEG has attracted increasing attention (Frenken, 2007; Boschma and Martin, 2010) and its conceptual framework has been applied to explain the path creation process in many different economic sectors. As Boschma and Martin (2007) put it, EEG deals with the process of spatial diffusion of economic novelties such as innovations, new products, new firms and new networks. The emphasis is on the micro-behaviours of economic agents (individuals, firms, organisations) and the analysis focus on the locational behaviour of firms and how firms compete and learn based on their routines in time and space. Due to their tacit and cumulative nature, routines do not change easily and they are difficult to be imitated (Boschma and Frenken, 2003).

Joining with an AFNs is a novelty that requires a deep renovation of farmers' routines. In the early stage of a new path such as the re-localisation of agri-food system, the key mechanisms is the imitation of successful routines. The literature (Boschma and Frenken, 2003) has focused on agglomeration externalities as a mechanism that allows firms to acquire successfully routines from other firms. In particular, co-location creates possibilities for knowledge spillover and the exchange of ideas through face-to-face contacts (Storper and Venables, 2004).Broadly speaking, there is a general claim in the literature that location matters in the sense the more proximity between actors, the more interaction, the more interactive learning, and more innovation.

Also in the case of AFNs, the transfer of knowledge may happen face-to-faceand the networks for such an interaction are at the core of the innovation process (Randelli and Rocchi, 2017).Such networks also works as social production systems in which trust and knowing each other play an important role (Graziano and Forno, 2012). These localized networks are important for yet another reason: it is through these networks that farmers gain reputation and recognition within their field.

Although reputation and credibility are important for all firms, they are even more crucial for firms producing food. The partnership-based characteristic and the high value of face-to-face contacts in AFNs makes it important for farmers to be geographically closed to these networks (Brunoriet al., 2012). The participation to networks is a way to reinforce the alliance between consumers and farmers and to increase the demand for high quality products with relevant credence characteristics (Anderson, 1994), such as the typical and organic food. Farmers Markets (FMs) are a typical expression of these emerging networks of producers. It follows that farmers located in a geographical context dense of FMs could be fostered in the decision to explore different marketing strategies. Broadly speaking, FMs function both as incubator spaces as they support the process of research and experimentation in an early phase of a path creation (Boschma and Martin, 2010) reducing the start-up costs and making them accessible also to small farms (Bonanno et al., 2014), and as a new market's opportunity to shift towards a different channel of commercialisation (Mastronardi et al, 2015).

HYPO n. 1: *Closer to farmer' markets, higher the probability to succeed in the transition towards AFNs.*

Few scholars took a rather critical stand (Nooteboom, 2000; Boschma, 2005) and argued that proximity means more than just geography as it includes also non-spatial dimensions such as cognitive, organizational, institutional and social aspects. Therefore, the geographical proximity is important but it is not sufficient to have access to knowledge (Boschma, 2005). It follows that some individual characteristics may foster the process of innovation and not all farmers will have equal access to knowledge. In a dynamic rural space, farmers with an absorptive capacity, which is to say with a specific background and skills, will have a higher probability to shift towards the new routines associated with AFNs. In a survey on 219 farms in West Virginia, Farmer and Betz (2016) found a positive association between educational attainment and the choice of direct-selling strategy, which is to say the higher educational level, the lower concern about change in technology and routines.

HYPO n. 2: *To be competitive in a re-localised agri-food system the farmer needs some selected capabilities (use of ICTs) and a higher educational degree. The youngest farmers have more probability to step into AFNs*.

The participation of the farm to an AFN is often part of a "deepening" strategy within a multifunctional approach to farming (Van Der Ploeg and Roep, 2003; Van Huylenbroeck et al, 2007). The deepening of farming aims at increasing the share of value added remaining on farm both supplying products with non-conventional qualitative features (such as organic and local/typical food products) and reducing the downward competitive pressure along the food supply chain marketing directly to consumers. Very often the two actions are shaped as a single strategy (Dries et al, 2012) as direct marketing interactionsallows the farmers to supply to consumers the knowledge relevant for assessing the quality of products (information on organic production techniques or about the uniqueness of local food).Furthermore, it reduces the risks intrinsic inmarketing agricultural commodities, mostly affecting smaller farms.

HYPO n. 3: *Smallfarms are more likely to join AFNs.*
HYPO n.4: *Organic farms are more likely to join AFNs.*

2.2 The role of consumers

In recent years, there have been some manifestations of a growing dissatisfaction with the conventional food network, linked to broader concerns that the current agro-industrial food system has not effectively provided a nutritious, sustainable and equitable supply of food to the world's population (Marsden, 2003; Graziano and Forno, 2012). Technological innovations have provided cheap food to millions, but there are external costs of the system in terms of soil and water depletion, food safety scares, animal welfare, declining rural communities, rising obesity and diet-related health problems, as well as growing food insecurity (Donald et al., 2010). Furthermore, some food scandals combined with recent media attention on pesticides and obesity (Hargreaves et al., 2013) fuelled a surge in demand for healthy and secure food.

