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Pluriactivity in Italian agriculture: are farmers using interlinked strategies?

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1. Introduction

The agricultural sector is important for rural livelihoods in Italy.¹ Italy has the second largest agricultural sector in the EU, behind France. While the average size of Italian farms is below the EU average, output per farm is above average (European Commission, 2009). Recently, the agricultural sector is confronted with a number of developments. Changing consumer preferences, drastic policy revisions (that turn the focus on environmental, animal and food safety issues) and increased urbanization (unlocking rural areas) are just a few factors that continue to have a major influence on the Italian farm sector.² Some of the challenges that this changing environment creates are stronger competition for natural resources – especially land –, increased constraints on resource use, and a rise in regulations that restrict the farm operator's choice set. At the same time, the changing farm business environment also offers new opportunities, e.g. the proximity to large consumer markets and better links to infrastructure and logistics networks. The current institutional and economic environment has created the opportunity, or sometimes even the need, to assign farm resources to diversification strategies.³

This paper studies the determinants of the diversification strategies followed by Italian farmers. Several studies point to the importance of diversification and pluriactivity in Italian rural areas (Esposti and Finocchio, 2008; Aguglia *et al.*, 2009; Salvioni *et al.*, 2009). Italy is an interesting country to study diversification and pluriactivity because of the heterogeneity of its rural areas. The first source of heterogeneity is due to geographical diversity (OECD, 2009). Italian geography is characterized by the prevalence of hilly and mountainous areas. Out of a total land area of about 30 million hectares, only 23% is categorized as plains (MIPAAF, 2007). Furthermore, the combination of varied climate conditions (from the south to the north and from the coastal to the inner areas) and altitudes have produced a great range of different eco-systems.

A second source of heterogeneity is related to the diversity in socio-economic conditions. Important differences can be observed between the economically wealthier north and the poorer south of the country. South Italy is characterized by poor development conditions. Moreover, southern Italian rural areas have a less developed material and immaterial infrastructure (i.e. roads, irrigation systems, highways, railways and internet connections) than rural areas in the center and north of Italy. This is affecting job opportunities in and outside the agricultural and food sector. This distinction is also translated in the prevailing structure of the agricultural complex. For example, average farm size changes from around 10.1 ha in the north, to 8.3 ha in the center and 5.8 ha in the south of Italy (MIPAAF, 2007). Moreover, the agricultural sector in the center and the north of the country has the main features of more industrialized societies, viz. a higher productive capacity, good infrastructures, access to water, high factor use productivity, better organized supply chains and the presence of strong processors and retailers. On the other hand, hilly and mountainous areas in the center and south are characterized by the presence of small-scale agricultural systems, a great variety of local production and niche markets and strong traditions.

Several studies point to the importance of regional differences in diversification (Lowe *et al.*, 2002; Terluin, 2003). Furthermore, the richness of habitats, biodiversity and agro-natural landscape in Italy is threatened by urbanization of rural areas and depopulation of rural communities. While northern Italian agricultural systems are experiencing an increase in

¹ In 2007 there were 1,679 thousand farms in Italy. In total, these farms employed around 1.2 million annual work units (AWU) (European Commission, 2009).

² For example, in the presentation of the Strategic Plan for Rural Development the Italian Ministry of Agriculture, Food and Forestry reported the presence of 2.8 million hectares of High Value Nature agricultural land and an extension of Natura 2000 sites over 20% of the national territory (MIPAAF, 2007).

³ The literature distinguishes between diversification and pluriactivity. Section 2 will clarify this distinction.

resource use and demographic pressure (especially in the river Po basin), central and southern Italian rural areas are exposed to economic growth difficulties, depopulation, and land abandonment (MIPAAF, 2007). It is therefore particularly interesting to analyze diversification in Italy, taking the prevailing heterogeneity of the rural areas into account. Only few studies explicitly model farm household decisions related to diversification and pluriactivity. Studies that do focus on farm diversification have often been descriptive in nature (Bowler et al., 1996; Carter, 1999; Ilbery, 1991; Maye et al., 2009; Meert et al., 2005). Furthermore, the existing quantitative studies have modeled diversification strategies as independent choices by farm households (Barbieri and Mahoney, 2009; Barbieri et al., 2008; Bateman and Ray, 1994; Damianos and Skuras, 1996; McNally, 2001). This paper contributes to the literature by providing a quantitative analysis of farm household decisions while explicitly taking into account the potential jointness of pluriactivity strategies. This is important from a methodological perspective because ignoring the correlation between different strategies that are in competition for the same resources may lead to biased results (Pfeifer et al., 2009). Furthermore, modeling and quantifying the degree of interlinkage between different strategies allows us to derive conclusions about which diversification strategies are more likely to be taken up by the same rural household and which combinations of activities are less likely to be observed.

