Journal of Rural Studies 55 (2017) 289–302

Contents lists available at ScienceDirect

Journal of Rural Studies

journal homepage: www.elsevier.com/locate/jrurstud

Portfolio entrepreneurship in farming: Empirical evidence from the 1881 census for England and Wales

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ARTICLE INFO

Article history:
Received 23 November 2016
Received in revised form
26 May 2017
Accepted 28 August 2017
Available online 14 September 2017

1. Introduction

This paper examines portfolio entrepreneurs: those who operate more than one business at any one time. It focuses on the conditions that influence the occurrence of multiple businesses as compared with single business. Empirical evidence on the choice between portfolio entrepreneurship and a single occupation are scarce. In particular, most previous studies discuss the incidence of portfolio entrepreneurship without providing further insights into what influences the decision to engage in multiple activities. To fill this gap in the literature, our objective is to test empirically the factors that affect choice. Drawing for the first time from the historical resource of the 1881 census data for England and Wales, we use a multi-level logit model to explore how employee size, farm size in acres, population density, age, gender, marital status, household size, the entrepreneurial ratio, and regional heterogeneity affect the probability of portfolio entrepreneurship. This historical resource allows a unique whole population analysis which offers opportunities, for the first time, to compare factors influencing portfolio choices between modern and past farming practices.

Our study offers several contributions to the literature on portfolio entrepreneurship in farming. First, it is among few empirical studies to investigate the determinants of portfolio entrepreneurship in the farming sector. Second, besides common factors, such as farm size, number of employees, gender and age, we also model the impact of the population density on the probability of portfolio entrepreneurship, thus offering empirical evidence of the effect of urbanization and local market potential. Third, our study provides an historical perspective on portfolio entrepreneurship more generally. The insights gained from this early period of portfolio development indicate that historical features are remarkably similar to modern developments in both level of portfolio activity and explanatory factors underlying it.

In addition the paper also seeks to engage with recent suggestions of the importance of combining greater historical insight with the modern entrepreneurship research. These suggestions have come from the perspectives of contemporary researchers such as Aldrich (2012) who has lamented the limitations of entrepreneurship research as an academic field, or Carter and Ram (2003) and Alsos et al. (2011, 2014a, b) who have focused on the changing role of households and families in farming and other businesses. Wadhwani (2015) and Perchard et al. (2017) note that much modern research on entrepreneurship has failed to understand the historical context of the data and the role of contingency. It has also been suggested that some business history can be better understood in the context of modern entrepreneurship theory (Casson, 2010; Casson and Casson, 2013). Indeed there has been a long-running debate between those focused on case studies in business history and those advocating a more systematic approach (see especially McCloskey, 1981). To some extent these issues arise because of the lack of large scale historical data on a comparable basis to modern surveys that allow comparative study. This paper seeks to begin a greater exchange between these different approaches by focusing on the issue of portfolio farms using the newly available large scale electronic database of the nineteenth century census.

The remainder of the paper is organized as follows. The next section discusses theoretical considerations about portfolio entrepreneurship, with a focus on the farming sector. We then summarise previous empirical literature, comparing modern and historical cases. Then we present our methodology, the data used in the study and our empirical strategy. The penultimate section presents and discusses empirical results for the whole sample as

This research was supported by ESRC grant ES/M010953 'Drivers of Entrepreneurship and Small Businesses'. Piloting of the research for 1881 was supported by Leverhulme Trust grant RG66385 'The long-term evolution of Small and Medium-Sized Enterprises (SMEs)'.

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http://dx.doi.org/10.1016/j.jrurstud.2017.08.019

well as for each region separately. The final section concludes and assesses the significance of the findings.

2. Literature review

With respect to multiple occupations, modern literature distinguishes between novice entrepreneurs, who run one business, and habitual entrepreneurs, who either run several businesses sequentially (serial entrepreneurs) or own multiple businesses (portfolio entrepreneurs)[1] (Parker, 2014). However, demographic characteristics of entrepreneurs that make them more likely to become habitual entrepreneurs, instead of remaining novice, are little discussed in the theoretical literature and empirical evidence remains scarce (Parker, 2014). Furthermore, theoretical developments in relation to conceptualising portfolio entrepreneurship are still in a nascent phase (Ucbasaran et al., 2008; Parker, 2014).

Portfolio entrepreneurship is particularly prominent in the agricultural sector, where a term commonly used to denote portfolio entrepreneurship is "pluriactivity" (adopted from the French *pluriactivité*) (Fuller, 1990; Carter, 2001). Fuller (1990) and Evans and Ilbery (1993) define pluriactivity as the combination of farming with other economic activities, whether on or off-farm. It may include either on-farm non-agricultural, and/or off-farm agriculture and non-agricultural work (Sofer, 2001; Niemelä and Häkkinen, 2014). Rønning and Kovereid (2006) note that pluriactivity and portfolio entrepreneurship are not synonyms, but within a household can often be regarded as parts of the same activity. Pluriactivity includes occupations of employee status as well as running businesses, whereas portfolio entrepreneurs are only involved in businesses. Both forms of activity are common in farming; as Carter (2001, p. 44) notes it "has always been an important and distinctive feature of farming". Indeed, early modern research on pluriactivity in farming identified a range of phenomena such as "double jobholding", "moonlighting", "weekend workers", "variable-day workers", "rotating employment", "irregular employment", "part time workers" and other conceptual starting points (see e.g. Alden, 1977). 'Part time farmers' have also been a focus for early policy discussions of business diversification that have sought to help rural communities (see OECD, 1978).

Farm pluriactivity has been identified as a driving force for both survival and growth strategies for farm businesses (Fuller, 1990; Carter, 2001), whilst Kautsky (1988) regarded portfolio entrepreneurship in farming as inevitable, in particular when profit from farming declined (see: Banaji, 1980; Carter and Ram, 2003). His argument is confirmed in the contemporary farm sector, where portfolio activities are noted for farms of all sizes (Carter and Ram, 2003). However, as noted by Carter and Ram (2003), portfolio entrepreneurship in farming has been prevalent throughout history, and this aspect of historical continuity is a focus of this paper.

Rønning and Kovereid (2006) review of the literature recognizes three distinct motivations behind pluriactivity: (i) as an exit strategy, (ii) as a coping strategy during downturns in agricultural activities and profits, and (iii) as a deliberate family strategy to increase wealth. De Silva and Kodithuwakku (2011), De Lauwere et al. (2002) and Evans and Ilbery (1993) argue that the coping strategy is a survival strategy, which is more dominant among necessity-driven and socio-economically disadvantaged farmers (see also Bowler et al., 1996; Eikeland and Lie, 1999; De Silva and Kodithuwakku, 2011). Portfolio activity can also be a safety strategy pursued in an attempt to reduce risk stemming from a single business (Carter, 2001; McNally, 2001). In contrast, a strategy of wealth accumulation can be adopted by better-off, larger and more successful farmers. In addition, Sofer (2001) notes that strategies behind pluriactivity often exhibit spatial differences, such that in peripheral regions, which are often characterized by small-farm production, pluriactivity is more likely to be focused on survival and continued ownership of the family farm. In contrast, at the fringes of metropolitan areas, pluriactivity is more likely to offer opportunities for wealth accumulation, and is sometimes a means to develop experience that allows exit from agriculture.

