



Structural factors of labour allocation for farm diversification activities

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ABSTRACT

While the share of agriculture, forestry, and fisheries in rural economies has declined, the importance of diversification activities has increased. The aim of this study is to investigate how structural factors affect both the decision of diversification into on-farm non-agricultural activities and the total labour assigned to them, measured in terms of the workdays allocated to producing diversification activities. Using Tuscany, a region in central Italy, as a case study, a negative binomial hurdle model has been applied to represent the two steps involved in farmers' behaviour. Farmers first decide whether to diversify and then decide the amount of farm resources to devote to diversification. The results have revealed that farms located in regions more distant from urban areas are more likely to diversify, but that distance is not an influential factor in predicting the number of workdays dedicated to diversification. In addition, small family farms are less likely to diversify than large farms, and those that do so dedicate fewer workdays to diversification activities. A possible explanation for this evidence is that structural and endowment constraints are entrance barriers for involvement in on-farm non-agricultural production.

1. Introduction

On-farm non-agricultural diversification (hereafter only diversification) is a business strategy in which a farmer produces non-agricultural goods and services employing farm resources (capital, labour and land) with the aim to sell them in the market. These activities can be a continuation of agricultural production using the farm agricultural outputs for processing. Production of dairy products using farm milk or production of juices and alcoholic beverages are typical examples. Moreover, diversification activities can employ the farm's equipment, buildings, and workforce for the production of other goods and services rather than growing crops or rearing animals. Agro-tourism and services for third parties are illustrative cases (Van Der Ploeg and Roep, 2003).

The results of Eurostat's Farm Structure Survey (2008) revealed that 12% of European farmers have set up diversification activities on their farms. According to Eurostat (2013), while the share of agriculture, forestry, and fisheries in rural economies has declined, the importance of farms' secondary activities in rural economies has grown. In 28 European countries, between 2005 and 2015, production in secondary activities has increased by almost 5% per year, while agricultural production at basic value has grown by only 2.2%. An increasing share of farms' resources is, therefore, being allocated to producing non-agricultural goods and services. The same is evident in the United States,

where the contribution of diversification activities to the total value of US agricultural production is roughly 40% (Vogel, 2012).

Diversification represents a viable strategy for increasing a farm's income and for using any otherwise unemployed household workforce (McNamara and Weiss, 2005). In addition, these activities help farms and agricultural households to reduce their risk exposure by enlarging their income portfolio (Mishra et al., 2004). Indeed, diversifying their income sources, either by purchasing assets or by engaging in other activities with payoffs unrelated to agricultural production, allows farmers to reduce the uncertainty linked to their primary production, that is, the uncertainties of prices, technology, and policies (Moschini and Hennessy, 2001). Moreover, since agricultural households have an average income lower than that of non-agricultural households (Boncinelli and Casini, 2014), farmers must find new earning sources to support their economic sustainability. Therefore, diversification is vital, even in terms of rural development, since these activities represent an opportunity to support rural economies and to maintain viability in rural areas. For example, Hyytiä (2014) has found that diversification has a positive effect on regional income in areas where agriculture is a minor player. Moreover, diversification has a pivotal impact at a local level because it helps to maintain employment levels in areas with development concerns and where opportunities provided by other economic sectors are limited (Di Iacovo, 2014).

Diversification in new activities is furthermore perceived as central

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to the Common Agricultural Policy's (CAP) reform strategies, not only because it strengthens the territorial and social cohesion of rural areas (European Commission, 2010) but also because of the strong link between multifunctionality and diversification (Van Der Ploeg and Roep, 2003). Indeed, several diversification activities can derive advantages from externalities and other goods produced by agriculture. Consequently, diversification has brought about greater integration and interdependency between farm households and rural economies.

Due to the importance of diversification for the economic viability of farms and rural areas, both agricultural economics and rural development literature have focused on identifying the structural determinants of diversification. Despite such an emphasis, little attention has been paid to fully understanding farmers' decision-making regarding diversification. Indeed, the majority of articles simulate farmers' behaviour toward diversification as a discrete choice of whether or not to be involved in diversification. Boncinelli et al. (2017) and Knanal and Mishra (2015) have criticized the existing approach, as it does not properly explain the complexity and causality of decision-making. The latter authors stress that determinants regarding diversification remain controversial and this evidence can be explained by the fact that previous studies have considered each diversification activity separately, without considering diversification as a single behaviour (Knanal and Mishra, 2015). Instead, Boncinelli et al. (2017) point out that literature about diversification has focused solely on the decision to diversify or not, without considering the allocation choice of the farm resources for diversification. Indeed, the decision regarding diversification can be split into two different decisions: (i) a farmer decides in favour of diversity and then (ii) he/she will choose the amount of farm resources to allocate to producing diversification goods or services. If the diversification is a two-step process, in each step different determinants might play contrasting roles in terms of sign and burden.