Nowadays, consumers exhibit a diversity ofsocial, ethical and cultural values in the transition process: in fact, they incorporate environmental issues and also extend to animal welfare, human rights and worker conditions (Randelli 2015). Broadly speaking, the so called “ethical consumer feels in charge with society and follows these feelings with an appropriate purchase behavior” (Vermeir and Verbeke, 2006, p. 170). In the case of AFNs, the motivation of consumers is to provide healthy food for themselves and to support local farmers (Brunoriet al., 2012; Randelli and Rocchi, 2017) even though different segmentsshowing different attitudes are likely to exist (Rocchi et al., 2011). The re-positioning of consumers purchase decisions might open a window of opportunity for new configurations (networks) at the niche level and new spaces of interaction with farmers (Migliore et al., 2013).

Since the Nineties, some consumers have organized themselves in informal networks of consumers in order to search for new ties in the food supply. These new informal networks of consumers shape differently worldwide (for example the experiences of *Community Supported Agriculture* in the USA) while in Italy are widely spread as Solidarity Purchasing Groups (SPGs). ASPG is an informal network of consumers set up by a number of members who cooperate in order to buy food and other commonly used goods directly from the producers (Randelli, 2015).In this paper, we test the capacity of SPGs to support farmers in the transition towards AFNs. Many scholars (Brunori et al., 2012: Migliore et al., 2013; Randelli and Rocchi, 2017) argue that there is a twofold effect of SPGs: direct, as they increase the demand for local food; indirectas they produce environmental and social impacts such as environmental awareness-raising, education andpromotion, changing the attitudes of local policymakers, engaging people in sustainabilityissues in their daily lives, and developing new ways of working towards sustainabledevelopment. In many cases, SPGs are good examples of grassroots lobbying activities: organizing petitions or events aimed at influencing local institutional decision-makers on environmental issues, meeting with party candidates, supporting the inclusion of environmental (and social justice) issues in the political agenda, and, creating an electoral list connected to the SPGor at least supporting an existing one, to better channel its key goals and participating in local elections (Graziano and Forno, 2012).

HYPO n. 5: *The presence of SPGs in the surroundings increases the probability for farmers to join AFNs.*

The quality of local food can also be a driver of destination attractiveness and then the tourist movement can reinforce the growth of local AFNs (Randelli et al., 2014; Viassone and Grimmer, 2015).

HYPO n. 6: *The local presence of tourists can support the participation of farmers to AFNs.*

Many scholars (Jarosz, 2008; Aguglia et al., 2011; Corsi and Novelli. 2018)) have proposed proximity to urban areas as a factor affecting the choice of direct selling, in the sense that the more population in the surroundings the more probability to start to sell directly their products.The access to urban areas may be affected also by accessibility which is to say that the distance may be reduced by the availability of road infrastructures.

HYPO n.7: *Higher the population density in the surroundings of the farm, higher the probability for farmers to joinAFNs*;

HYPO n.8: *Better accessibility (Km of roads),increases the probability for farmers to join AFNs.*

2.3 The role of policy

The selection environment also includes policy, "whose effects become especially visible when a major institutional change occurs and the "playing field" on which firms compete changes dramatically" (Boschma and Martin 2010, p. 12). Thus, understanding the transition of agri-food systems from long to short, alternative networks requires an analysis of policies, as relevant enabling and constraining context drivers. Any level of institution (municipality, region and country) may influence the emergence of new paths at the micro level of the firm, although today the CAP (Common Agricultural Policy) affects rural development widely and more deeply than national and regional policies do.

It follows that we explain agri-food transitions as a shift from a predominant historical conventional system to a new ri-localized food system through the interplay of processes at three different levels: micro (local), meso (regional) and macro (European).The important point of such evolutionary approach is that the further success of AFNs within rural areas is not only governed by processes within the micro-level (HYPO 1-8), but also by developments at the meso and macro level. It is the alignment of developments - successful processes within the micro level reinforced by changes at meso and at the macro level - which determine whether a rural shift towards a re-localisation of agri-food systems will occur. In this paper, we test the role of CAP funds in the transition towards a re-localised food system.

HYPO n.9: *Higher the total amount of CAP funds (pillar 1 and 2) in the area, higher the probability to develop AFNs.*

The largest part of support under the current "first pillar" of the CAP is provided in the form of direct payments decoupled by (i.e. not depending on) production levels aiming at ensuring and adequate and stable farm incomes. The relative stability of payments reduces the variability of incomes from farming (Mattews, 2016) with an impact increasing with the share of payments within the total receipts of the farm (Severini et al., 2016). The risk-reducing effect of direct payments may reduce the incentive to implement other strategies for reducing and managing risks, such as the deepening of farming activities and the participation to AFNs.

HYPO n.10. *A higher share of direct payments reduces the probability for farmers to join AFNs.*

3. Data and empirical methods

3.1 Data

The analysis was carried out using microeconomic information on the universe of Italian farms from the 2010 Census of Agriculture. The Census surveyed a total of 1,620,884 farms, gathering information on productive factors(land, livestock and equipment, labour), production processes, marketing actions (marketing channels, certification of products), technology, and a set of detailed data on farmers and their families.

