Part-Time Farming in Italy: Does Farm Size Really Matter?

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Abstract

This paper explores the phenomenon of part-time farming in Italy and investigates the drivers of farm holders' labour supply based on the farm size. Since the definition of 'small farm' is arbitrary, the study explores different criteria taking into account the farm type and the utilised agricultural area. A random effects ordered probit is estimated using micro-data from the Italian Agricultural Business Survey for the period 2003-2009. The findings indicate significant differences in labour market responses between small and large farms, highlighting structural diversity in the farming systems and thus different incentives and business requirements. The conclusions support the policy claim that for smaller farmers rural development policies which encourage diversification activities and support commercialisation are much more important than farm subsidies.

Keywords: Part-time farming, labour allocation, farm size, Italy

1   Introduction

Part-time farming is a well-documented 'phenomenon' and a prominent feature in advanced industrial economies (Buttel, 1982), and has become a distinctive trait of European agriculture, often associated with pluriactivity and small-scale farming. Nonetheless, sometimes part-time farming has been treated as a feature of regional underdevelopment and structural rigidity, and way often associated with hobby farming (Fuller, 1991). In particular, the insufficient farm income of part-time farmers is generally viewed as a concern and perceived as a threat to productive efficiency in agriculture (Jervell, 1999). As a consequence, the distinction between part-time and viable full-time commercial farms has been often emphasised in the farm policy debate (Hill, 1996). Empirically, some attention has been given to assess whether part-time farming can be regarded as a stable condition or a step in the way out of agriculture. Whereas Kimhi (2000) provides support for the stable condition, based on a sample of Israeli family farms in the 1970s, the findings remain mixed at the European level. Some studies show that income from off-farm activities is crucial for cross-subsidising farming, and thus for farming survival (Glauben et al., 2006; Breustedt and Glauben, 2007). In contrast, others indicate that the expectations of part-time farmers to continue farming, in comparison to their full-time counterparts, are lower (Pfeffer 1989; Weiss, 1999; Bojnec et al., 2003). Hence, according to the latter studies, part-time farmers exhibit a higher likelihood of exiting farm employment and may simply face market constraints to move into other sectoral employment.

It is worth mentioning that the label of part-time farming suffers from the lack of a common definition and, thus, is open to a number of interpretations (Gasson, 1967). For instance, in the US part-time farming and pluriactivity, or multiple-job holding, are used interchangeably (Ahearn and Lee, 1991). Therefore, full-time farms are those whose farm holders declare such activity to be their principal occupation, whereas part-time farms are those whose farm operators are principally employed outside farming and thus pursue a dual farm/non-farm career[1]. In the EU, full-time farmers are those who work on the farm on a full-time basis, whereby full-time translates into 1,800 annual hours, equivalent to 225 working days of eight-hours each, unless the national provisions governing contracts of employment indicate a different amount of annual working hours (Eurostat, 2015)[2]. Of course, many of these farmers may be pluriactive, and thus have alternative, and important, sources of income from other gainful activities. In this respect, pluriactivity is generally defined as gaining income from more than one economic activity, combining farm work to other activities carried out for remuneration,

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[1] This part-time concept can be hour-based and/or income-based.
[2] The measure of labour input in the EU is often expressed in terms of full-time annual work units (AWU).

which can be on the same holding (farm diversification), on another holding, or through employment in non-agricultural enterprises (EC, 2008; ENRD, 2010). Hence, when comparing the two definitions of part-time farming, it is not surprising that the EU is characterised by an even higher share of part-time farmers than the US (USDA, 2004).

The high prevalence of part-time farming, to a certain extent, is a consequence of the seasonal labour peaks characterising agricultural activities, which imply that family labour input is necessary at different times of the year. Moreover, since family members do not always receive a wage, as they share the profit made by the holding, they often rely upon other sources of income, such as off-farm employment. Especially where there is a predominance of small, family and semi-subsistence farms, many farmers pursue agriculture as a part-time activity. This trend is particularly common in the Italian agricultural sector, where the farm structure is heavily polarised, with a large share of small and even micro farms. According to the 2010 Farm Structure Survey (FSS), in Italy, only 9.3 per cent of the regular farm labour force works full-time, compared to the average of 14.3 per cent in the EU-27 (ranging from 0.9 per cent in Romania to 60.4 per cent in Czech Republic). Moreover, for more than 2.3 million people in Italy, equivalent to around 70 per cent of the regular farm labour force, farm work only represents a minor activity, i.e. less than 25 per cent of their annual working time is spent on the farm (EC, 2013). Similarly, more than 85 per cent of Italian farm holders supply labour on a part-time basis (2010 Italian Agricultural Census, ISTAT). To a great extent, the prevalence of small-scale farming in Italy is a consequence of institutional arrangements, such as succession laws (the Napoleonic code) and redistributive land reforms. Cultural factors, such as social identity and preferences, and market factors are among the main reasons behind the persistence of small and semi-subsistence farms in the country (Salvioni et al., 2014). By the same token, there is some supporting evidence showing that part-time farming and pluriactivity are the main factors responsible for the slow pace of change in the Italian farm structure and the persistence, with a large proportion, of very small farms (Ascione et al., 2013).