Since the second decision concerning farm resources allocated to diversification has received less attention, the purpose of this article is to enrich the existing literature by expanding the perspective to include a more realistic decision-making structure, considering the fact that farmers decide the total resources, such as the labour force, to be devoted to diversification conditionally to the choice of being involved in diversification. Moreover, as the same factors can have different impacts on the two decisions (i.e., deciding to diversify and deciding the total resources devoted to diversification), there is room for investigating and discussing the existing empirical literature in the light of this two-step process.

Therefore, by applying an innovative procedure to model diversification strategies, this study aims to investigate how structural factors affect the choice to diversify and the total farm labour forces allocated to these activities, measured as the workdays allocated to diversification activities. To the best knowledge of the authors, this article presents one of the first theoretical and empirical analyses to enable description of the intensity of diversification by the means of a decision to allocate labour between diversification activities and the usual agricultural activities. The factors analysed in this study are the characteristics of both the farm and the farmer, in addition to spatial factors that affect decisions concerning diversification. The final goal is to better understand this increasingly important aspect of modern agriculture.

Altogether, the paper contributes to the existing literature by developing a theoretical model that helps understand the decision to diversify and the allocation of labour towards diversification activities, and by applying a negative binomial hurdle model to study diversification as a two-step process that is involved both in the entrance into diversification and the amount of farm resources dedicated to these activities. Hence, the determinants of both steps are integrated to provide a coherent set of motivations that affect diversification. The main contribution of the article to the existing debate on diversification is the ability to disentangle the determinants' diversification processes, offering a more reliable picture of farmers' behaviour towards

diversification and support for the development of policy actions that enable the effective preservation of agricultural labour in rural areas.

The remaining parts of the article are structured as follows. Section 2 introduces the existing literature. This is followed by Section 3, which describes the data and by Section 4, which presents the results. Finally, discussions are provided in Section 5 and conclusions in Section 6.

2. The determinants of diversification

The theoretical basis of the diversification adoption process is rooted in the farm household model (Taylor and Adelman, 2003). Following the theoretical basis of this model, a generic farm maximizes household profit to satisfy household consumption. The decision-making process regards the allocation of household resources (labour, capital, etc.) to farm production intensification, to diversification, and to off-farm activities (Mishra et al., 2014; Andersson et al., 2003).

An extensive body of literature has dealt with understanding the phenomenon of farm diversification, considering the contributions of farms, farmers, and household characteristics (see, for example, Meraner et al., 2015 and Hansson et al., 2013), in addition to external drivers such as location and spatial interactions (see, for example, Lange et al., 2013).

Several scholars have stressed the relevance of spatial connections and location for explaining the diffusion and magnitude of farm diversification. Some studies have discovered the demand-driven effects of space on diversification, whereby farmers closer to tourist sites or urban areas are more likely to diversify their production (Zasada, 2011) because of a higher demand for farming services. Other studies have found contrary results, pointing out that proximity to urban areas can increase off-farm opportunities (Mishra et al., 2014; Bartolini et al., 2014), reducing the availability of the workforce that would be employed in farm diversification. Boncinelli et al. (2017) have pointed out that diversification is a relevant option for farms located in marginal areas with exogenous structural constraints. In this context, diversification may be a viable strategy for overcoming fewer opportunities to allocate household labour to diversification activities. Pfeifer et al. (2009) have provided a similar explanation, arguing that low returns from agricultural production incentivise farmers to find new strategies other than cropping or rearing; thus, poor soil quality can be a determinant for diversification. The source of the ambiguous results related to the relationship between localization and diversification is not manifest. All the cited studies explained their results by stressing the role of exogenous factors. However, as mentioned above, these studies assumed diversification as a discrete choice (to diversify or not) and considered specific diversification activities. The difference in the findings in the literature might be context specific. Therefore, modelling diversification, as the current article has done, as a two-step decision-making process by farmers, not linked to a specific activity, will shed new light on this topic.

The influence of a farmer's age on the probability of engaging in diversification activities has been disputed. Some authors have noted that older farmers are more likely to participate in on-farm income diversification (Joo et al., 2013). Barbieri and Mahoney (2009) have stressed that younger farmers feel a bigger need to strengthen the existing farm business for future generations. Meraner et al. (2015) and García-Arias et al. (2015), however, have found empirical evidence that younger farmers seem to be more likely to be involved in diversification. McNamara and Weiss (2005), quoting rural sociology studies, have determined that both young and old farmers are less likely to diversify, due to lower risk aversion levels among young farmers and reduced workloads for older farmers.

Farmers' education level also contributes to explaining diversification strategies (Bowman and Zilberman, 2013). Boncinelli et al. (2017) have found that farmers with higher education levels have a greater likelihood of diversifying, although this is not the case when the farmer has an agricultural education. McElwee and Bosworth (2010) have

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