These empirical findings can be interpreted through three main theoretical approaches to explore why farmers engage in multiple business activities (Alsos et al., 2003). In developing these approaches we try to differentiate entrepreneurship from business proprietorship. For farming we regard all farmers as proprietors (as does Carter, 2001, and most other commentators), even though many will be tenants. But only some farmers are entrepreneurial. Similarly we try to separate portfolios into those that follow entrepreneurial strategies and those that do not. A first theoretical perspective, originally from rural sociology, treats the household as the unit of analysis so that resources of the whole family are judged as key influences on how pluriactive farm households allocate resources between farm and non-farm activities (Fuller, 1990). In modern analysis this focuses on the 'family in business' (Aldrich and Cliff, 2003; Alsos et al., 2014b) which combines normative and private with utilitarian business motives (Brannon et al., 2013). Family owners were, and remain, particularly prevalent in agriculture (in the modern UK 86% are family owned: BIS, 2013). Family size and demography play key roles in this approach and are major elements in pluriactivity (De Silva and Kodithuwakku, 2011); e.g. undertaking additional business activities through different family members to mitigate recessions or market constraints within the agriculture sector. Pluriactivity is also valuable at different stages of the business or family life cycle to cope with a range of personal and household circumstances affecting the business proprietors, their partners and families, including issues of succession. However, even if separate and independent between family members, family businesses often remain interconnected (Alsos et al., 2014a).

The second theoretical approach emphasises the opportunity perspective: that entrepreneurs are defined by embarking on discovery and exploitation of business opportunities. Following Shane and Venkataraman (2000), entrepreneurship is viewed as the discovery and exploitation of profitable business opportunities. As noted by Alsos et al. (2003) farmers seek out business opportunities to overcome the constraints of limited returns to scale in agriculture. From a nineteenth century perspective there may have been more opportunities to explore diversification because of growing technological supports from mechanisation which released family and other resources to develop new businesses. Starting a new business is regarded as a key indicator of entrepreneurship (Westhead and Wright, 1998).[2] Given that Carter and Rosa (1998)

[1] Besides portfolio entrepreneurship, other terms used in the literature interchangeably are multiple business ownership (Carter, 2001), simultaneous ownership (Carter and Ram, 2003), and in historical research for all persons whether business owners or not, as dual occupations (Bellamy, 1978), and by-employment (Keibek and Shaw-Taylor, 2013).

[2] Indeed Wright et al. (1998) suggest that entrepreneurship can be viewed as not just the foundation of a new business, but also undertaken through the development, purchase or inheritance of other businesses. Based on this argument, Alsos et al. (2003) note, from the opportunity perceptive of entrepreneurship, that farm portfolios could result from exploitation of wider business opportunities, through start-up, purchase, inheritance or diversification.

consider farmers as primarily business owner-managers, Alsos et al. (2003) expand this interpretation by noting that portfolio farm entrepreneurs discover and explore profitable opportunities while at the same time maintaining their farm business. Summing up, Alsos et al., (2003, p. 438) conclude that "farm-based entrepreneurship is the result of alert farmers discovering and exploiting business opportunities related to their prior knowledge."

A third theoretical approach is the long-established resource-based view of the firm (Penrose, 1959). This considers firms' internal resources - human, physical and financial - as a source of competitive advantage. Alsos et al. (2003) argue that for farm activities current resources (e.g. existing assets, distribution channels, etc.) can be utilized for starting new business activities. Farmers possess valuable resources that can be used for wider purposes, reducing start-up and other costs (Barney, 1991). For example, existing transport equipment such as carts or horse and traction engine motive power, premises and land assets gave Victorian farmers opportunities others might not have which were used to start new businesses in carting, storage and distribution (especially coal merchandising), refreshment or lodging provision.

In practice these three theoretical approaches overlap. Although Alsos et al. (2003) identify three categories of farm entrepreneurs engaged in additional business activities: the pluriactive farmer, the portfolio entrepreneur, and the resource exploiting entrepreneur, these different strategies can be combined in different situations. Thus De Silva and Kodithuwakku (2011) note necessity-driven and economically worse-off farms will be more survival-oriented but will also respond to opportunities if they are available. In contrast, better-off and more successful farms have more scope to be opportunity driven to pursue capital and wealth accumulation strategies, but will also use portfolios to hedge against possible adversity. Similarly both survival and opportunity behaviour have scope to use existing farm assets to diversify if local market conditions offer. In practice therefore the exact balance of responses depends on a mixture of individual, household and local conditions, as well as the drive of the individual farmer; and this will be as true in historical and modern situations. This helps to explain what McElwee (2008) noted as a lack of consensus with respect to defining farm entrepreneurship, and the paucity of literature exploring entrepreneurship in the context of the farm sector (McElwee, 2006). Thus a multi-layered theoretical framework is required. Modern theory focuses on the personal traits of entrepreneurs and entrepreneurial skills, such as growth-oriented; innovative; prone to risk-taking etc (McElwee, 2006). Whilst the modern definition of entrepreneur by Gray (2002, p.61) can be applied to the farm sector "individuals who manage a business with the intention of expanding that business with the leadership and managerial capabilities for achieving their goals", this can also be applied to historical farming situations. Indeed Carter (1998) regards all farmers as traditionally being entrepreneurs.

In this paper we seek to differentiate entrepreneurship from business proprietorship using a range of contrasted explanatory variables. We largely follow McElwee (2008) who suggests that there are four distinct categories of modern farm entrepreneurs: *farmers as entrepreneurs* (engaged in innovative, opportunity-oriented and diverse business activities); *farmers as farmers* (engaged in land-based economic activity); *rural entrepreneur, not farmer* (who owns farm, land or business); and *farmer as contractor* (who possesses specific skills and expertise). Within these groups McElwee argues that family farms and tenant farmers are more likely to be entrepreneurial arising from the fact that they are *family* businesses. For the nineteenth century this is particularly relevant since the farm household is often the main resource that can be exploited in flexible and innovative ways.

In our study the whole population of farmers is available, which allows the farmer as entrepreneur who develops portfolios to be compared with other farmers. Moreover the availability of data on farm employees allows us to distinguish farmers and entrepreneurs by employment size. The availability of census data on farm employee size for all farms allows analysis of the relationship of portfolio entrepreneurship to business growth, which is a key aspect of the entrepreneurship literature (Carter, 1998, 2001, 1999; Carter et al., 2004; Rosa and Scott, 1999). Farm portfolios can then be interpreted as a form of habitual entrepreneurship where the farmer prefers the challenges associated with diversification rather than a pure start-up. Alternatively, some farm entrepreneurs who prefer their business to remain at a certain size because of personal or regulatory factors can seek growth laterally by engaging in additional non-farm activity. Additionally, industries like farming which are labour intensive are characterized by a small minimum efficient scale (depending on location), and/or limited scope for growth and scale economies, can lead to a strategy, once this point is reached, where an entrepreneur may seek additional business opportunities that less entrepreneurial farmers will not. This leads towards the use of the choice model developed below.