Against this background, this paper aims to contribute to improved understanding of the phenomenon of part-time farming. Thus, the main objective is to investigate the determinants of farm holders' on-farm labour supply and explore whether there exist substantial differences in labour market allocation decisions based on the size of the farm. Italy provides an interesting setting for this study, due to its specific farm structure characterised by small-scale and semi-subsistence farming, and the large persistence of part-time farming. Since the definition of 'small farm' is arbitrary, this study explores different criteria taking into account the farm type and the utilised agricultural area (UAA), as well as the sensitivity of estimates to different thresholds. The remainder of the paper is organised as follows. The next section outlines the theoretical framework. The empirical strategy and data used are presented in sections 3-5. The estimation results are discussed in section 6, and section 7 concludes.

2   Theoretical framework

The standard framework for studying farm holders' labour allocation decisions is the farm-household model (following Singh et al. 1986). Based on neoclassical assumptions, this model integrates agricultural production, consumption and labour supply decisions into a single conceptual framework and provides insights into the driving forces behind such decisions in a behavioural sense. In line with the seminal paper by Becker (1965) on the time allocation between labour and leisure, and extended for farm households by Lee (1965), labour supply decisions are viewed within a household utility maximisation framework. The model is frequently applied in the literature to study labour allocation decisions on and off the farm (see Huffman and Lange, 1989; Gould and Saupe, 1989; Hennessy and Rehman, 2008). In this study, the reduced form of the household model is used, where the household is assumed to act as a single decision maker, i.e. from the perspective of the household head. In a

competitive labour market, the farm holder is assumed to maximise a utility function over consumption (C) and leisure (L), subject to time, income and production constraints:

$$Max\ U = U\ (C, L; H, Z_h) \tag{1}$$

where H is a vector of personal variables and Z_h is a vector of characteristics of the household. Total time endowment (T) is allocated between farm work (F), off-farm work (O), and leisure (L):

$$T = F + O + L \tag{2}$$

where $F, O \geq 0$ and $L > 0$. Total consumption is subject to the income constraint, which comprises net farm income (farm output PQ minus the costs of production IX), off-farm wages (W) and exogenous wealth, or unearned income (V):

$$C = PQ - IX + WO + V \tag{3}$$

where Q is the quantity of output produced by the farm and P is its price; X is the vector of farm purchased inputs, including farmland services and hired labour, and I is the vector of their prices. Lastly, on-farm labour is dependent on the production function, which imposes the final constraint on the household utility maximisation:

$$Q = f(F, K, N; H, Z_f) \tag{4}$$

where total production is a function of farm labour and other inputs, namely capital (K) and land (N). The efficiency of farm production depends on personal characteristics (particularly human capital), as well as a vector of farm specific characteristics (Z_f). The amount of time spent working on the farm is determined by the optimal levels of leisure hours and off-farm work hours:

$$F = T - L - O = f(PQ - IX, W, V, H, Z_f) \tag{5}$$

where on-farm labour supply is a function of the net farm income, off-farm wages, unearned income, personal characteristics and farm specific characteristics. A key factor in determining the time allocation decisions of workers is the wage rate, which represents the opportunity cost of leisure. In the neoclassical model, an increase in the wage rate has an unpredictable effect on labour supply decisions due to two opposing effects: it can lead individuals to work more, due to the higher return of work time (substitution effect), or it may lead to work less time, since the same amount of income can be earned by working less, and thus more leisure time can be afforded (income effect). In the context of a pluriactive farm holder, who engages in both farm and off-farm activities, off-farm wages will also affect farm labour supply decisions, although the expected effect is *a priori* ambiguous. On the other hand, an increase in the unearned income will only lead to an income effect, causing the individual to work less. With regard to the impact of subsidies there is no predictable effect of farm subsidies on labour supply, apart from increasing the marginal value of farm labour, increasing household wealth and reducing income variability (Hennessy and Rehman, 2008). From a theoretical point of view, it seems crucial to recognize the way these payments are perceived by the household, whether as an increase in the farm wage or as unearned income (Ahearn et al., 2006). Therefore, they could either lead to a substitution or to an income effect. In particular, coupled payments, dependent on the level of production, are often considered as an increase in the farm wage, whereas decoupled payments, not related to the level of production, can be viewed as unearned income.