2. Literature review on pluriactivity

2.1. Diversification versus pluriactivity

Farm diversification is defined as the development of income-earning activities outside the range of conventional crop and livestock enterprises associated with agriculture (McInerney et al., 1989; Ilbery, 1990). It involves a diversion of resources (land, labor and capital) which were previously committed to conventional agricultural activities (Ilbery, 1990). In essence, this definition excludes off-farm employment as a type of diversification. The main reason is that it is difficult to argue that off-farm employment uses diverted resources, i.e. labor, that was previously committed to agricultural activities as farm labor. For example, Jervell (1999) points out that the increased share of off-farm labor in farm household income can mainly be attributed to previously un- (or under)employed farm spouses' increased participation in the labor market. If this is the case, then off-farm employment is not necessarily the result of diverted farm resources.

Other authors argue in favor of the inclusion of off-farm labor of farm family members under the umbrella of diversification (Shucksmith et al., 1989; Gasson, 1988). On the one hand, off-farm employment makes a significant contribution to farm household incomes across different countries and regions in Europe (Shucksmith and Smith, 1991; Bateman and Ray, 1994). Furthermore, exclusion of off-farm income is likely to underestimate the contribution of female household members to farm household income (Maye et al., 2009). The terminology that is generally used in this context is that of pluriactivity of farm households, where farm diversification is only a sub-set of strategies that pluriactive farm households can follow.

Many studies have looked at pluriactivity in terms of a survival or even an exit strategy (Barbieri and Mahoney, 2009; Carter, 1989; Meert et al., 2005; Weiss, 1996). Others have pointed out that pluriactivity should be seen as a natural development in rural resource use (McInerney et al., 1989). In line with this view, a study on farm diversification in the U.K. states that "as the requirement for agriculture, namely food production, to have the primary claim on land use decreases, the demand for a range of new products and services that farmers can provide increases" (CCR, 2002, p.).⁴ This natural development towards pluriactivity fits

⁴ This observation has led a number of authors to link pluriactivity to the notion of multifunctionality of agriculture (Meert et al., 2005; Renting et al., 2009).

within the seven-paths-of-farm-business-development that are distinguished by Bowler et al. (1996):

1. Industrial model;
2. Non-conventional agricultural production;
3. Non-agricultural products and services on-farm;
4. Off-farm employment and other gainful activities;
5. Traditional model of conventional farm production;
6. Hobby / winding down / semi-retirement;
7. Retirement.

Strategies 2 and 3 are generally considered as farm diversification. Including also strategy 4 renders a working definition of pluriactivity.

In practice, farm households can follow different strategies simultaneously.⁵ Bowler et al. (1996)'s framework has been used and adapted in a number of papers (Damianos and Skuras, 1996; Meert et al., 2005). It will also form the basis of definitions on pluriactivity strategies used in this paper.

2.2 Determinants of pluriactivity

Pluriactivity has been explained in the literature based on internal – to the farm and farm household – and external characteristics. External determinants are often linked to the location of the farm.

Location includes the degree of rurality and the distance to urban population centers. Nearby urban centers can be important for example to determine the potential for on-farm sales. Furthermore, the proximity of a local job market creates opportunities for off-farm employment (Barbieri and Mahoney 2009; Bateman and Ray, 1994; Carter, 1999; Chaplin 2004; CRR 2002; Damianos and Skuras, 1996; Heimlich and Barnard, 1997; Heimlich and Brooks, 1989; Ilbery, 1991; Meert et al., 2005; Vandermeulen et al., 2006). Another element related to location is that of landscape features. Natural beauty of the landscape can enhance opportunities for diversification while specific landscape features – e.g. high altitude – can also pose constraints. Studies have found that there is less diversification in less favored areas but at the same time, more service-related diversification (e.g. agro-tourism) in environmentally attractive locations (McInerney et al., 1989; Bateman and Ray, 1994; Bowler et al. 1996; Ilbery, 1991; Ilbery et al., 1998; McNally 2001; Sharpley and Vass, 2006).

Farm location also relates to the quality of social embeddedness or social capital of the communities in which farmers operate. Following Ostrom (2000) social capital can be defined as “the shared knowledge, understandings, norms, rules, and expectations about patterns of interactions that groups of individuals bring to a recurrent activity”. Trust and social networks are the two main aspects of social capital. Slangen and Polman (2008) find that a low level of social capital decreases the probability of farmers to diversify into providing environmental services.