The dependent variable of our analysis is direct-selling that, as we argued, is an evidence of the participation of the farm to the AFNs. Despite a long-lasting tradition in some of the Italian region, often linked to the presence of specific agricultural products like wine and olive oil (Cavicchi and Rocchi, 2010), direct selling to consumers is still a minor marketing channel for Italian farms. In 2010 the farms selling their products directly to consumers, both on farm and off farm, were 270579, corresponding to a share of 16.7% of total (Table 1).

Table 1. Farms with direct selling in the Italian agriculture.

Number of farms	270,579
Share of total farms	16.7%
Share of total Utilized Agricultural Area	20.9%
Share of total Labour Units	26.3%
Share of total Standard Output	21.4%

The largest part of them (11.2%) presented only on farm direct selling while only a minor share sold directly to consumers off farm, both exclusively (3.7%) or in combination with on-farm direct selling (1.8%). On average, farms with direct selling are larger than others both in terms of Utilized Agricultural Area (UAA: 20.7%) and even more of labour employed (representing about one quarter of total labour units). The Standard Output[1] produced by farms with direct selling is above 21% of total.

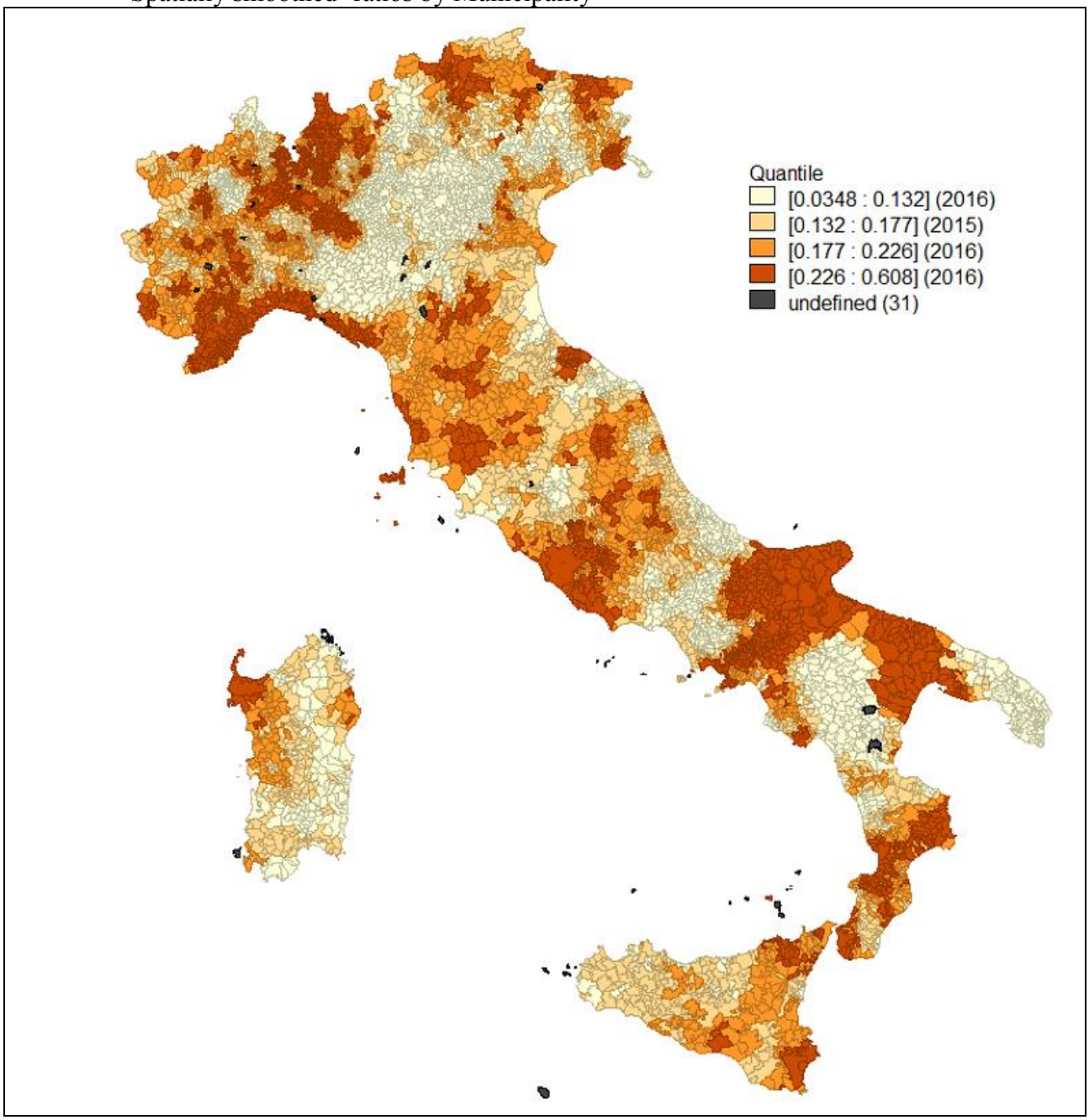
Average values hide the uneven distribution of the phenomenon across different regions of Italy (Figure 1). The prevalence of farms with direct selling is variable across the 8,094 municipalities,[2] .