In line with this theoretical framework, the study addresses the following empirical questions: (i) Are there any significant differences in labour market responses between small and large farms and how important are farm structural characteristics? (ii) Is there a link between market integration and labour supply? (iii) How does the off-farm income affect the amount of labour supplied on the farm? (iv) What is the impact of farm support on the on-farm labour supply decisions?

3   Empirical methodology

The random effects ordered probit is the empirical strategy employed to estimate the on-farm labour supply decisions of farm holders. The choice of an ordered probit technique is justified by the ordinal nature of the dependent variable which measures the daily number of hours supplied by the farm holder on the farm, with the respective four outcomes being: 0 hours, < 4 hours, 4-8 hours, and > 8 hours. The choice of panel data over cross-sectional or pooled cross-sectional ones entails several major advantages. First, the multiple observations on the same individuals enable to control for unobserved time-invariant and individual-specific effects, permitting the identification of causal inference more efficiently than cross-sectional data. Second, it becomes possible to study the impact of lags in behaviour or decision making (Cameron and Trivedi, 2005; Wooldridge, 2009). The latent linear response model can be specified as:

$$y_{it}^* = \beta' x_{it} + \delta_i + \varepsilon_{it}, \qquad \text{for i = 1, ..., N; t = 2003, ..., 2009} \qquad (6)$$

where x_{it} is a set of observed variables, β' are the parameters to be estimated, and δ_i is the individual-specific and time-invariant random component. The error term ε_{it} is decomposed into an unobservable individual specific effect (μ_i), which is time-invariant, and a remainder disturbance (v_{it}), which varies with individuals and time:

$$\varepsilon_{it} = \mu_i + v_{it} \qquad (7)$$

The latent nature of the dependent variable necessitates the assumption of a random effect[3]. In the random effects model the explanatory variables x_{it} are assumed to be independent of the individual effect μ_i and the remainder disturbance v_{it}, for all individuals i and time t (Baltagi, 2008). The four ordered outcomes are modelled to arise sequentially as the latent variable y_{it}^* crosses progressively higher thresholds (Cameron and Trivedi, 2010), or cut points $a_1, ..., a_{k-1}$, where k is the number of possible outcomes. In general, for a k-alternative ordered model, the following is defined:

$$y_{it} = j \qquad \text{if } a_{j-1} < y_{it}^* \le a_j, \qquad \text{for j = 1, ..., k} \qquad (8)$$

where j represents a specific outcome. The observed ordinal responses can be summarized as:

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\begin{aligned}
y_{it} &= 1 & & if\ y_{it}^* \le a_1 \\
y_{it} &= 2 & & if\ a_1 < y_{it}^* \le a_2 \\
y_{it} &= 3 & & if\ a_2 < y_{it}^* \le a_3 \\
y_{it} &= k & & if\ a_{k-1} < y_{it}^*
\end{aligned} \qquad (9)
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Therefore, for very low y_{it}^*, labor supply is zero; for $y_{it}^* > a_1$, the number of hours increases up to 4 hours; for $y_{it}^* > a_2$, labor supply increases further to 4-8 hours; and lastly for $y_{it}^* > a_3$, labour supply is over 8 hours. The regression parameters β' and the $k - 1$ thresholds parameters are obtained by maximising the log likelihood with $p_{itj} = \text{Pr}(y_{it} = j)$. The sign of the regression parameters determines whether the latent variable y_{it}^* increases with the regressor. Hence, when β_j is positive, an increase in x_{itj} necessarily increases the probability of being in the highest category ($y_{it} = k$), which is equivalent to the farm holder working more than 8 hours on the farm. This implicitly decreases the probability of being in the lowest category ($y_{it} = 1$) of working 0 hours[4]. The above model is first estimated for the full sample. In order to compare farm holders' labour supply responses in small (*s*) and large farms (*l*), the model is also estimated separately, such that $i = s, l$.