Before presenting the model, however, it is important to situate the analysis in its historical context. In a wide-ranging review of previous historical studies Casson and Godley (2010) argue that the key context of Victorian entrepreneurism was infrastructure development (especially railways), urban development, expanded factory employment and service industry development, and protection within an imperial market (until the rupture of the First World War; see also Payne, 1988). This provided opportunities for farmers accessible to urban areas, or with new transport links, to supply the food and other needs to growing numbers of land-less workers. They could expand their own production of farm products, diversify into other sectors using their assets, or leave for wage employment themselves. Moreover, as Crafts (1985) has argued farm diversification had been interrelated with industrialisation since the eighteenth century in some northern and more marginal agricultural areas, and was also prevalent in mining areas (see also Bellerby, 1956; Hallas, 1990, 1999). Hence, the Victorian period offered generally expanding opportunities and demand for farm products and scope for portfolio development. However, at the same time, although there were low interest rates leading to low risk premiums that encouraged entrepreneurship in general (Edelstein, 1976), as Kennedy and Delargy (2000) argue this also encouraged many to be complacent. They briefly use the example of middle-income Essex farmers as an example of a general Victorian pattern of numerous business proprietors who were comfortable with relatively low long-term average returns who did not feel any urge to expand their businesses further. They were 'satisficers' whose comfortable position was maintained as long as the whole economy followed established patterns. These farmers did not need to be entrepreneurial. Some could develop if they wanted to pursue opportunities; and if they were below middling and at survival levels they had to attempt to do so. Although Kennedy and Delargy (2000, p. 38) produce no evidence to support this claim in farming, they argue that 'there were unusually large numbers of such people in Britain' by the late 1880s who did not have to change until the cataclysm of the First World War ruptured protected markets and manpower supply. Hence, the context of the period was one which offered opportunity for those who had to respond in order to survive, allowed the truly entrepreneurial many opportunities to prosper, but also may have left many farmers unmoved. This leads us to expect a variety of farming responses to portfolio choice, but the testing of such ideas against large scale

empirical evidence has been previously lacking.

2.1. Empirical evidence

Early studies of modern portfolio activities in farming have undertaken analysis at the level of both the individual entrepreneur (Scott and Rosa, 1996; Rønning and Kovereid, 2006) and the household (Carter and Ram, 2003; Rønning and Kovereid, 2006). However, few studies have explored the factors determining the incidence of portfolio entrepreneurship at both levels because the required data on both individuals and households is rarely available (Carter, 2001; Westhead et al., 2005; Parker, 2014). We intend to fill this gap in the literature.

In the more modern literature Gasson (1967) and Harrison (1975) are among the earliest studies for the UK, finding that in the 1960s over 30% of the business partners on farms had other occupations, 55% of which were full time indicating that farming was a secondary business, with 80% of farmers' portfolios providing equal or greater earnings than farming, with the proportions higher for smaller farms. EC (1981) recognised this pattern as long standing across Europe; as also found by OECD (1978) in most advanced economies. More recently the incidence of portfolio entrepreneurship is suggested to occur in about 10–20 per cent of farms (Parker, 2014).

Carter (2001), in her study of Cambridgeshire farmers, found that younger farmers were more likely to be portfolio owners. In addition, farmers with a single occupation (termed monoactive, Carter, 2001) tended to operate smaller farms (less than 100ha), while portfolio farmers operated larger farms (see also Grande et al., 2011). However, in a larger scale and earlier study Gasson (1967) found multiple activities highest for farms under 10 ha. (25 acres) and decreased with farm size to over 50 ha. (124 acres). Portfolio owners tended to employ a larger number of workers than mono-active farmers. Other studies have also found larger farms to be associated with pluriactivity. Ilbery (1991) and McInerney and Turner (1991) have interpreted this as larger farms having more capital that can be redeployed towards other activities, more land that can be used for other businesses, and owners who can more easily raise additional capital for other businesses than owners of small farms (McNally, 2001).

Though Carter and Ram (2003) comment that portfolio activities were historically widespread, most previous historical research on farming has been based on local case studies. Davies (1909) found that over one third of farmers had another occupation in the early 1900s in Corsley, Wiltshire. Others suggest that farmers that were close to urban settlements developed a wider range of opportunities through diversification, often gaining their principal income from direct retailing of produce and ancillary activities such as beer retailing, inn keeping, carriage of goods, or handling and dealing in lime, coal or stone. In a Lancashire case study these additional occupations to farming generally *decreased* with farm acreage: from 36% for farms of 1–5 acres to 6% for those of over 50 acres in non-industrial districts, but in industrial districts the decrease was less: 70% for 1–5 acres farms decreasing to 59% for those of 5–20 acres, 44% for 20–50 acres, and 21% for those over 50 acres (Winstanley, 1996, Table 7). Much diversification was achieved through utilisation of family resources: wives, children and relatives either on the land or supporting marketing through retailing (Winstanley, 1996, Table 9). In a context where there were also mining opportunities, Hallas (1999) found Yorkshire lead miners diversified into small holdings mainly selling to other mining families as a means of buffering against uncertain mining income, with some later becoming larger scale farmers. On a broader scale Bellerby (1956), using the reports of Royal Commissions of 1881 and 1893–4, noted that 'part time farming' was extremely common, with supplementary occupations including fishing, retailing, road haulage and carrying, wholesale distribution, factory work, and agricultural work on other farms. Summarising case studies, Reed (1986, pp. 86–8) suggests the main ancillary occupations to farming were most commonly curing, produce selling, carrying, building and wage labour.

Using historical biographical material, Davidoff and Hall (1997) demonstrate that family and kinship encouraged portfolio business development to meet the needs of offspring for business opportunities. Ethnographic studies by Samuel (1975) suggests that there were three broad categories: (i) survival strategies, where 'doing a bit on the side' was a strategy 'to get by', and hence was counter-cyclical, as Hill (1982) found during the agriculture depression in Britain during the late eighteenth century; (ii) selling produce, which was the most frequent diversification for farmers; and (iii) development of businesses in new directions, as a means to share activities across different household members, siblings, and across generations, with women often playing a pivotal role in this process (see also Davidoff, 2012). Anderson (1971) suggests that such examples covered a very large proportion of the population in the nineteenth and early-mid twentieth century; as Pahl (1984, p. 46) termed it, pluriactivity was an historical strategy for 'occupational easement' where earnings would otherwise be low or insufficient.

These studies are subject to the criticisms voiced particularly by McCloskey (1981), that case studies do not allow wider generalisation, but they do indicate that the historical motivation for pluriactivity and portfolio businesses was similar to modern findings. However, previous research has not been able to scale up historical findings to the whole population, nor to investigate the systematic factors that affect farmers' choice between a single and multiple occupations. The rest of this paper seeks to fill this gap by undertaking the first large scale national analysis of farming portfolios for an early period and compares the findings to the previous modern and historical research.

3. Methodology

3.1. Data

This paper is a national level analysis of farming portfolio businesses in England and Wales. These are identified and extracted from the 26 million records within the population census of 1881. These data have not been previously available in electronically manipulable form for the whole country. They were extracted from the original manuscript census records encoded into an electronic database by Schürer and Woollard (2000) using records transcribed and keyed by the Genealogical Society of Utah, available as a UK Data Archive deposit (SN-4177-1). From these data, entrepreneurs and their declared number of employees (if any) can be identified from their alphanumeric occupational descriptor strings by a complex algorithmic and hand-refined identification process; those that have multiple occupations and hence potentially pluralistic business activities were then identified using a methodology developed by Bennett and Newton (2015) based on the number of their identifiably separate business activities. The result is a unique database that allows a whole-population analysis, subject to the limitations of the census question design, and the constraint that not all households and enumerators may have fully followed the census instructions to state numbers of employees and farm acreages to the letter. It provides the opportunity to pilot for one historical year a method of modelling that can be extended to other census years and data.

In this database farmers with multiple occupations represent 3.2 per cent of all farmers (descriptive statistics for the full sample

and regions in Table A1). The average number of employees is four, the average age of farmers is 48 years, the average farm acreage is 100 acres and the average population density 0.3 people per acre. Regarding gender and marital status, married men represent by far the largest category with 71.9 per cent of portfolio farms. The next largest category is single men with 12.5 per cent. The smallest male category is widowers with 7.4 per cent. The participation of women, regardless of their age and marital status is minor. Single women run only 0.9 per cent of portfolio farms, while married women are only 0.5 per cent. The proportion of widows is higher than other female categories, and amounts to 6.8 per cent. The average household has six members, while the average entrepreneurship ratio (entrepreneurs per head of local population) at parish level is 9.4 per cent.