[1]Standard Output is a proxy measure of Total Production that is calculated based on the physical dimension (hectares, livestock units) of the production processes activated by each farm and standard unitary output values for each production process (see http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Standard_output_(SO)).

[2]The map in figure 1 actually represents spatially smoothed values of the prevalence of farms with direct selling in order to emphasize the underlying pattern in the spatial distribution.

The areas where farms with direct selling accounts for a larger share of the total are present along the whole Italian territory and seems linked both to the presence of large urban areas (as in the case of Milan, Turin and Rome) and to the relevance of permanent crops in the agricultural output mix (Piedmont, Tuscany and Apulia regions). The map suggests the presence of a relevant geographic dimension of the studied phenomenon.

Figure 1 Prevalence of farms with direct selling
Spatially smoothed[1] ratios by Municipality



1. Neighbors defined according to a second level Rook distance

A set of variables referred to the subjective characteristic of farmers and the structural characteristics of farms has been defined to be used in the model. Table A1 in the appendix provides the definition of variables and their descriptive statistics.

All data at the firm level were based on the Census dataset while a variety of sources were accessed to define context variables, referred both at the municipality and province level.The source for the number of farmer markets is Coldiretti while data for SPGs comes from the volunteer list registered on the official website of the Italian Network of SPGs (www.retegas.org). While the number of farmer markets is available per municipality, the number of SPGs is only available per province.The source of data on CAP expenditure at the territory level are the reports that AGEA, the Italian Agency in charge of CAP payments in Italy, periodically delivers to the European Commission[3].

3.2 Econometric strategy

Our analysis exploits the information and the spatial dimension of Census data focusing on three groups of determinants of direct sales:

i) the characteristics of the farms and the farmers;
ii) the characteristics of the area where the farm is located (the context variables);
iii) the characteristics of the neighbouring areas (context variables weighted for the distance from the farm).

Given the structure of the Census and the administrative division of Italy this means that we take into account that each observation (each farm) is located in a specific municipality that is included in a province that in turn belongs to a given region: in econometrical terms it means that each observation is organized on 4 nested levels.

From a theoretical point of view, the spatial dimension can be represented considering that each different level has a level-specific error term (that captures erratic component shared among all farms in that level). This is the structure used in multilevel regressions and that will be used in our estimations.

A further spatial dimension that can be included in our analysis is represented by spatially lagged variables, that is, variables representing the characteristics of distant contexts weighted for the distance from the farm. Including spatially lagged variables is equivalent to assume that not only the characteristics of the area in the immediate proximity of a farm (the municipality or the province in our case) affect its decisions but also the characteristics of more distant areas.

In practice the dependent variable y of our analysis can be modelled according to the following model:

$$y_{r,p,m,i} = \alpha + \beta_1 x_i + \beta_2 z_m + \beta_3 z_p + \beta_4 z_{m\_sl} + \beta_5 z_{p\_sl} + \theta_r + \varepsilon_{r,p} + \epsilon_{r,p,m} + u_{r,p,m,i}$$

[3]The authors wish to thank prof. Franco Sotte and dr. Edoardo Baldoni for sharing the data they used in their study on CAP payments in Italy from 2008 to 2014 (Sotte and Baldoni, 2016).

where $y_{r,p,m,i}$ represents whether the firm *i*, located in municipality *m*, province *p* and region *r* is directly selling its product and this is variable is one in case of direct selling and zero otherwise. The components $\theta_r, \varepsilon_{r,p}, \epsilon_{r,p,m}$ and $u_{r,p,m,i}$ and the zero-mean, normally distributed random term for each level. The component x_i are the observable characteristics of the farm, whereas *z* are the characteristics of the administrative context where the farm is located and therefore do not vary between farms belonging to the same context: given our data availability, some variables will capture characteristics of the municipality context (z_m) and others of the provincial context (z_p). The components $z_{m\ sl}$ and z_{p_sl} are the spatially lagged variables at the municipality and province levels. A spatial lag of a variable is defined as a weighted average of values of the variable over neighbouring administrative levels, where the weighted average is obtained using a spatial-weighting matrix and the weights are thus related to the distance between administrative levels. The spatial-weighting matrices allow us to take into account Tobler's first law of geography—"everything is related to everything else, but near things are more related than distant things" (Tobler, 1970: 234-240). In our specific case, we compute an inverse-distance spatial-weighting matrix that is composed of weights that are inversely related to the distances between the administrative units: this is done computing the inverse of the Euclidean distance obtained from the coordinates of the area where the farm is located, the province for some context variables and the municipalities for others.