Other external factors that can influence the move into pluriactivity are cultural aspects, regional population dynamics (Bateman and Ray, 1994) and policy changes (CRR 2002; Maye et al., 2009). Finally, Maye et al. (2009) point out that the degree of diversification is also affected by macroeconomic conditions, e.g. economic crisis.

Numerous farm-related internal determinants of pluriactivity have been identified in the literature. There is mixed evidence on the relation between farm size and pluriactivity (Whatmore et al., 1987; Shucksmith and Smith, 1991; Bateman and Ray, 1994; CRR, 2002;

⁵ A common term from small business economics is sometimes also applied here: portfolio entrepreneurship. This means that entrepreneurs / business partners can simultaneously manage different businesses. For example, a farm household can manage a conventional farm unit and at the same time be engaged in agro-tourism, or direct on-farm sales.

Damianos and Skuras, 1996; Ilbery, 1991; McNally, 2001; Meert et al., 2005). Specialization also plays an important role. Extensive livestock and seasonal production is more suited for combination with other activities on and off the farm, while intensive livestock and dairy production is less favorable (McInerney et al., 1989; Ilbery, 1991; Bateman and Ray, 1994; Bowler et al., 1996; Ilbery et al., 1997; McNally, 2001; CRR, 2002; Chaplin et al., 2004; Potter and Loble, 2004; Alasia et al., 2009).

Other farm characteristics that are linked to pluriactivity are: the financial structure; tenancy restrictions; labor use – family versus hired labor – and business structure (Ilbery, 1991; Bateman and Ray, 1994; Bowler et al., 1996; Damianos and Skuras, 1996; McNally 2001; Maye et al., 2009).

Farmer and farm household characteristics are a final category of internal determinants of pluriactivity. Variables that have been looked at in this category include farming experience, education level and marketing skills of the farmer and spouse; culture, household composition and other family-related characteristics and unearned income (Ilbery, 1991; Bateman and Ray, 1994; Damianos and Skuras, 1996; Woldehanna et al., 2000; McNally 2001; CRR, 2002; Chaplin et al., 2004; Meert et al., 2005)

3. Farm household pluriactivity in Italian rural areas

3.1. The importance of pluriactivity in Italy⁶

The Italian Census Bureau measures pluriactivity of farm households as the presence of “non-agricultural activities”. These activities include agro-tourism, handicraft activities (hand-made wooden articles, embroidery, straw baskets and pottery), on-farm processing of vegetal and animal products (wine, olive oils and cheese), energy production, aquaculture, leisure activities and contracting of farm equipment. There are about 121 thousand pluriactive farms in 2007 that represent roughly 7% of the entire Italian farm population. This is an increase of 15% compared to 2005. Diversification in agro-tourism has increased the most (+41%), followed by on-farm processing (+ 12%). On-farm processing of vegetal products remains the most popular diversification activity and is found in 71 thousands farm businesses.

Pluriactive farms are spread evenly across the north (39%) and the south of Italy (39%) with an increase of 20% and 10% respectively from 2005 to 2007. The remaining 22% of pluriactive farms are located in central Italy. Pluriactive farms are mainly small- and medium-sized businesses. About 19% of them have less than 1 hectare and perform only one non-agricultural activity. Farms with a size of 5 to 10 hectares are more likely to diversify in 2 or more activities simultaneously.

Apart from the growing importance of diversification in Italian rural areas, diversification activities have also changed in recent years. While traditional agro-tourism mainly involved catering and accommodation, Italian farms are increasingly adopting a wide range of touristic activities. For example, accommodation and hosting activities are present in 83% of the Italian agro-tourism farms and catering in 49%, activities like product degustation and leisure activities (sport, horse riding, health-care, etc.) are performed in 56% of these farms respectively.

Pluriactivity is also related to the capacity of farm households to enhance the quality of “traditional” agricultural production and to create a higher value-added. An indicator of this is represented by the number of farms using quality labels. In Italy, 76 thousand farms delivered products with Protected Designation of Origin (PDO) or Protected Geographical Indication (PGI) in 2008, mainly cheeses (34 thousand), olive oils (18 thousand) and fruits and vegetables (15 thousand). This is an increase of about 40% compared to 2005.

⁶ This section is based on ISTAT (2000; 2007a; 2007b; 2008; 2009)

Finally, also off-farm employment is widespread in Italian rural areas. In 2000 one out of four Italian farm managers worked off-farm, mainly in the industrial sector. About 16% of farm spouses are engaged in off-farm activities, while about 2% of other relatives (living in the farm household) have off-farm employment.