3.2. Model specification

This paper estimates a model of the relationship of portfolio choice or not to a series of explanatory variables. We assess the influence of farm size using declared number of acres held (variable *ln_acres*; in natural logarithms) (see Table A1 for variable description). Farm size is expected to be positively associated with portfolio entrepreneurship in farming for small farms indicating survival strategies (McNally, 2001), but at large farm sizes, previous literature suggests portfolios are less likely because the farm is an efficient marketing unit and diversification is less necessary (as found by Gasson, 1967; Winstanley, 1996). To account for this non-linear relationship, we include the square and cube of farm acres in the model. In addition to farm size, we also estimate the effect of the declared number of employees as firm size (variable *ln_total*; in natural logarithm), where again non-linear effects are expected and the square term of the firm size is used. Firm size, as with areal size of the farm, is expected to have a positive relationship with pluriactivity. This is because on a resource theory view larger farm employment is associated with greater human capital assets and hence increases scope to diversify (Grande et al., 2011). This should reflect those who are farmers as entrepreneurs. In addition, larger farms offer economies of scale and are usually better equipped with respect to buildings and machinery (McElwee, 2006; Grande et al., 2011) and hence have more scope to diversify.

McInerney and Turner (1991) note that development of pluriactivity is conditional on demand. Consistent with the opportunistic view of entrepreneurship, the existence of a larger or growing market for diversified products and/or services will stimulate portfolios. Consistent with this, the proximity to urban centres is potentially an important factor offering opportunities for farmers to engage in additional business activities to increase incomes. As noted in case studies, urban proximity offers lower transportation costs and easier access to customers (Winstanley, 1996; Carter, 1999; Grande et al., 2011). Consequently, we include a continuous variable *ln_density* in the model (in natural logarithm), which measures the population density per acre for the parish in which each farm is located (there were 15,000 parishes in England and Wales in 1881). Population density directly measures the level of urbanisation, but to control for potential non-linear relationships with portfolio activities, we modelled square and cubic terms.

Regarding the incidence of portfolio entrepreneurs based on their gender, Carter et al. (2004) found that 'mixed gender' multiple owners are most frequent after male portfolio entrepreneurs. As found in other studies, the smallest number of portfolios is likely to be among female entrepreneurs, relative to males and mixed gender (Carter et al., 2004; Rosa and Hamilton, 1994). However, we also need to manage the mix of personal and household characteristics reflecting the joint and interconnected roles of family and business members (Aldrich and Cliff, 2003; Alsos et al., 2011, 2014a). Accordingly, we include dummy variables for the gender of employers combined with their marital status (*Single women*, *Single men*, *Married women*, *Widows* and *Widowers*, the base category is *Married men*). McNally (2001) found that the presence of a spouse on the farm is the main explanatory variable in estimating the likelihood of portfolio activities in tourism. Gender and marital status are shown in case studies to be important aspects of farm portfolios in modern studies (Carter et al., 2004; Ram, 1994) and in historical situations (Anderson, 1971; Winstanley, 1996; Davidoff and Hall, 1997). Another important group of factors influencing portfolio entrepreneurship is human and social capital (Wiklund and Shepherd, 2008; Parker, 2014). Although in our model we are unable to control for entrepreneurs' education and abilities, we have information on one form of social capital, the size of a household (variable *Household size*) which indicates something of the broader family as well as other resources available, which is viewed as a key element in farm business (Alsos et al., 2011, 2014b).

Age is another important factor generally found to influence portfolio entrepreneurship in farming (McNally, 2001; Rønning and Kovereid, 2006; Westhead and Wright, 1998), with very young entrepreneurs (younger than 21 years) and entrepreneurs in the median age ranges more likely to engage in portfolio activities than older counterparts (Carter et al., 2004). Age is also a surrogate for succession effects in family businesses, since increasing age generally leads to some withdrawal and passing on management to younger individuals. We cannot estimate succession issues directly as we have only one time period for analysis. But the inclusion of *ln_age* (in natural logarithm) and its square term, allows capture of potential non-linearity between age, the probability of portfolio entrepreneurship, and the effects of succession strategies.

Finally, we include an *entrepreneurship ratio* variable (the ratio of employers to the population of the parish) to capture the effect of different local concentrations of wider entrepreneurship activity on the likelihood of local pluriactivity. This captures potential effects of local social capital, clustering, or 'cultural' influences. To account for possible regional heterogeneity, we included eleven regional dummy variables in Model 1 (full sample) for census regions: Eastern, London, Wales, North Midland, North Western, Northern, South Midland, South Western, West Midland and Yorkshire (the base category is South East).[3] Moreover, we also estimate the models for each region separately (see Section "Regional analysis").

3.3. Empirical method

Given that our dependent variable is a binary indicator (portfolio or not), and to account for inter-cluster correlation, we utilize a mixed-effects logit model. Because our unit of analysis is an individual, we take into account that people in the same group of parishes (the circa 2000 geographical units represented by registration sub-districts) are correlated, as they share common cluster-level random effects (industry structures, markets and cultures). This is one means to take account of possible spatial autocorrelation, controlled by a two-level framework. However, any error in measurement will cause the error terms to be spatially autocorrelated. Spatial econometrics models could be applied in future research (Anselin, 2003) but is not developed in this paper.

The two-level logit model with a random intercept can be written as

[3] The definition of these regions derives from the census 'divisions' used in the nineteenth century censuses.

$$\log[P_{ij}/(1-P_{ij})] = \beta_0 + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \ldots + \beta_n X_{nij} + u_j \quad (1)$$

where $P_{ij}$is the probability of the response for individual i in a sub-district j, a set of coefficients to be estimated are denoted by $\beta_0, \beta_1 \ldots \beta_n$, a set of n covariates having fixed effects are X_{1ij}, $X_{2ij} \ldots X_{nij}$, and u_j is the random effect at level two (assumed to be logistically distributed). Equation (1) presents the combined model incorporating both levels (in our case, the level of individuals and of sub-districts) (Guo and Zhao, 2000). A combined model can be divided into two equations, each representing one level in the analysis:

$$\log[P_{ij}/(1-P_{ij})] = \beta_{0j} + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \ldots + \beta_n X_{nij} \quad (2)$$

Equation (2) represents our level 1 model (the level of individuals), while Equation (3) below is the level 2 model.

$$\beta_{0j} = \beta_0 + u_j \quad (3)$$

Model (1) can also be expressed through a latent variable conceptualization. If y^*_{ij} denotes a latent variable such that $y^*_{ij} > 0$ when $y_{ij} = 1$ and $y^*_{ij} \leq 0$ when $y_{ij} = 0$, then Model (1) for a latent variable y^*_{ij} can be written as

$$y^*_{ij} = \beta_0 + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \ldots + \beta_n X_{nij} + u_j + e_{ij} \quad (4)$$

where e_{ij} is the error term which follows a logistic distribution.

4. Empirical results and discussion

Results for analysis of the full population using Equation (1) are reported in Table 1. The impact of variables that are modelled with the square and cubic terms (*ln_total*, *ln_age*, *ln_acres* and *ln_density*) are interpreted using the Average Marginal Effects (AMEs) to allow interpretation of how probabilities of portfolios change across the non-linear range. Focusing initially on the impact of gender and marital status, our results suggest that single men and women, as well as widows, were less likely to engage in pluriactivity than married men (the base category). This strongly confirms the role of family resources, especially from wives, to facilitate diversification and portfolio development; most restricted were single women and widows. This interpretation is reinforced by our proxy measure of human capital (household size), which is positive and highly statistically significant (at the 1% level), confirming that farmers in larger households with greater human resources had a higher probability of pluriactivity.[4] The entrepreneurship ratio is positive but surprisingly it is statistically insignificant (at any conventional level). This indicates that at a local level portfolio development by farmers was essentially independent of wider local entrepreneurship clustering or 'culture'; it depended instead primarily on other factors captured in our model: demographic characteristics of the entrepreneur, family, and local market opportunities. In relation to regional heterogeneity, farmers in Eastern, North Midland, South Midland, West Midland, and Yorkshire regions were more likely to engage in pluriactivity than farmers living in South East (the base category). In contrast, farmers in London, Wales and North Western regions were less likely to have portfolios than farmers in the South East.