In our analysis we produce the estimation of the above model using a multilevel linear probability model (LPM) with four levels. Given the binary nature of the dependent variable, the logit and probit models would also be possible choices. However, the huge amount of observations (about 1.6 millions) and four levels of unobserved components generate computational problems making these models hardly feasible: as a matter of fact, econometric theory have acknowledged that logit and probit models with unobserved components are difficult to estimate and interpret (see Wooldridge 2010, Chapter 15) and it is known that LPM delivers good estimates of the partial effects of the covariates (see Wooldridge 2010). Finally, even if standard LPM can suffer from heteroscedasticity issues in our specific case we take them into account using Hubner/White sandwich robust variance estimation.

4. Results

Table 2 provides a summary of the estimated model. The likelihood ratio test clearly confirms that the multilevel model better performs than the corresponding pooled one. Our predictions in terms of probability falls out of the 0-1 bounds in 8.11% of cases. This is a typical outcome of the LMP approach and from this point of view the model doesn't perform a perfect prediction of the outcome:

however, our study is mainly focused on the determinants of the outcome and, as a consequence, the methodology adopted still satisfy our needs.

Table 2. Multilevel linear probability model for direct sale: regression summary.

Constant	0.1738
	(0.1005)
Observations	1,620,884
Number of groups	21
Lr Test on equality of Multivelvs. Pooled	215,318.92***
Out of bound predictions	8.11%

Robust standard errors in parentheses.*** p<0.001, ** p<0.01, * p<0.05

The impact of farmers characteristics on the choice to sell directly to consumers can be assed with the coefficients estimation reported in table 3.

Table 3. Multilevel linear probability model for direct sale: farm-level variables on subjective characteristics.

	Coefficients (Robust SE)
Age	-0.000249
	(0.000528)
Age Squared	-4.04e-06
	(3.24e-06)
Female	-0.00699***
	(0.00186)
Lower Secondary Education	-0.00613**
	(0.00234)
Intermediate Secondary Education in agriculture studies	0.0215*
	(0.00982)
Intermediate Secondary Education	-0.00206
	(0.00304)
Higher Secondary Education in agriculture studies	0.0275***
	(0.00555)
Higher Secondary Education	-0.00447
	(0.00328)
Tertiary Education in agriculture studies	0.0210***
	(0.00543)
Tertiary Education	-0.0198***
	(0.00549)

Robust standard errors in parentheses.*** p<0.001, ** p<0.01, * p<0.05

Our results suggest that age of the farmer doesn't show a significant impact on the outcome: we still find a negative sign, similar to others studies on Italy (Aguglia et al., 2011, Bonanno et al., 2014) but no statistical significance.

The coefficients for educational attainments show an interesting pattern. Previous studies on Italy generally find a positive impact of education on the participation to alternative forms of agricultural and food markets. We find that farmers with higher degree of education tends to use more the direct sale channel but only when the focus of studies is on agriculture; conversely, general education shows a null or negative (at the tertiary level of education) impact on direct selling. The results of previous studies on this aspect may be driven by a large presence of agriculture studies within the observed data whereas we find that education have a much more diverse effect.

Our findings suggest that highly educated farmers without a specific background on agriculture prefer the standard marketing channels: their high but general skills that are probably more useful in the conventional food supply chain. On the other hand, specific knowledge on agriculture can foster the decision to enter on AFNs. For instance, the direct contact with consumers looking for a better knowledge about the food they purchase, allows the farmers to share their contextual knowledge on production methods as an immaterial, valuable characteristics of products. Interestingly, AFNs appear here as a social phenomenon that is strictly linked to the intrinsic features of agriculture as a production process.

Our regression also included also the impact of a set of farm-level structural characteristics on the probability to direct sell to consumers. Table 4 and 5 provides the coefficients for them.

Table 4. Multilevel linear probability model for direct sale: farm-level variables on structural characteristics.

	Coefficients (Robust SE)
Standard Output	-0.214e-08***
	(3.53e-09)
Share of CAP direct payment as on total revenues (%)	-0.00106***
	(0.000191)
Farm hasemployees	-0.0304***
	(0.00413)
Share of family labour	-0.0565***
	(0.0136)
Farm producesorganicproducts	0.107***
	(0.0120)
Farm has internet access	0.105***
	(0.0142)
Farm has a web page	0.228***
	(0.0220)
Farm uses IT devices	0.0399***
	(0.00874)
FT2: Horticolture	0.190***
	(0.0539)
FT3: PermanentCrops	0.00692
	(0.00940)
FT4: Grazing Livestocks	0.0541***
	(0.0119)
FT5: Granivores	0.165***
	(0.0213)
FT6: Mixed Crops	0.0952***
	(0.00991)
FT7: Mixed Livestocks	0.318***
	(0.0264)
FT8: Mixed Crops and Livestocks	0.189***
	(0.0145)
FT9: Others	-0.0771***
	(0.0125)

Robust standard errors in parentheses.*** p<0.001, ** p<0.01, * p<0.05

The farm type shows a significant impact on direct selling: almost all farm types (with the exception of the residual, small group of not classifiable farms) are more likely to directly sell their products

than farms specialised in field crops (FT 1, which acts as our benchmark category). As expected, farms specialised in horticulture (as found for example by Aguglia et al. 2011) and mixed farm types show the highest propensity to direct selling. As in previous studies the adoption of organic agriculture is associated with a more frequent use of direct marketing channels, confirming that the direct contact with consumers is today largely the expression of a transition towards new and alternative models of food supply chain.