3.2 *Pluriactivity in the Italian Farm Accountancy Data Network (FADN)*

The empirical analysis on farm pluriactivity in Italy is based on the information from the 2006 Farm Accountancy Data Network (FADN). This dataset contains detailed information on more than 15,000 farm businesses. The Italian National Institute of Agricultural Economics (INEA) is responsible for collecting and organizing the FADN on a yearly basis. The data is representative for the population of farmers in Italy and it is in line with the formal procedures of the European Commission. Data is counter-checked by the National Institute of Statistics (ISTAT). The sample is stratified on three key variables, i.e. location (21 NUTS2 regions), economic size (6 classes) and farm types (19 typologies) (INEA, 2006). We use the information related to farm location to attach site specific variables to each observation.

We typify pluriactivity following the framework used in Meert et al. (2005) and adapted from Bowler et al. (1996) and Ilbery (2001), and identify four farm strategies in our analysis, as shown in table 1.

Table 1. Definitions of pluriactivity

| <i>Pluriactivity</i> | <i>Description</i> |
|-----------------------------------|--|
| (1) Agricultural diversification | Farm resources are diverted to the production of non-traditional crops or livestock. It includes organic farming and presence of energy crops. |
| (2) Structural diversification | Farm resources are redeployed into non-agricultural products and services (excluding environmental services). It includes on farm processing, presence of marketing of products with quality labels (i.e. PDO, PGI, etc.), agritourism and direct sales. |
| (3) Environmental diversification | Farm resources are redeployed into environmental services. It includes services such as landscape management, biodiversity measures and so on which procure at least more than 250 euro as revenue to the farmer on a yearly base. |
| (4) Income diversification | Farm household assets are used for non-agricultural activities unconnected to the farm business. It includes off-farm activities. |

Source: Own adaptation from Bowler (1996), Ilbery (2001) and Meert et al. (2005)

Agricultural diversification occurs whenever farm resources are diverted to the production of non-traditional crops or livestock. Specific examples are organic farming and the production of energy crops. Structural diversification implies that farm resources are redeployed into non-agricultural products and services. In the context of this paper we make a distinction between structural diversification and the provision of environmental services. We include the latter in a separate category of pluriactivity which we define as environmental diversification.⁷ Structural diversification activities include on-farm processing, the marketing of products

⁷ A distinction often used in the literature is that revenues from environmental services are the result of public policies while in structural diversification revenues are still mainly the result of “private” transactions.

with quality labels (PDO and PGI), agro-tourism and direct sales. Environmental diversification includes activities such as landscape management and biodiversity and natural habitat preservation. Finally, income diversification occurs when farm household assets are used for non-agricultural activities not connected to the farm business, such as off-farm employment.

Table 2 shows that a substantial share of Italian farms is engaged in pluriactivity. About one third of farm households are diverting farm resources into nonagricultural production activities such as on-farm processing or agro-tourism and more than one third of farms is providing environmental services. Furthermore, about a quarter of surveyed farms is gaining income from activities unrelated to the farm business. Agricultural diversification is the least likely diversification strategy followed (chosen by only 6% of the sample).

Table 2. Pluriactivity in Italian farms, 2006

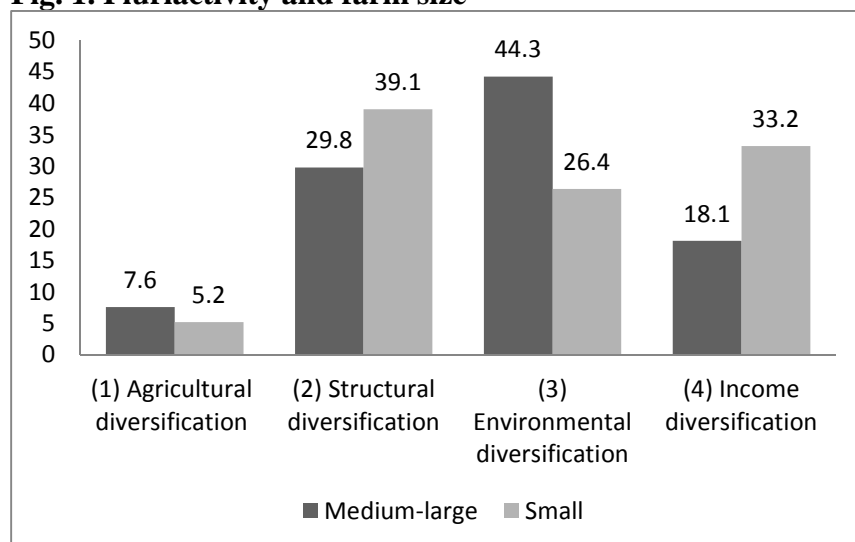
| Type of Pluriactivity | Share of farms | | |
|--|----------------|--------------|--------------|
| | <i>North</i> | <i>South</i> | <i>Italy</i> |
| 1. Agricultural diversification | 4.9 | 11.8 | 6.8 |
| <i>Organic farming</i> | 4.4 | 11.8 | 6.4 |
| <i>Energy crops</i> | 0.5 | 0.0 | 0.4 |
| 2. Structural diversification | 30.2 | 41.1 | 33.2 |
| <i>Agro-tourism</i> | 3.4 | 0.5 | 2.6 |
| <i>Direct sales</i> | 19.2 | 31.3 | 22.5 |
| <i>On farm processing</i> | 27.7 | 40.7 | 31.2 |
| <i>Local label and quality certification (i.e. PDO, PGI)</i> | 1.6 | 0.1 | 1.2 |
| 3. Environmental diversification | 37.7 | 38.2 | 37.8 |
| 4. Income diversification | 22.9 | 25.5 | 23.6 |