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[3] As opposed to a fixed effects model, this model can capture the effect of time-invariant covariates and estimate their parameters (e.g. gender, farm location, and other farm specific characteristics).

[4] An alternative methodology is interval regression, which models outcomes with interval censoring. The larger log likelihood for the ordered probit indicates that this method provides a better fit.

4 What is a small farm? Towards an appropriate criterion

As emphasised by the EC (2011), a universal and commonly agreed definition of 'small farms' does not exist in the EU, but is instead arbitrary and context specific. The heterogeneity in farm structures and the lack of consistent data for all Member States (MS) are among the main reasons behind this. The Eurostat thus relies on several physical and economic indicators in order to compare different farm structures across countries, regions and over time. Based on the common features of small-sized agricultural holdings, the most frequently used indicators comprise: the UAA, the density of livestock units, the labour input per farm, the share of self-consumption in total output (or alternatively the share of output sold), and the economic farm size.

To the extent that data availability and research objectives constitute the main reasons behind the choice of a specific criterion, this study recognises that the definition of small farm is specialisation specific and seeks an appropriate criterion to be employed for empirical analysis. In this study both labour input per farm and share of own consumption are used as explanatory variables, whereas the economic farm size cannot be employed due to data inconsistencies. Therefore, a first criterion consists in setting a threshold in terms of UAA, namely the number of hectares of UAA below which a farm is considered to be small. This criterion, which is extensively used in the literature and across the EU FSS, often uses as benchmark the 5 hectares, defining small farms those with less than 5 hectares and large farm with greater than or equal to 5 hectares. Nonetheless, this indicator in absolute terms may not be appropriate to characterise the universe of small farms, which depends upon the specific farm typology. For instance, farms specialised in horticulture, or in intensive pig or poultry production, often have a smaller than average UAA. Moreover, some of these farms, such as for example in horticultural production, are very labour-intensive in comparison to other crops activities, and require a more seasonal demand of labour. A second criterion considered the production and specialisation structure of farms to construct a threshold in relative terms, where 'relative' means in relation to the characteristics of all farms in the Italian sample. For this purpose, the median of the distribution of the UAA within each type of farming was set as threshold. Thus, a 'small' sub-sample was created by pooling together all those farms that, for each farming type, fall below the median, and as 'large' for those farms greater than or equal to the median. A third criterion, similar to the one above, consisted in taking the mean of the distribution of UAA within different types of farming as threshold, thus defining small farms those falling below the mean and large farms those with greater than or equal to the mean.

After careful consideration the second criterion was deemed to be the most appropriate and informative one. This choice is based on the fact that the distribution of the UAA in the Italian agricultural sample is heavily positively skewed (with a median of 7.3 hectares, a mean of 24.7 hectares, and a standard deviation of 54.7). Therefore, the strengths of this criterion consist in taking into account the large bias in the sample towards smaller farms in terms of UAA while acknowledging the diverse characteristics across the various production and specialisation structures. In the remainder of this chapter, the distinction between small and large farms will thus refer to this relative criterion[5].

5 Data

5.1 Data source and variables

The Italian agricultural business survey (Risultati Economici delle Aziende agricole - REA) collected by the Italian National Institute for Statistics (ISTAT) is used to estimate the model. This annual survey investigates the economic results of farms and their multifunctionality, through the off-farm

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[5] For robustness checks, the model results based on the other two criteria have also been estimated and compared. These estimation results are available upon request.

income of households involved in agricultural production and the existence of other gainful activities. The REA survey is the main source of micro-data for holdings of any dimensions and also includes those very small farms which are generally excluded from national agricultural business surveys (e.g. the Farm Accountancy Data Network - FADN, where the field of observation consists of commercial farms). The reference population thus includes all agricultural holdings of at least one hectare of UAA or below one hectare but with turnover of more than 2,066 €. The final sample used covers 3,550 Italian agricultural holdings and consists of a seven-wave balanced panel accounting for the period 2003-2009.