Table 5. Multilevel linear probability model for direct sale: farm type specific coefficients for total Utilized Agricultural Area..

	Coefficients (Robust SE)
FT1: Field Crops	-1.07e-06**
	(3.79e-07)
FT2: Horticolture	-1.31e-05*
	(6.64e-06)
FT3: PermanentCrops	1.89e-05***
	(3.13e-06)
FT4: Grazing Livestocks	1.09e-06
	(7.54e-07)
FT5: Granivores	-8.64e-06***
	(2.15e-06)
FT6: Mixed Crops	2.80e-06*
	(1.34e-06)
FT7: Mixed Livestocks	-7.11e-06*
	(3.23e-06)
FT8: Mixed Crops and Livestocks	-2.80e-06*
	(1.36e-06)
FT9: Others	-2.04e-06**
	(7.83e-07)

Robust standard errors in parentheses.*** p<0.001, ** p<0.01, * p<0.05

Overall, farm size both in economic (standard output coefficients in table 4) and in physical terms (Farm type specific coefficients for UAA in table 5) shows a negative impact on the probability to sell directly to consumers. Small farms are more likely to choose AFNs to market their output. However, there is an important exception to this result: in the permanent crop sectors, larger farms (in terms of UAA) have a higher probability of directly selling. This may be due to the presence of farms specialized in wine and olive oil production within the group. Directly selling to consumers is traditional in Italy for the products of these two major crops, and it is a standard marketing action to promote the image and the reputation of major brands in the wine sector, often associated with the provision of touristic services. A further result may reinforce this interpretation. The presence of employees in the farm, a structural feature associated with a larger economic size of the farm business, is inversely related with direct selling. This result should be anyway read together with the coefficient associated with the share of family labour, showing a negative sign. Even though small farm businesses choose more frequently direct selling than others, among the farms using employed labour the probability to choose alternative forms of marketing increases with the share of hired labour. The result suggests that choosing direct selling and joining AFNs may be driven by different

strategies of "deepening" (Van Huylebroeck et al., 2007) within different models of business (small, family-run vs. large, quasi-corporate).

Farms and farmers that use IT technology are strictly more likely to adopt the direct sales channel. It is likely that these technologies are key instruments to handle the direct sale process and to promote and advertise the products. The use of IT technologies is also likely to be associated to the process of creation of new business routines and social innovations typically present in AFNs (Randelli and Rocchi, 2017). Networking activities functional to the process of "reconnection" (biological, social and moral) that characterizes AFNs is often supported and reinforced by the creation of "virtual spaces" (Bos and Owen, 2016). Unsurprisingly, the coefficient for the variable "Farm has a web page" shows the stronger association with the presence of direct selling.

Moving to consider the context variables observed at the municipality and province level (Table 6 and 7) our analysis confirms some of the results of previous studies. Direct selling is more likely to be chosen in hill and mountain areas, a result probably linked to the specialization of farms, due to environmental constraints, on productions more suitable to sell directly their products. Population density, as expected, increases the probability to directly sell.

Table 6. Multilevel linear probability model for direct sale: municipality-level context variables

	Coefficients (Robust SE)	
	Context variables	Spatially lagged context variables
Farmer markets per square km	0.0208	102.3**
	(0.194)	(46.48)
Square of farmer markets per square km	-0.264	535.0***
	(0.199)	(139.3)
First Pillar PAC expenditure per total Utilized Agricultural Area	-0.000102	-0.213
	(8.53e-05)	(0.201)
Second Pillar PAC expenditure per total Utilized Agricultural Area	-5.86e-05	0.333
	(0.000638)	(0.802)
Population Density (resident people per square km)	2.15e-05**	-0.00121
	(6.77e-06)	(0.00212)
Hill	0.0782***	
	(0.0191)	
Mountain	0.101***	
	(0.0239)	

Robust standard errors in parentheses.*** p<0.001, ** p<0.01, * p<0.05

The current policy interventions do not seem to provide an effective incentive to direct sale. The aggregate policy expenditure (both for the first and the second pillar of the CAP) at the municipality level does not show any significant impact, while at the farm level (see Table 4) the share of direct payments on individual farm revenues actually *reduces* the probability to use this channel. The latter result suggests that the reduction of entrepreneurial risks, implicit in the high dependence of farm revenues from policy, creates a sort of path dependence in the productive and sale process, reducing the need for innovative marketing channels. As smaller farms are, on average, more

heavily dependent on public support (even though accounting for a smaller share of total payments), the result suggests a controversial outcome of the policy, contrasting the *higher* propensity of smaller farms (*coeteris paribus*) to choose direct selling and joining AFNs. CAP direct payments actually disincentives the possible development of new, profitable forms of small farming activity within a possible transition towards more sustainable forms of supply chain.