The results for the full population strongly confirm earlier historical studies that view gender and marital status as key influences on portfolio development, with the Victorian married couple in particular offering an efficient means to share resources, and family members (partly indicated by household size) a further factor that opened opportunities for additional business development (e.g. Anderson, 1971; Davidoff, 2012). The results also confirm modern studies that argue for the importance of the family unit (Carter et al., 2004; McNally, 2001) and family size as key influences on portfolio development (Carter and Ram, 2003; Rønning and Kovereid, 2006). Hence the model strongly confirms that sharing ownership and management with a spouse increases the likelihood of portfolio entrepreneurship compared to unmarried entrepreneurs, as expected from modern studies (Aldrich and Cliff, 2003; Alsos et al., 2014a, b). However, to interpret these findings in terms of entrepreneurship requires a wider range of explanatory factors to be evaluated.

The rest of the variables included in the model are interpreted using the Average Marginal Effects (AMEs); these show how portfolio probability varied with firm size, farm acreage, population density, and age. Fig. 1 shows AMEs for the firm size *ln_total* (i.e. the number of employees). For the full population the estimated coefficients on the level, and the square term on *ln_total*, shown in Fig. 1 (the plot titled "Full sample"), indicate that firm size had a positive and statistically significant impact (at the 1% level) for all firm size categories. The largest positive impact of firm size on the probability of pluriactivity was from around 40 workers upwards. After this turning point, the impact of firm size is still positive but decreasing. Regarding the impact of the farm size (variable *ln_acres*), Fig. 2 ("Full sample") indicates that at very small farm sizes up to 3 acres (and for those who did not declare any acreage), the probability of pluriactivity was positive. However, for farms with more than 3 acres there was a negative marginal relation of probability of engaging in pluriactivity to size. Finally, for large farms (more than 800 acres), the impact of farm size on portfolios was statistically insignificant at any conventional level.

These findings give large scale confirmation of previous case studies that the effects of *farm size* on portfolio activity were non-linear, and were most likely for small-medium acreage. Thus Victorian farmers with small holdings were more likely to have portfolios, but this was a survival strategy. For larger acreages diversification was less needed so portfolio activity was more limited. Conversely, as *firm size* (number of employees) increased, the likelihood of portfolios increased as farmers became more entrepreneurial by diversifying into other areas: retailing, accommodation and refreshment. However, with very large firm and farm sizes there was a stronger tendency to specialise and focus either on achieving maximum internal economies of farm production resulting in a lower tendency to have portfolios, or as Kennedy and Delargy argue, there may have been complacency because they were already achieving a satisfying income. The contrast between farm size and firm size appears to be a strong differentiator of entrepreneurship. Firm sizes of up to about 40 employees exhibited increasing frequency of 'farmers as entrepreneurs' in terms of diversification into portfolios. They may also have entered into the category of 'rural entrepreneur' (McElwee, 2008) where their land or farming was less important than other businesses, but the available census data is insufficient to be certain of this. Farm size, in contrast, appears as a strong indicator of 'farmers as farmers' or contractors. Portfolios were chiefly survival strategies out of necessity because the smallest holdings were insufficient to meet family income needs. This was probably mainly achieved through by-employment rather than business activity, though the census data do not clearly separate employee and sole trader activity.

Population density (variable *ln_density*) gives opportunities to enlarge this interpretation. Fig. 3 ("Full sample") shows that

[4] We also estimated the model with variables measuring whether an employer was in partnership (a binary indicator), but the coefficients were statistically insignificant at any conventional level.

Table 1
Results from the multi-level logit model. The dependent variable is *Portfolio*. Firm size is larger than zero.