Source: Own calculations based on FADN (2006)

Figure 1 distinguishes pluriactivity strategies followed by large and small farms. A higher share of small farms is actively diversifying. The only exception is agricultural diversification which is a strategy chosen by around 7.6% of large farms but only 5% of small farms. This is in line with the hypothesis that agricultural diversification requires a higher capital-generating potential from the farm, and hence, is less likely to be found in small farms (Bowler, 1992; Ilbery, 1991; Meert et al., 2005). Also environmental diversification is mainly followed by large farms (44.3%) and less by small farms (26.4%).

Table 3 describes the variables that are used to explain the choice of farm strategy. The nature of the dataset makes that internal factors related to the farm household are underrepresented. However, this should not be problematic to our analysis as Bowler et al. (1996) find that economic factors are most important in discriminating between different business development pathways, more so than farmer and farm family characteristics.

Fig. 1. Pluriactivity and farm size



Source: Own calculations based on FADN (2006)

Table 3. Description of variables

| Variables | Explanation | Mean | Standard deviation |
|---|---|-------|--------------------|
| <i>External factors (farm location)</i> | | | |
| <i>Farm location</i> | | | |
| South | <i>south</i> ^(b) 1 if located in south Italy | 0.27 | 0.45 |
| Population density | <i>pop_den</i> ^(c) Thousand inhabitants per square km | 0.23 | 0.38 |
| Mountain | <i>mont</i> ^(b) 1 if located in a mountainous area | 0.20 | 0.40 |
| Social security (trust) | <i>criminalit</i> ^(d) % of households with high perception of criminality | 26.00 | 9.91 |
| Networks | <i>coop</i> ^(a) 1 if member of agriculture-related cooperative | 0.52 | 0.50 |
| | <i>assoc</i> ^(a) 1 if member of an association | 0.44 | 0.50 |
| <i>Internal factors (farm/farmer)</i> | | | |
| <i>Farm characteristics</i> | | | |
| Farm size | <i>small</i> ^(a) 1 if farm < 16 ESU | 0.36 | 0.48 |
| Farm specialization | <i>arable</i> ^(a) 1 if specialized in arable crop production | 0.22 | 0.41 |
| | <i>horticult</i> ^(a) 1 if specialized in horticulture | 0.07 | 0.26 |
| | <i>perm_crop</i> ^(a) 1 if specialized in permanent crops | 0.30 | 0.46 |
| | <i>livestock</i> ^(a) 1 if specialized in livestock | 0.23 | 0.42 |
| Labour use | <i>lu_uad</i> ^(a) Labour intensity measured in Annual Working Unit (AWU) per hectare of Utilized Agricultural Area (UAA) | 9.17 | 491.78 |
| | <i>fam_labor</i> ^(a) Share AWU by family members | 0.85 | 0.26 |
| Land tenancy | <i>uAA_rent</i> ^(a) Share UAA rented | 0.30 | 0.39 |
| <i>Farmer characteristics</i> | | | |
| Type of land manager | <i>manager</i> ^(a) 1 if manager also provides farm labour | 0.91 | 0.29 |
| Farmer age | <i>age</i> ^(a) Number of years | 54.02 | 13.81 |
| Presence of successor | <i>success</i> ^(a) 1 if a successor is present | 0.06 | 0.23 |
| <i>Internal-external interaction (networking)</i> | | | |