The explanatory variables comprise some personal characteristics of the farm holder, such as age, gender and marital status, in line with human capital and life-cycle considerations[6]. The correlation between farm holder and spouse's labour decisions is captured through the spouse's on-farm labour supply (hours) and their participation in off-farm employment (dummy). Instead, family members' age and their status in the labour force are missing from the survey. Ideally it would have been interesting to control for the dependency ratio in the household and the pressure of unpaid family members on the labour supply of farm holders via their demand for home time and consumption (Kimhi, 1996; Kimhi, 2000), as well as for the presence of young children, e.g. < 6 years, to examine differences in labour market responses between male and female farm holders. In order to account for different labour inputs on the farm the presence of hired labour and of family labour are also included (excluding the holder and the spouse). Specifically, family labour is measured in full-time units, as a weighted index of the number of hours supplied on farm daily (with the following weights applied: > 8 hours are weighted 1, 4-8 hours are weighted 0.75, < 4 hours are weighted 0.25, and 0 hours are weighted 0). With respect to farm structural characteristics these include the specific type of farming, based on eight categories (specialist field crops, specialist horticulture, specialist permanent crops, specialist grazing livestock, specialist granivores, mixed cropping, mixed livestock, mixed crops and livestock), the share of own consumption in total output (as a proxy for market integration to distinguish between commercial holdings and semi-subsistence farms), and the presence of on-farm diversification activities, e.g. the existence of any gainful activities that do not comprise any farm work but are directly related to the holding through the use of its resources or products (such as agritourism, contractual work, aquaculture, maintenance of the landscape). The geographical location of the farm is expressed in terms of altitude (plain, hill, mountain) and region at the European NUTS-1 level (North-West, North-East, Centre, South, Islands). Lastly, financial characteristics comprise the amount of income received in off-farm employment (€), the presence of unearned income such as pension or capital income, and the amount of total farm subsidies (CAP and other regional payments) received by the agricultural holding[7]. In order to deal with the potential endogeneity of off-farm income, and in the absence of exogenous wage rates, the empirical analysis uses lagged values of off-farm income (by one year). This is a common practice in applied econometrics work, and the assumption made is that the off-farm decision is made first and the on-farm decision is a residual one.

5.2   Farm size and on-farm labour supply

Table 1 shows summary statistics for the variables used in the model, respectively for the full sample and by farm size. The t-test for the equality of means between small and large farms suggests that, in the vast majority of the cases, the difference in the means is significant at the 1 per cent level. The distribution of farm holders by farm size and the extent of on-farm labour supply are presented in Table 2. The predominance of part-time farming in Italy is evident, with the large majority of the

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[6] A shortcoming is that the educational attainment and the specific agricultural training of farm holders are missing from the survey.

[7] Due to data inconsistencies it is not possible to accurately disentangle farm payments into coupled, decoupled and rural development.

sample (over 75 per cent) supplying 4-8 hours of daily labour, and around 11 per cent working less than 4 hours per day. The figures are even more impressive for small farms, where almost 20 per cent of farm holders spend less than half of their time on the farm and work less than 4 hours, in comparison to only 3 per cent for large farms. As indicated by the table, the possibility of a farm holder who does not supply any labour on the farm exists in the Italian sample. In these cases, the spouse and other family members operate the farm. Although the higher incidence of off-farm employment in small farms is often deemed as the main explanation behind part-time farming, here it seems that even in the absence of off-farm participation there is a clear positive relationship between farm size and on-farm labour supply (correlation coefficient of 0.23).

6   Estimation results

Table 3 reports the estimate results. The discussion commences with the full sample results (presented in the first column) and proceeds with highlighting the differences between small and large farms (presented in the second and third columns respectively).

6.1 Full sample estimate results

Age displays a negative linear relationship in line with life-cycle considerations. Males are found to supply more hours of on-farm labour suggesting that men are more active in the labour market (Bojnec and Dries, 2005). On the other hand, women are more inclined to work part-time, presumably to look after the family and household related tasks[8]. Similarly, married farm holders tend to supply less hours of labour. Spouses and farm holders' labour decisions appear to be correlated, with the strong positive linear relationship between the on-farm labour supply of the spouse and of the farm holder suggesting a complementarity in on-farm activities. Conversely, the spouse's participation in off-farm employment does not have any significant impact on the farm holder's labour supply. Family labour (in full-time equivalents) and hired labour appear to be complements to the holder's labour input, as indicated by the positive coefficients. This contradicts some of the previous evidence suggesting that a large availability of family labour reduces the household head's labour allocation to farming (Kimhi, 1994; Rizov and Swinnen, 2004).