Independent variables	Full sample	Eastern	London	Wales	North Midland	North Western	Northern	South East	South Midland	South Western	West Midland	Yorkshire
Ln_total	0.796***	1.037***	1.931**	0.683**	1.126***	0.570**	1.022**	0.594***	0.517***	0.766***	0.703***	1.141***
	(0.059)	(0.191)	(0.811)	(0.305)	(0.193)	(0.236)	(0.419)	(0.209)	(0.178)	(0.192)	(0.184)	(0.186)
Ln_total^2	0.028*	−0.057	−0.262*	0.100	−0.060	0.145**	−0.024	0.089*	0.078*	0.031	0.081	−0.054
	(0.016)	(0.049)	(0.152)	(0.097)	(0.056)	(0.071)	(0.105)	(0.053)	(0.046)	(0.060)	(0.052)	(0.055)
Ln_age	14.660***	14.847***	1.013	16.133*	26.499***	14.360**	26.557**	5.860	10.279**	21.162***	10.589**	16.644***
	(1.740)	(5.029)	(27.728)	(9.099)	(6.225)	(7.169)	(12.206)	(4.764)	(4.280)	(5.197)	(4.906)	(5.920)
Ln_age^2	−1.946***	−1.972***	−0.351	−2.169*	−3.421***	−1.835*	−3.401**	−0.756	−1.395**	−2.851***	−1.436**	−2.222***
	(0.229)	(0.661)	(3.664)	(1.189)	(0.812)	(0.937)	(1.591)	(0.625)	(0.565)	(0.686)	(0.649)	(0.775)
Ln_acres	1.298***	1.837***	−9.018**	1.898***	1.287***	0.933**	1.901***	0.787***	0.826***	1.415***	1.414***	1.237***
	(0.076)	(0.306)	(4.357)	(0.403)	(0.329)	(0.411)	(0.442)	(0.280)	(0.279)	(0.292)	(0.317)	(0.344)
Ln_acres^2	−0.483***	−0.727***	3.746**	−0.803***	−0.449***	−0.464**	−0.645***	−0.277***	−0.274**	−0.546***	−0.473***	−0.373***
	(0.025)	(0.099)	(1.825)	(0.143)	(0.127)	(0.181)	(0.127)	(0.105)	(0.108)	(0.117)	(0.125)	(0.143)
Ln_acres^3	0.030***	0.056***	−0.389**	0.066***	0.025*	0.034	0.043***	0.013	0.010	0.035***	0.025*	0.010
	(0.002)	(0.008)	(0.186)	(0.014)	(0.013)	(0.021)	(0.010)	(0.010)	(0.011)	(0.012)	(0.013)	(0.016)
Ln_density	−0.010	−0.385**	5.110	0.545***	−0.151	−0.095	0.183	−0.224**	−0.129	0.113	0.139	−0.057
	(0.031)	(0.151)	(4.026)	(0.166)	(0.125)	(0.101)	(0.123)	(0.106)	(0.100)	(0.105)	(0.100)	(0.090)
Ln_density^2	−0.060***	−0.084*	−1.511	−0.121*	−0.062*	0.024	−0.031	−0.045	−0.081**	−0.023	−0.094***	−0.084***
	(0.010)	(0.046)	(1.366)	(0.068)	(0.032)	(0.038)	(0.044)	(0.038)	(0.033)	(0.031)	(0.036)	(0.027)
Ln_density^3	0.007*	0.051**	0.118	−0.057**	0.037**	−0.008	−0.018	0.029**	0.009	−0.001	−0.030*	0.019*
	(0.004)	(0.021)	(0.145)	(0.025)	(0.015)	(0.012)	(0.015)	(0.014)	(0.014)	(0.013)	(0.017)	(0.010)
Single men	−0.462***	−0.277		−0.436	−0.761***	−0.450	−0.218	−0.748***	−0.455**	−0.384*	−0.038	−0.465*
	(0.078)	(0.195)		(0.374)	(0.271)	(0.348)	(0.406)	(0.251)	(0.197)	(0.219)	(0.202)	(0.263)
Single women	−0.528**			−0.691		−1.006		0.576	0.357	0.344	−1.518	
	(0.245)			(1.027)		(0.742)		(0.501)	(0.486)	(0.539)	(1.015)	
Married women	−0.315	−0.293	1.752***		−0.205			−0.602	0.059	−0.791	−0.039	0.116
	(0.297)	(0.829)	(0.644)		(1.046)			(1.057)	(0.624)	(1.064)	(0.751)	(0.822)
Widows	−0.864***	−1.195***		−1.930***	−1.485***	−0.930**	−0.797	−0.460	−0.726**	−1.142***	−0.222	−0.757**
	(0.114)	(0.388)		(0.728)	(0.462)	(0.366)	(0.577)	(0.309)	(0.286)	(0.395)	(0.274)	(0.332)
Widowers	−0.071	0.167	−0.202	0.038	−0.151	−0.607*	−0.276	−0.362	0.149	−0.523	0.091	0.190
	(0.083)	(0.227)	(1.051)	(0.382)	(0.258)	(0.353)	(0.455)	(0.251)	(0.193)	(0.327)	(0.245)	(0.243)
Household size	0.028***	0.044*	0.088	0.062	0.048**	−0.032	0.045	0.047***	0.036*	0.055**	0.060***	0.046*
	(0.006)	(0.023)	(0.096)	(0.039)	(0.022)	(0.031)	(0.045)	(0.016)	(0.020)	(0.022)	(0.023)	(0.024)
Entrepreneurship ratio	0.991	3.047	−20.862	2.742	1.716	−2.316	1.521	0.768	4.071**	0.393	1.336	1.862
	(0.797)	(2.499)	(13.034)	(3.627)	(2.310)	(3.174)	(3.969)	(3.513)	(1.967)	(2.581)	(2.526)	(2.595)
Eastern	0.212**											
	(0.099)											
London	−0.880***											
	(0.339)											
Wales	−0.340**											
	(0.133)											
North Midland	0.478***											
	(0.106)											
North Western	−0.364***											
	(0.117)											
Northern	0.205											
	(0.153)											
South Midland	0.417***											
	(0.096)											
South Western	−0.009											
	(0.097)											
West Midland	0.259***											
	(0.100)											
Yorkshire	0.539***											
	(0.105)											
Constant	−31.021***	−31.658***	−6.409	−33.294*	−54.589***	−30.637**	−55.745**	−15.288*	−22.182***	−42.399***	−23.060**	−34.448***
	(3.302)	(9.482)	(52.219)	(17.339)	(11.894)	(13.646)	(23.345)	(9.048)	(8.074)	(9.803)	(9.233)	(11.252)
Observations	88,511	9183	325	8627	8266	6513	3918	9021	9069	14,744	10,598	7862

Notes: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

pluriactivity was more likely in rural areas with a density of less than 1 person per acre than in the largest urban areas (highly statistically significant at the 1% level). When population density exceeded three people per acre its impact became negative and highly statistically significant (at the 1% level). One person per acre is usually taken as a threshold for urban-type characteristics, so that portfolios appear to have increased as local opportunities became more urban in character. However, when the population density increased further, portfolios tended to decrease, and at approximately 55 or more people per acre (highly urbanised areas), its impact was negative but statistically insignificant at any conventional level.

These findings suggest, first, that a major influence on portfolio development was the absence of alternative demand and opportunities in low population density rural areas where any portfolios were mainly part of pluriactivity for survival. Second, in line with previous case studies, urban market opportunities encouraged increased portfolio development as density increased to densities up to about 3 people per acres; however, for high densities portfolio development declined. These results indicate that the main

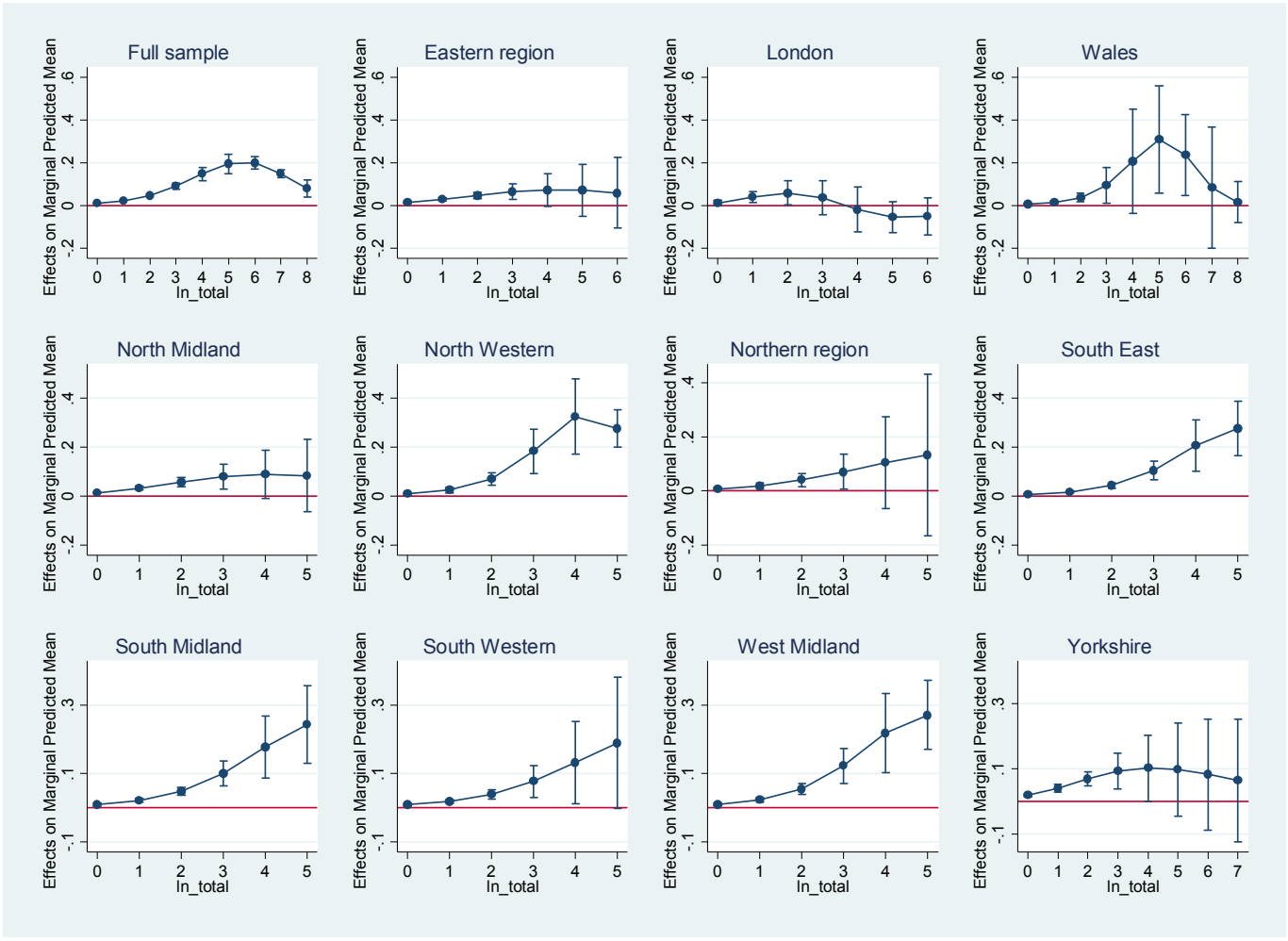

Fig. 1. Average Marginal Effects (AMEs) for firm size (variable *ln_total*).

locational influences on portfolio farming as entrepreneurs were in fringe urban areas. This in turn reflects an opportunity-based explanation of entrepreneurship, as indicated by Ilbery (1991) and McInerney and Turner (1991), and also found in historical studies by Winstanley (1996) and for mining areas by Hallas (1999).