Source: (a) INEA, 2006; (b) MIPAAF, 2007; (c) ISTAT, 2001 (d) ISTAT, 2006

4. Characteristics associated with pluriactivity

In this section we analyze the likelihood of observing a certain activity associated with a set of factors related to farm location, farm business characteristics and farmers' features. This empirical approach is similar to that of Bateman and Ray (1994), Damianos and Skuras (1996) and MacNally (2001) in previous investigations of farm pluriactivity in different European countries such as the UK and Greece. The main difference is that we employ a multivariate probit model to study the joint-decision making process of resource allocation between different strategies and to identify their potential substitutability or complementarity (Lesaffre and Kaufman, 1992). Because the decisions to allocate resources to different activities are related – for example spending time in one strategy lowers the amount of time left to dedicate to other strategies – it is important to allow for different combinations of strategies. Bowler et al. (1996) point to other ways in which different strategies followed by pluriactive households can be correlated. For example, earnings from off-farm employment can be used to invest in on-farm diversification (positive correlation). On the other hand, complementing conventional farm income with off-farm income sources can reduce the need for other types of farm diversification (negative correlation).

The multivariate probit as an econometric model to investigate farmers' decisions between potentially joint alternatives has been used extensively in the field of information and knowledge transfer (Velandia et al., 2009), on- and off-farm labour allocation (Kimhi, 1996), market strategies (Lowell and Kau, 1973; Fletcher and Terza, 1986), investment and planning decisions (Oude Lansink et al., 2003) and participation in agri-environmental schemes (Polman and Slangen, 2008). The model is specified as follows:

$$Y_{ij}^* = X_i b + \varepsilon_{ij}$$
$$Z_{ij} = 1 \quad \text{if } Y_{ij}^* > 0 \quad \text{and } 0 \quad \text{otherwise} \quad (1)$$

where Z_{ij} denotes a vector of observed binary responses, Y_{ij}^* is an unobserved latent variable, X_i represents the set of explanatory variables related to farmer and farm characteristics, location and context features, and ε_{ij} are error terms.

Table 4 provides the estimation results of the multivariate probit model. These results indicate the impact of the explanatory variables on the likelihood to observe a certain type of pluriactivity. Table 4 also documents that correlation between different strategies and shows which types of pluriactivity are substitutes or complements. Next we discuss the main results.

4.1. Farm location

In our analyses the role of farm location is linked to several socio-geographical factors. The first element refers to the location of the farm in the south of Italy (*south*). In this region the likelihood to observe a certain activity is higher for all four strategies. As pointed out in the introduction a structural socio-economic differentiation exists between southern and center-northern regions. The socio-economic environment in the south creates barriers for the development of “traditional” agricultural activities. As a result, non-traditional activities are set-up to complement agricultural incomes. This is in line with Maye et al. (2009) who find that farmers' pluriactive strategies are to a large extent determined by macroeconomic conditions.

Table 4. Multivariate probit model: Factors associated with pluriactivity

| Explanatory variables | | (1) Agricultural diversification | | (2) Structural diversification | | (3) Environmental diversification | | (4) Income diversification | |
|-----------------------|------------|----------------------------------|--------------|--------------------------------|--------------|-----------------------------------|--------------|----------------------------|--------------|
| | | <i>Coeff.</i> | <i>Sign.</i> | <i>Coeff.</i> | <i>Sign.</i> | <i>Coeff.</i> | <i>Sign.</i> | <i>Coeff.</i> | <i>Sign.</i> |
| cons | | -0.412 | 0.000 | -0.418 | 0.000 | 0.276 | 0.001 | -2.274 | 0.000 |
| Location | south | 0.495 | 0.000 | 0.224 | 0.000 | 0.280 | 0.000 | 0.056 | 0.038 |
| | pop_den | -0.279 | 0.000 | -0.416 | 0.000 | -0.555 | 0.000 | 0.068 | 0.030 |
| | mont | -0.087 | 0.042 | -0.476 | 0.000 | -0.763 | 0.000 | 0.083 | 0.008 |
| | criminalit | -0.015 | 0.000 | -0.011 | 0.000 | -0.005 | 0.000 | -0.005 | 0.000 |
| | ass_prod | -0.004 | 0.904 | 0.128 | 0.000 | 0.055 | 0.019 | 0.137 | 0.000 |
| | other_netw | 0.253 | 0.000 | 0.165 | 0.000 | 0.047 | 0.042 | 0.042 | 0.073 |
| Farm | small | -0.167 | 0.000 | 0.253 | 0.000 | -0.629 | 0.000 | 0.348 | 0.000 |
| | arabl_spec | -0.032 | 0.467 | -0.229 | 0.000 | 0.336 | 0.000 | 0.099 | 0.002 |
| | hort_spec | -0.875 | 0.000 | -0.428 | 0.000 | -1.213 | 0.000 | -0.088 | 0.094 |
| | perm_spec | 0.009 | 0.818 | 0.450 | 0.000 | -1.148 | 0.000 | 0.122 | 0.000 |
| | p_uaa_rent | 0.024 | 0.610 | -0.145 | 0.000 | 0.285 | 0.000 | -0.088 | 0.009 |
| | lu_uaa | -0.003 | 0.035 | -0.004 | 0.000 | -0.005 | 0.000 | 0.000 | 0.793 |
| | p_fam_lab | -0.261 | 0.000 | 0.024 | 0.646 | 0.145 | 0.007 | 0.066 | 0.235 |
| Farmer | manag | -0.117 | 0.046 | -0.032 | 0.456 | -0.160 | 0.000 | 0.084 | 0.075 |
| | age | -0.010 | 0.000 | 0.002 | 0.006 | 0.002 | 0.009 | 0.022 | 0.000 |
| | success | -0.120 | 0.102 | 0.199 | 0.000 | -0.016 | 0.747 | 0.126 | 0.018 |