Looking at the different production systems, specialist horticulture, mixed livestock and grazing livestock, in comparison to specialist field crops, are positively associated with the on-farm labour supply of farm holders, whereas farms specialised in granivores, such as pigs and poultry, exert a negative effect on their labour supply. This suggests that some production activities are more labour-intensive, particularly horticulture, and the fact that some may require special labour skills as in the case of livestock production (Rizov and Swinnen, 2004; Salvioni et al., 2013). For instance, several studies indicate a positive impact of dairy farming on farm holders' labour input on the farm, due to higher specialisation, higher technology, low seasonality and lower risk being associated with this particular farming system (Sumner, 1982). This higher demand for the farm holder implies that a constant presence is needed and that good substitutes are not available (Kimhi, 1994). The negative sign for own consumption implies that semi-subsistence farming, in comparison to those farms which are more market integrated, is generally associated with less labour supply. In contrast, the presence of on-farm diversification activities does not suggest a statistically significant impact. Farm location is generally an important determinant of on-farm labour supply. Farm holders are found to supply less hours of labour in mountainous areas, in comparison to their counterparts in the plains. Different

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[8] Overall, significant gender gaps characterise the agricultural sector, with respect to employment, pay, and decision-making, so that agriculture largely remains a man's world (EC, 2012). A preliminary empirical analysis of the gender gap in Italian agriculture, focussing on the gender differences in on-farm labour supply decisions, can be found in Tocco et al. (2015).

labour intensities in different activities may suggest lower input use in less favoured areas and better farming conditions in the lowland due to geology and climate. Farms in the mountains are often characterised by lower farm participation and a larger extent of part-time work, due to the lower profitability of agriculture in these regions (Kimhi, 1994). In terms of the geographical regions, farm holders are found to work longer hours in the North-West, followed respectively by the Centre, South, North-East and the Islands, denoting different agri-environmental conditions and farm structures. This regional order is also inversely proportional to the amount of time allocated to off-farm activities, as supported by the explorative statistics.

Off-farm participation (in the previous year) and the associated levels of off-farm income generally display a negative, although non-linear, relationship. In particular, the positive coefficient for the first off-farm income band (< 2,000 euro) implies that a minimal level of extra income, in comparison to no off-farm participation, is associated with more hours of farm labour. This may suggest that this extra income is invested in farm inputs or other assets which are complementary to the role of the farm holder in farm production. Previous studies show that income from off-farm activities (measured as binary outcome) is a positive determinant for working on the farm and a crucial strategy for farm survival (Glauben et al., 2006; Breustedt and Glauben, 2007). However, in line with these findings not only off-farm participation but also the level of off-farm income is as important determinant of labour allocation decisions. Unearned income, such as pension, capital and other revenues, exerts the expected negative effect on farm holders' labour supply, due to the income effect, whereas farm subsidies are not found to have a statistically significant impact, contributing to the rather mixed and inconclusive empirical evidence on the impact of farm subsidies on labour allocation[9].

6.2 Differences between small and large farms

The negative linear relationship between age and labour supply for the full sample is also confirmed in small farms. On the other hand, an inverted U-shaped relationship is found in large farms, suggesting that older farm holders tend to supply more hours of on-farm labour up until the age of 35-44, as the turning point of the function, after which they progressively reduce labour supply. The marginally lager coefficient of male in large farms indicates a stronger gender effect on labour supply. The interdependence of labour supply decisions between farm holder and spouse appear to be more pronounced in small farms[10]. Although a positive impact of hired labour is found in both small and large farms, a diverse result was originally expected, due to their different mix and intensity of labour inputs (family and hired) and thus their capacity to absorb and substitute labour. The presence of farm diversification is found to exert a positive impact in small farms and a negative one in large ones, indicating the different and, presumably, relatively more important economic impact on smaller holdings in expanding and supplementing their farm income. Moreover, farm holders in small farms are found to be more responsive to locational and agri-environmental conditions.

The relationship between off-farm income and on-farm labour supply also differs between small and large farms. For small farms this relationship follows the full sample, with a particularly large positive coefficient for the lowest off-farm income band (< 2,000 euro), which may suggest the presence of credit constraints and thus the importance of off-farm income for the survival of the farm business. Conversely, in large farms, higher levels of off-farm income are found to reduce on-farm labour supply, with a negative and almost linear relationship. The negative impact of unearned income on farm labour supply holds for both small and large farms, despite a much larger coefficient for large farms. Instead, the divergent effect of farm subsidies, not significant for small farms and negative in

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[9] For a discussion see Tocco et al. (2016).