Concerning variable *ln_age* (Fig. 4, "Full sample"), for farmers younger than about 33 years, the impact of age on the likelihood of pluriactivity was negative but not statistically significant at any conventional level. Only for farmers from ages from about 33 did the impact of age became positive and highly statistically significant. In contrast, farmers older than about 54 years were less likely to engage in portfolio entrepreneurship than younger counterparts. This indicates that portfolios were frequently part of a diversification strategy in middle years. This in turn suggests the effects of additional family farm labour, increased household income needs until dependent children could share decision-making as partners, or left home to develop on their own (Anderson, 1971; Davidoff, 2012). The decrease at older ages suggests some effect of succession effects as older heads withdraw. This would be more likely in the Victorian period, bearing in mind less effective medical interventions and shorter average adult life expectancy compared with today. The effect of age is in line with modern studies that suggest entrepreneurship is most strongly developed in middle years (33–54), but the interaction with family needs indicates both resource and sociological interpretations (in-house family available) as well as an income pressure to improve survival and household income. This indicates an important mix of drivers between necessity 'push' and entrepreneurship discovery and opportunism.

4.1. Regional analysis

To explore the determinants of pluriactivity further, we estimated the models for each region separately. This is shown in the right hand columns of Table 1 for each region and in the main part of Figs. 1–4. It is accepted that at region level only very summary spatial differences will be evident. A better spatial analysis has already been given using the density variable. However, regional differences allow a broader assessment of large scale differentiation such as regional sector specialisation.

The most important conclusion from the regional analysis is that we find only small differences from the pattern for the whole population, confirming that the main factors explaining portfolio development were at individual and family level as well as farm size, firm size, and local population density. The few most marked contrasts were for the most urban locations: London, the North West, and the Northern region. In the last two harsher farming conditions restricted farm outputs and mining offered some alternatives, and in all three regions urban centres provided greater opportunities to combine farming with wage employment. In the

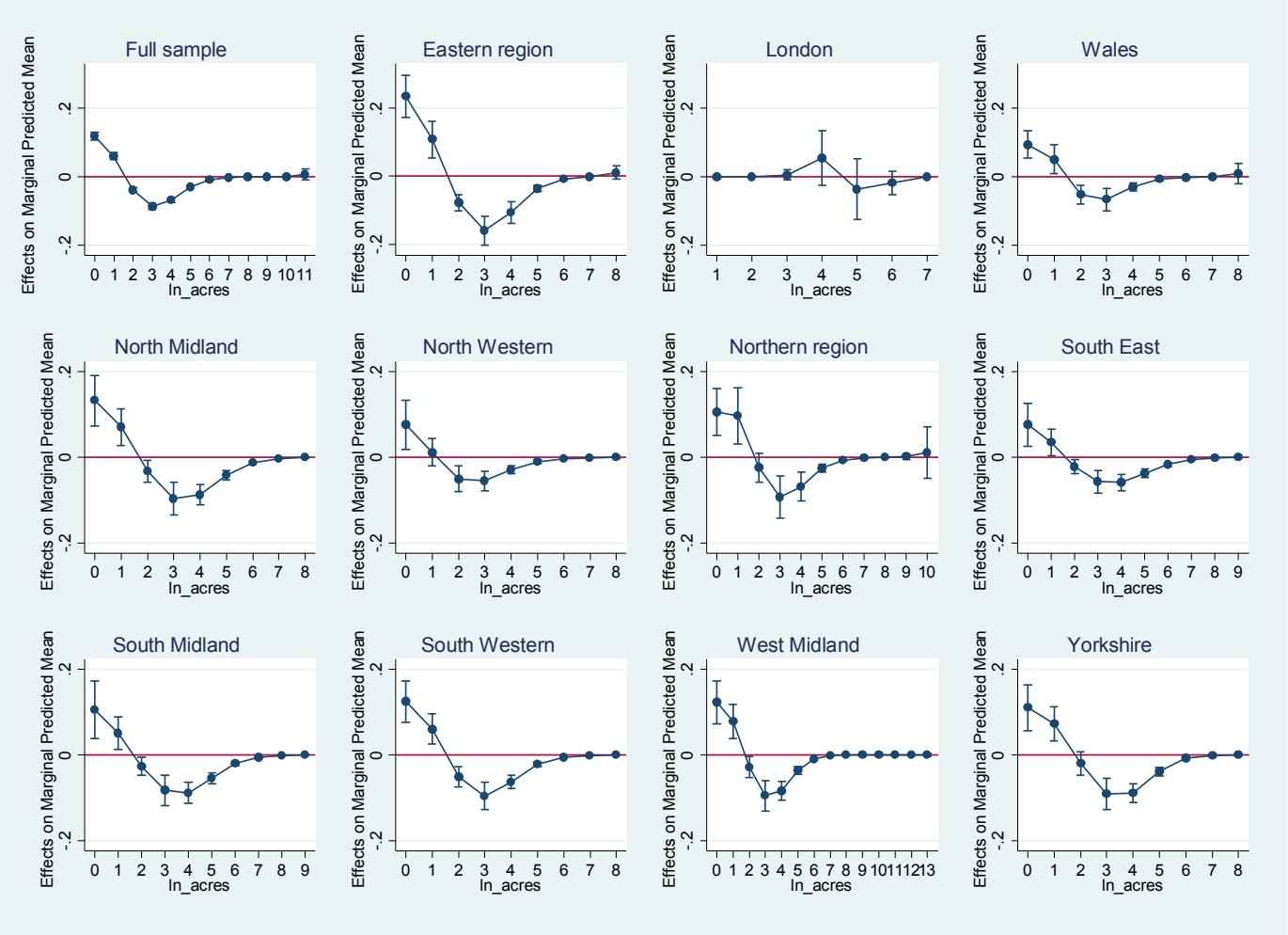

Fig. 2. Average Marginal Effects (AMEs) for variable *ln_acres.*

most highly urbanised regions, where farms were closely co-located with urban (and/or mining) activities, portfolios appear to have been a response to opportunities on a scale not seen elsewhere. These regions also generally had the least significance for gender, marital status, the size of household and the entrepreneurship ratio. However, in London there is the exceptional result that married female farmers (although small in number) appear to be more likely to have had multiple occupations than married men. This probably results from the wider range of opportunities available in the metropolis for women, and the concentration of much male employment in waged occupations.

There is also the surprising result that, whilst the whole population shows no influence of the entrepreneurship ratio on the probability of portfolios, in one region it was positive and significant: the South Midlands (Buckinghamshire-Oxfordshire). This may be indicative of the wider scale of development of contract outworking in this region (for hats and garments), where portfolios may have reflected the general local conditions of strong development of industrial sub-contracting. This is confirmed by the positive coefficients (though not significant) in other regions with known high levels of outworking (notably Eastern, Wales and Midland regions), and the high negative coefficient in London where outworking was lower as a result of other employment opportunities. This possible impact of outworking is a specialist field and is the subject of further research.