Correlation between strategies

| | | | | | |
|-------------------|--------|-------|---------------------|--------|-------|
| Agr. & Env. | 0.002 | 0.928 | Env. & Structural | -0.044 | 0.002 |
| Agr. & Structural | 0.157 | 0.000 | Env. & Income | -0.052 | 0.001 |
| Agr. & Income | -0.043 | 0.020 | Structural & Income | 0.019 | 0.176 |

Likelihood ratio test of $\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$: $\chi^2(6) = 112.753$ Prob > $\chi^2 = 0.0000$

Log likelihood = -28170.153 Prob > $\chi^2 = 0.0000$

N = 15,380

Source: Own estimations based on FADN (2006)

Location in the vicinity of an urban area (*pop_den*) positively affects the likelihood to observe income diversification while it negatively affects agricultural, structural, and environmental diversification. The positive correlation between income diversification and proximity to an urban area is found in a number of studies in both Europe and North-America and indicates that urbanization increases opportunities to find off-farm employment. Less explored are the linkages between urban location and agricultural and structural diversification. Proximity to an urban area means that farmers are close to final consumers, which increases the potential to set-up short supply chains of local products. Moreover, as pointed out by Vandermeulen et al. (2006), location within an urban region increases the likelihood that agricultural areas are the main source of amenities for urban citizens. This creates possibilities for businesses that provide leisure activities such as agro-tourism. However, the negative signs for agricultural and structural diversification do not confirm these hypotheses. The negative sign for environmental diversification is plausible since urbanization can pose constraints for farmers willing to provide environmental services such as landscape protection plans and agri-environmental schemes.

Another element we consider when addressing farm location refers to location in a mountainous area (*mont*). This negatively affects agricultural, environmental and structural diversification while increases the likelihood to observe an income diversification strategy. This result is in line with Maye et al. (2005) who emphasize the importance of off-farm employment as a survival strategy in marginal areas. A negative correlation between location in less favorite areas and diversification activities such as agro-tourism and direct sales was also found by McNally (2001) and McInerney (1989) in the British context.

Finally, we use both trust and participation in farmers' networks to analyze the connection between social capital and the likelihood to observe pluriactivity. Being located in a region with a low level of trust due to the high perception of criminality and social insecurity (*criminalit*) negatively affects the likelihood to observe farm pluriactivity. On the other hand, belonging to a producer association or other rural networks (*ass_prod* and *other_netw*) increases the likelihood to observe pluriactivity. As pointed out by Slangen and Polman (2002) a lower level of social capital can discourage farmers from undertaking business initiatives whose success is highly dependent on collective actions. This is particularly relevant for implementing strategies such as environmental and structural diversification.

4.2 Farm characteristics

Farm size (*small*) is the first characteristic that we analyze. We find that small farm businesses are less likely to develop agricultural diversification and environmental diversification strategies, while they are more likely to implement structural and income diversification. This is in line with findings by Meert et al. (2005) who find that structural and income diversification is a survival strategy in response to internal resource constraints (Meert et al., 2005). In this perspective, small size can be seen as a proxy of insufficient resource endowment.

Farm specialization is also used as a determinant of pluriactivity. Results show that farms specialized in arable crops (*arable_spec*) are more likely to engage in environmental and income diversification while they are less likely to structurally diversify. Pluriactivity is not common on horticultural farms (*hort_spec*), while farms specialized in permanent crops (*perm_spec*) are more likely to use structural and income diversification strategies. Seasonality (of both arable and permanent crop production) seems to be a key-factor for explaining income diversification. The additional time available for farmers and their family members in certain periods of the year allows them to look for non-agricultural sources of income. Being specialized in arable crops increases the capacity to switch to organic or

energy crops. Being specialized in permanent crops, such as vineyards, fruit and olive trees, can be associated with on-farm processing and quality labeling strategies.