[10] The empirical evidence on the jointness in work participation and labour supply, both on and off the farm, remains mixed up to date (see Huffman and Lange, 1989; Gould and Saupe, 1989; Tokle and Huffman, 1991; Ahearn et al., 2006; Benjamin and Kimhi, 2006).

large ones (statistically significant only at 10% level), could reflect the different intensity of payments being received, significantly higher in large farms, as well as the way these payments are perceived by the farm household. Specifically, farm subsidies in large farms could be viewed as non-labour income, thus reducing the labour supplied on the farm. Similarly, farm holders in large farms may invest more heavily in physical capital and substitute capital for labour.

7 Conclusions

This study has focussed on part-time farming in Italian agriculture and has investigated the drivers of farm holders' labour supply decisions. The findings suggest that some significant differences do exist between small and large farms, highlighting structural diversity in the farming systems and thus different incentives and business requirements. To a great extent, some of these key differences concern farm structural characteristics, indicating diverse capacities of absorbing labour. In particular, different labour intensities and demand across production and specialisation systems are important, so that specialist horticulture, mixed livestock and grazing livestock are positive determinants of farm holders' labour supply. In small farms, the positive impact of farm diversification indicates the importance of these activities for the stabilisation of income. The negative effect of own household consumption on labour market decisions, in both small and large farms, indicates the positive relationship between market integration and farm labour supply. Conversely, the relationship between part-time farming and off-farm employment differs between small and large farms, reflecting the importance of off-farm work for the survival of small farms and/or even the existence of some credit constraints. The negative impact of farm subsidies in large farms with the not statistically significant effect for small farms may reflect the substantial difference in the amount of subsidies being received. Overall, the way these payments are perceived by small farm households deserves further empirical attention.

From a policy perspective, it is certainly important to recognise the structural diversities that characterise the farm sector and thus differentiate the needs and objectives of different farm holdings. The heavy reliance on family labour in small farms, often engaged part-time, is compared to a more efficient allocation of resources in large farms, via the substitution of different labour inputs. In this respect, a lower absorption of surplus labour in small farms would lead to a more 'optimal' allocation of resources. As confirmed by the empirical findings, pluriactivity and market integration are important drivers of on-farm labour supply and are fundamental for the stabilisation of income of small farmers. These results support the policy claim that for smaller farmers rural development policies which encourage diversification activities and support commercialisation are much more important than farm subsidies. The promotion of these activities would certainly enhance the incomes of farm households but also guarantee their farm survival in the future.

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Table 1. Descriptive statistics of the full sample and by farm size

Variable	Full sample Mean	Small Mean	Large Mean	Diff.	T-test p-value
Personal characteristics					
Age: 17-24	0.00	0.00	0.00	0.001	0.148
Age: 25-34	0.06	0.04	0.07	0.025***	0.000
Age: 35-44	0.18	0.15	0.21	0.066***	0.000
Age: 45-54	0.23	0.21	0.25	0.042***	0.000
Age: 55-64	0.25	0.26	0.23	-0.027***	0.000
Age: 65-100	0.29	0.34	0.23	-0.108***	0.000
Male	0.77	0.72	0.83	0.111***	0.000
Married	0.40	0.42	0.39	-0.026***	0.000
Family characteristics					
On farm spouse: 0 hours	0.62	0.61	0.62	0.006	0.263
On farm spouse: < 4 hours	0.07	0.11	0.03	-0.074***	0.000
On farm spouse: 4-8 hours	0.27	0.25	0.30	0.051***	0.000
On farm spouse: > 8 hours	0.04	0.03	0.05	0.016***	0.000
Off-farm spouse	0.06	0.08	0.04	-0.038***	0.000
Farm characteristics					
Family labour units	0.25	0.16	0.34	0.175***	0.000
Hired labour	0.34	0.21	0.48	0.270***	0.000
Specialist field crops	0.23				
Specialist horticulture	0.08				
Specialist permanent crops	0.31				
Specialist grazing livestock	0.18				
Specialist granivores	0.02				
Mixed cropping	0.10				
Mixed livestock	0.02				
Mixed crops and livestock	0.06				