Table 7. Multilevel linear probability model for direct sale: province-level context variables

	Coefficients (Robust SE)	
	Context variables	Spatially lagged context variables
Number of SPG per square km	8.574***	426.0
	(2.566)	(343.0)
Square of number of SPG per square km	-108.1**	-5.414
	(39.83)	(17.42)
Km of roads per square km	0.00302	-75,015
	(0.0585)	(52,944)
Per capitanumber of tourist visitors	-8.74e-05	1.682e+06
	(0.000923)	(957,124)

Robust standard errors in parentheses.*** p<0.001, ** p<0.01, * p<0.05

Table A.1 Variables descriptive statistics

Variables	Mean or share	Standard error
Farm-level		
Age	59.05521	.0115313
Female	.3071454	.0003623
Lower Secondary Education	.3202475	.0003665
Intermediate Secondary Education in agriculture studies	.0094362	.0000759
Intermediate Secondary Education	.0353819	.0001451
Higher Secondary Education in agriculture studies	.0244465	.0001213
Higher Secondary Education	.1537056	.0002833
Tertiary Education in agriculture studies	.0080728	.0000703
Tertiary Education	.0542272	.0001779
Standard Output	30701.90	192.7288
Share of CAP direct payment as on total revenues (%)	29.62278	.0294223
Farm has employees	.0410208	.0001558
Farm share of family labour	.9365989	.0001570
Farm produces organic products		
Farm has internet access	.0120039	.0000855
Farm has a web page	.017918	.0001042
Farm uses IT devices	.0375999	.0001494
Utilized Agricultural Area	7.931504	.0285262
FT1: Fieldcrops	.2367578	.0003339
FT2: Horticulture	.0233191	.0001185
FT3: Permanent crops	.5499417	.0003908
FT4 Grazing livestock	.0798895	.000213
FT5: Granivores	.0057733	.0000595
FT6: Mixed crops	.0650558	.0001937
FT7: Mixed livestock	.002614	.0000401
FT8: Mixed crops and livestock	.0219551	.0001151
FT9: Other	.0146832	.0000945
Municipality level		
Farmer markets per square km	.0027141	.0002122
First Pillar CAP expenditure per hectare of UAA	453.3996	23.10447
Second Pillar PAC expenditure per hectare of UAA	102.6322	6.29588
Population Density (resident people per square km)	296.9387	7.025158

Plain	.262605	.0048922
Hill	.41609	.0054798
Mountain	.3192042	.0051825
Province level		
Number of SPG per square km	.0044371	.0008648
Km of roads per square km	.5574614	.0176569
Per capita number of tourist visitors	7.548541	.9240501

Among the other context driving factors the infrastructural endowment (kms of roads) and the presence of tourists (both in table 7) don't show a significant impact on the choice of direct selling. Conversely, the spatial distribution of farmers' markets and solidarity purchasing groups seems likely to drive the farmers' choice towards the direct interaction with consumers. For FM, it appears that what matter is not their number in the immediate context but in the whole neighbouring area. In fact, only the coefficient for the spatially lagged version of the variable is statistically significant. Apparently, the reverse is true for SPG, whose coefficient is significant only in the immediate version of the variable. This, anyway, may be simply due to the level at which each variable is observed: in particular, SPG are observed at the provincial level so that their effect is already measured considering a wider area than the immediate contextof the municipality.

There is an important difference in the impacts of these two forms of networking: FMs show increasing returns to scale (positive coefficient for the squared, lagged variable) while SPGs show diminishing returns. This suggests that the former need to reach a certain critical mass before actually becoming a push factor for direct sale: the presence of isolated or rare markets probably does not offer enough incentive to start direct sale. The result seems well representing the existence of agglomeration economies that are typical of a cumulative and localised process of social innovation, mainly based on knowledge sharing among the actors involved. On the contrary, in the case of SPG what matters is the presence of at least a few of them. This may be due to the fact that even few groups are able to aggregate enough motivated consumers, creating a local demand large enough to saturate the local supply of farm produce through this form of direct selling. This difference in the effect of these forms of alternative market outlets reveals their different nature and motivation of involved actors. It follows that the contribution of SPGs to the food supply transition is therefore more related to their cultural action and lobbying rather than to the market share that they have reached.

5. Conclusions

The agro-food regime is undergoing a process of change and several windows of opportunities are open. Among them, the re-localisation of consumers' choices has fostered the development, diffusion and use of technologies and practices suitable to reduce the distance (geographic, social and cultural) between production and consumption along the food supply chain. This paper follows on this lead and try to evaluate which factors are likely to drive the transition towards these innovative formsof food supply chain.

The availability of a large database as well as the opportunity to pinpoint the whole cohort of farmers selling directly to the consumers in 2010 in Italy has allowed us to test a set of hypotheses about the evolutionary patterns of AFNs.