Tenancy characteristics such as renting land (*p_uua_rent*), are highly relevant to explain Italian farmers' decisions about pluriactivity. Renting can be considered to ensure fewer safeguards about the way benefits from investments are assigned. Therefore, tenancy restrictions can cause a lower propensity to use assets for non-agricultural purposes such as agritourism and direct sales. This can explain the lower likelihood of tenant farmers in following structural diversification. Renting can also be interpreted as a signal of the centrality of agricultural activities for the farmer and his family, which implies a lower propensity to rely on off-farm employment.

Other farm characteristics that affect the likelihood of pluriactive strategies are the intensity of labor use (*lu_uua*) and the importance of family labor (*p_fam_lab*).

4.3 Farmer characteristics

Farmer contribution to entrepreneurial, managerial and manual activities of the farm (*manag*) is negatively correlated with the presence of agricultural and environmental diversification while it has a positive correlation with the presence of income diversification. This form of management is the most widespread in the Italian context. On one hand it is often related to particularly traditional form of family farm organization, where the land manager is also deeply involved in the manual activities within the farm. On the other hand it is also the type of organization part-time farmers use to have. In the former case less propensity to diversify is more likely to occur while in the former coupling farming and off-farm activity is the standard practice.

More experienced farmers (*age*) are less likely to follow agricultural diversification strategies while they are more likely to engage in the other types of pluriactivity. Organic and energy crops are rather complex in terms of farm and marketing management. Therefore, they require a dynamic and positive risk attitude. As a result, they seem to be more attractive for younger and dynamic farmers. Both structural and income diversification requires a higher degree of experience to combine the management of non-agricultural and agricultural related businesses.

The presence of a successor (*success*) increases the likelihood to observe structural and income diversification. This indicates that these types of pluriactivity are calling for a more long-term business plan and are motivated by the presence of more continuity in the family business.

4.5. Correlation between strategies

The multivariate probit model also allows identifying the potential correlation that exists between different diversification strategies. The results indicate that a complementarity exists between agricultural and structural diversification strategies. On the other hand, a negative correlation exists between agricultural and income strategies, structural and income strategies and structural and environmental strategies. This finding is not discussed yet in the literature and it deserves reflection. Resource diversion from agricultural to non-agricultural activities is costly and risky. Usually farmers prefer to follow only one alternative, if possible. In the case of agricultural and structural diversification more synergies are possible. For example developing organic farming can also lead to the development of short supply chains at the local level, opening an on-farm shop, or introducing certification and labeling as tools for direct marketing. The positive relationship between agro-tourism and organic farming is also documented by Mansuri and Hara (2007).

5. Conclusion

This paper analyses interlinkages between farmers' pluriactivity strategies. This is a challenging and often debated issue in rural economics and sociology. Our results indicate the presence of trade-offs and complementarity between different strategies. When assets and specific resources are not competing, such as in agricultural and structural diversification a strong complementarity and synergy is found. In other cases competition between resources results in a negative or absent interrelation between strategies.

More in general we found that pluriactivity can be seen as a response of farmers to adverse socio-economic conditions which tend to reduce the capacity of agriculture to provide sufficient income to the farmers and her family. External stimuli, such as a depressed economy or insecure socio-cultural context, have been recognized as key-factors to explain farmer strategies. We highlight how social capital is important as well, and how participation in networks can lead to developing pluriactivity in Italy.

Our empirical findings confirm that pluriactivity is more likely to occur when the specificity of farm internal resources to agricultural activities is low. Therefore farm businesses that have developed flexible capacities and multiple-skills are more likely to combine agricultural with nonagricultural activities. In other words, agricultural asset specificity matters to explain pluriactivity.

The results imply that the presence of potential synergies and trade-offs in different types of diversification are elements to be considered when tailoring rural development measures. Current EU rural development measures often are based on an "axis approach". This approach relies on three alternative development paths for the farm: an increased relevance of agricultural activities is emphasized mainly via the support of economic competitiveness (efficiency and profitability of farming, axis 1); diversification towards reduction of input use and implementation of environmental services (axis 2); diversification of nonagricultural activities for the farmers and their family members (axis 3). The LEADER axis (axis 4) refers to the same three types of strategies with a bottom-up instead of a top-down approach.

In the light of our results we can argue that more room for "mixed" strategies should be given in the rural development measures, mainly via the combination of measures belonging to different axes. This has already been introduced in the rural development plans for the 2007-2013, where packages of different measures have been allowed in special circumstances. Our argument is to consider this approach more systematically in the future for example by introducing an axis fully dedicated to combined measures in order to support pluriactivity strategies.

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