Own consumption	0.08	0.14	0.02	-0.119***	0.000
Farm diversification	0.04	0.03	0.06	0.028***	0.000
Plain	0.30	0.25	0.35	0.103***	0.000
Hill	0.46	0.45	0.46	0.013**	0.029
Mountain	0.24	0.30	0.18	-0.116***	0.000
North-West	0.20	0.19	0.20	0.008*	0.078
North-East	0.28	0.30	0.25	-0.044***	0.000
Centre	0.15	0.13	0.17	0.042***	0.000
South	0.30	0.33	0.28	-0.053***	0.000
Islands	0.08	0.06	0.10	0.047***	0.000
Financial characteristics					
Lag_off-farm income: none	0.89	0.84	0.94	0.099***	0.000
Lag_off-farm income: < 2,000 €	0.01	0.01	0.00	-0.008***	0.000
Lag_off-farm income: 2,001-5,200 €	0.01	0.01	0.00	-0.008***	0.000
Lag_off-farm income: 5,201-10,000 €	0.03	0.05	0.01	-0.032***	0.000
Lag_off-farm income: > 10,000 €	0.06	0.09	0.04	-0.051***	0.000
Unearned income	0.24	0.31	0.16	-0.155***	0.000
Subsidies	1.03	0.20	1.87	1.677***	0.000

Notes: As the distinction between small and large farms is based on their UAA within each type of farming, the respective means of different types of farming are the same as the full sample and are thus omitted from the table. Levels of significance: ***1%; **5%; *10%.

Table 2. Sample frequencies regarding on-farm labour supply

Farm holders	Hours worked on farm				
	0	< 4	4 - 8	> 8	Total
Small farms	205	2,095	8,862	1,248	12,410
	(1.65)	(16.88)	(71.41)	(10.06)	(100)
Large farms	36	370	9,833	2,201	12,440
	(0.29)	(2.97)	(79.04)	(17.69)	(100)
Total	241	2,465	18,695	3,449	24,850
	(0.97)	(9.92)	(75.23)	(13.88)	(100)

Notes: Numbers in brackets represent percentages of farm holders within each sub-sample, respectively small farms, large farms and full sample

Table 3. Estimate results of on-farm labour supply: random effects ordered probit

Variable	Hours on farm	Hours on farm	
	Full sample	Small farms	Large farms
	(1)	(2)	(3)
Age: 17-24	0.668***	0.866***	0.460
Age: 25-34	0.459***	0.626***	0.232**
Age: 35-44	0.388***	0.422***	0.273***
Age: 45-54	0.324***	0.384***	0.226***
Age: 55-64	0.154***	0.203***	0.079
Male	0.383***	0.232***	0.437***
Married	-1.153***	-1.252***	0.114
On farm spouse : < 4 hours	0.404***	0.587***	-0.795***
On farm spouse : 4-8 hours	1.253***	1.660***	-0.325
On farm spouse : > 8 hours	3.635***	3.868***	2.274***
Off-farm spouse	0.053	0.024	-0.020
Family labour units	0.205***	0.108**	0.225***
Hired labour	0.134***	0.077*	0.074*
Specialist horticulture	0.509***		
Specialist permanent crops	-0.001		
Specialist grazing livestock	0.160***		
Specialist granivores	-0.216*		
Mixed cropping	0.034		
Mixed livestock	0.353***		
Mixed crops and livestock	0.016		
Own consumption	-0.777***	-0.640***	-0.601*
Farm diversification	0.054	0.332***	-0.211**
Hill	-0.077	-0.126*	0.144**
Mountain	-0.275***	-0.230***	-0.027
North-East	-0.320***	-0.760***	-0.009
Centre	-0.171**	-0.499***	-0.260***
South	-0.210***	-0.527***	-0.213***
Islands	-0.657***	-0.992***	-0.666***
Lag_off-farm income: < 2,000 €	0.623***	0.858***	-0.025
Lag_off-farm income: 2,001-5,200 €	-0.269**	-0.315**	0.120
Lag_off-farm income: 5,201-10,000 €	-0.227***	-0.126	-0.293**
Lag_off-farm income: > 10,000 €	-0.615***	-0.558***	-0.577***
Unearned income	-0.304***	-0.183***	-0.401***
Subsidies	-0.000	-0.029	-0.009*
cut 1	-3.726***	-3.985***	-3.616***
cut 2	-1.847***	-1.912***	-2.331***
cut 3	1.984***	1.787***	1.786***
sigma2_u	0.987***	1.082***	0.863***
Number of observations	24,850	12,410	12,440

Notes: Levels of significance: ***1%; **5%; *10%. The estimated cut points and panel level variance (sigma2_u) are reported in the table. The likelihood-ratio test show that there is enough variability between farms to favour a random-effects ordered probit regression over a standard ordered probit regression (Prob>=chibar2 = 0.0000)