A first set of factors fostering the transition are the specific farmers' and farm's characteristics. To be competitive in a re-localised agro-food system the farmer needs some selected capabilities (confirming our Hypo 2) such as the use of ICT technologies. These capabilities appear to depend more on the farmer's field of education than on age and, in particular, a specific knowledge on production methods accessed through secondary and tertiary education in agricultural studies. From this point of view the path towards a more sustainable food system appears to be a social phenomenon deeply shaped by the peculiar characteristics of agriculture as a production process.

The small and organic farms being more likely to join AFNs (confirming Hypo 3 and 4) may suggests that the transition towards a re-localised food supply is the outcome of a broad process of change propelled by a diversity of social, ethical and cultural rules and values. At an early stage of development, large industrial farms are less interested in entering these new niche markets. But the results may suggest also that large farms have not the right reputation according to conventions ofquality governing transactions in the alternative forms of food markets (Eymard Duvernay, 1989 and 1993); and possibly that their hierarchical internal organization doesn’t allow them to share the relevant knowledge about food the consumers are looking for.

A second set of factors able to foster the transition are embedded in the geographical context where the farm is located. The role of FMs and SPGs is relevant (confirming Hypo 1 and 5) positively affecting the decision of farmers to enter AFNs. We are aware that the inclusion of these variables as covariates in the modelis subject to the possible criticism of endogeneity. The huge number of observations (more than 1.5 millions) and the complex, multilevel structure of the model impose computational constraints and limit a statistical analysis of the problem. Despite the presence of reverse causality cannot be completely excluded, we have reasons to believe that the problem doesn't question the overall validity of our results. First, the phenomenon represented by the two

variables (the territorial density of alternative market outlets) shows a certain degree of independence and exogenity from the decision of farmers to sell directly to consumers: the SPGs are networks typically promoted by groups of *consumers* and also the opening of FMs is often the consequence of local initiatives that are promoted by groups of actors and stakeholders broader than local community of farmers. Moreover, the impact of these variables operates at a higher geographical scale than the single municipality; this is especially true in the case of FM density (the variable more are risk of beingendogenous), showing a positive impact only in the spatially lagged dimensions.

We believe that, in an early stage of development, these "spaces" of interaction among producers and consumers depend more on the diffusion of the innovation (direct selling) and on the knowledge related to it (Randelli and Rocchi, 2017) rather than to the increase of the demand for local products.In the success of AFNs experiences, consumers shaping their desired model of consumption collaborate with producers shaping their desired model of business. The small scale of most of these networks facilitates the circulation of knowledge necessary to foster such co-produced innovation process. A farm located in a such geographical context, run by a farmer with a high absorptive capacity and a cognitive proximity, has more probability to step into AFNs.

The population density has a positive effect at the municipality level (confirming our Hypo 7), while the spatially lagged coefficient is not significant. This result confirms the strategic role in developing AFNs of networking within innovative spaces and with skilled consumers rather than of the access of a mass consumption, that probably continue to refer to large retailers.These insights support the idea that the evolution of AFNs is a localised process of social innovation, mainly based on knowledge sharing among actors (farmers, consumers, local institutions). Within this evolutionary process which is the role of the current sector policies? The results of our analysis suggest a controversial outcome of the European CAP at the farm level, showing that the more the direct payments become an important share of farm receipts, the more the inclination to innovate marketing channels declines(confirming our Hypo 10). In addition, the non-significant coefficients related to the expenditure intensity both for the First and the Second Pillar provide evidence that the geographical distribution of CAP support is unlikely to counterbalance the lock-in mechanism working at the farm level (rejecting Hypo 9)

The current CAP policy is still mainly designed to support larger industrial farms in plan areas (such as Pianura Padana).Where the policy is less effective in transmitting the economic incentives, as in hill and mountain area, small and organic farms are more successful in the transition towards alternative forms of food supply chain, due to the mutual support and trust with municipalities and local communities (of which FM and SPG variables can be considered a proxy). The main policy

lesson is that an effective promotion of a multifunctional agriculture should create spaces of opportunity to market "non-commodity outputs" such as environmental sustainability or local cultures on food that are a joint output of farming (Oecd, 2011). Such a result is more likely to be pursued by a policy designed to spread the relevant knowledge and enhance the institutional framework for local initiatives (Blay-Palmer et al., 2016) than by the direct monetary support of the farm income.

Our analysis has only touched upon the different types of factors that may drive the evolution of a more sustainable food system. We are anyway aware of the limits of our case study. They concern the specific context (Italy) where we study the innovation process within the AFNs. In Italy the average size of farms is very small and this support the rise of AFNs insofar as they represent an opportunity in the survival of small, family-run farm businesses. Second, the food culture is very developed and association such as Slow Food and Coldiretti are fostering the creation of innovative marketing channels for farmers with actions aiming at increasing among consumers awareness and knowledge on the quality and sustainability of food. Third, as their qualification as "alternative" implies, AFNs are still a niche phenomenon, even though some of their good practices andquality conventions have been largely adopted also in the "conventional" food system. For all these reasons, the case study cannotbe considered directlyrepresentative of the way AFNs are evolving worldwide. In our view, however, the study is quite informative regarding the evolutionary patterns and the mechanisms that foster their evolution.

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