With respect to the Average Marginal Effects (AMEs), firm size positively affects the probability of pluriactivity in all regions except London up to about 40 workers. After this, firm size had no significant effect on the choice between a single occupation and multiple occupations. In London, where the level of urbanisation was such that few farmers operated, firm size was positively related to the likelihood of pluriactivity for farmers with fewer than 20 employees, above which the impact was negative but statistically insignificant at any conventional level. Similarly, farm size was positively related to portfolio probability for AMEs for smaller farms (up to about 2.7 acres) in all regions except London, after which it became negative. In London, with few farmers and less land availability, there was no significant link between farm acreages and portfolios. The impact of population density on the AME of pluriactivity was heterogeneous between regions, with less urban regions generally having a stronger relation between density and portfolio development. The AMEs for age were similar across regions, with generally high significance levels (positive effects of age; negative effects of the square term of age), except again for London, where age had no significant influence on portfolios and was generally negative.

5. Conclusion

This study explores the determinants of the decision to engage

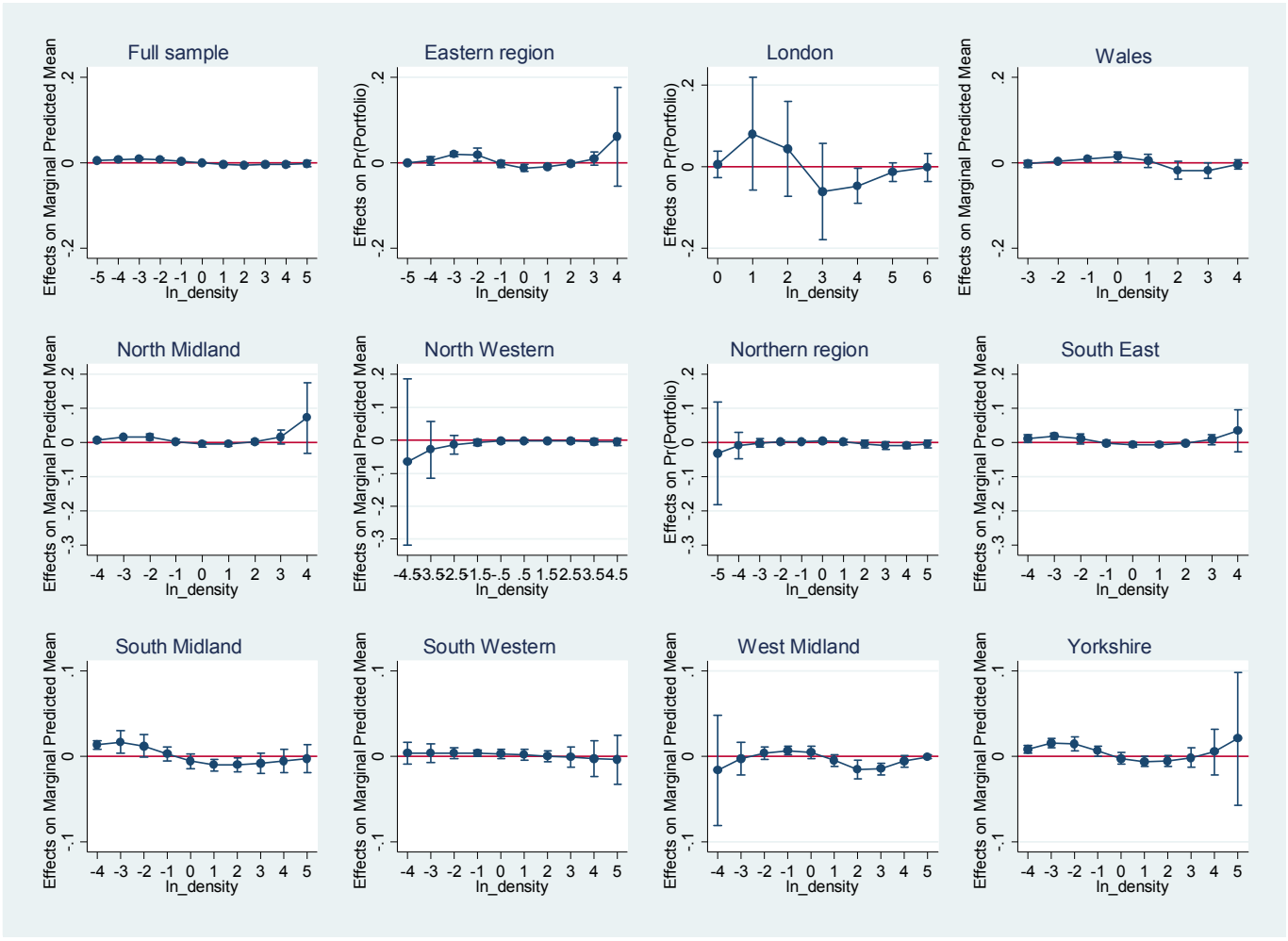

Fig. 3. Average Marginal Effects (AMEs) for variable *ln_density*.

in single or portfolio business activities in farming, using new data for England and Wales in 1881. Its purpose is to demonstrate that there are long-term historical continuities of portfolio development in farming, which have been suggested previously but never before confirmed at the scale of the whole population with the range of explanatory factors assessed here. Moreover, we have been able to prove for the whole population of farmers that there were important demographic factors influencing choice to develop portfolios (notably age, gender and marital status), confirming smaller-scale modern case studies (Carter, 2001; Carter et al., 2004; Wiklund and Shepherd, 2008; Alsos et al., 2011, 2014a, b), and historical cases examined by Anderson (1971) and Davidoff (2012). Portfolios are confirmed as frequently part of a diversification strategy in middle years and strongly related to gender and marital status. Also significant were human capital and wealth effects (household size) reflecting family resources and interconnections, and important distinctions between farmers as entrepreneurs (firm size effects) and pluriactivity as a survival strategy (farm size effects). Population density and regional levels of urbanisation were significant influences on opportunity and its take-up in farm portfolios. Our study is significant in showing how a national whole population analysis can be used for historical analysis, whereas most previous literature has been based on smaller case studies.

The findings from the multi-level logit model for the whole farm population suggest that firm size measured by the number of employees acted as a driver of farmers as entrepreneurs in Victorian times increasing the non-linear probability of portfolios; i.e. pluriactivity related to the resources available from additional personnel, usually family members. This is further confirmed by the significant relation between household size and increased levels of pluriactivity. In contrast, farm size suggests that the likelihood of portfolio businesses was mainly restricted to survival strategies in the smallest farms. These findings provide a large-scale endorsement of previous case studies and modern surveys that the influence of farm size on portfolio activity is non-linear and mainly explained as survival strategies (Carter, 2001; Evans and Ilbery, 1993; Fuller, 1990; Rønning and Kovereid, 2006). It also offers larger scale evidence to support the arguments of Kennedy and Delargy (2000) that middling to large scale farms may have been complacent and had little interest in seeking out entrepreneurial opportunities.

However, there was an important aspect of truer entrepreneurship in urban fringes. Portfolios were more probable at low population densities (survival needs) but increased from low to medium densities in urban fringes up to about 3 people per acre (where greater market access supported opportunity strategies). This confirms at national scale the main aspects of most previous research based on case studies (e.g. Bellerby, 1956; Davies, 1909; Hallas, 1990, 1999; Reed, 1986; Winstanley, 1996). It also indicates that at the national scale entrepreneurship in farming that went

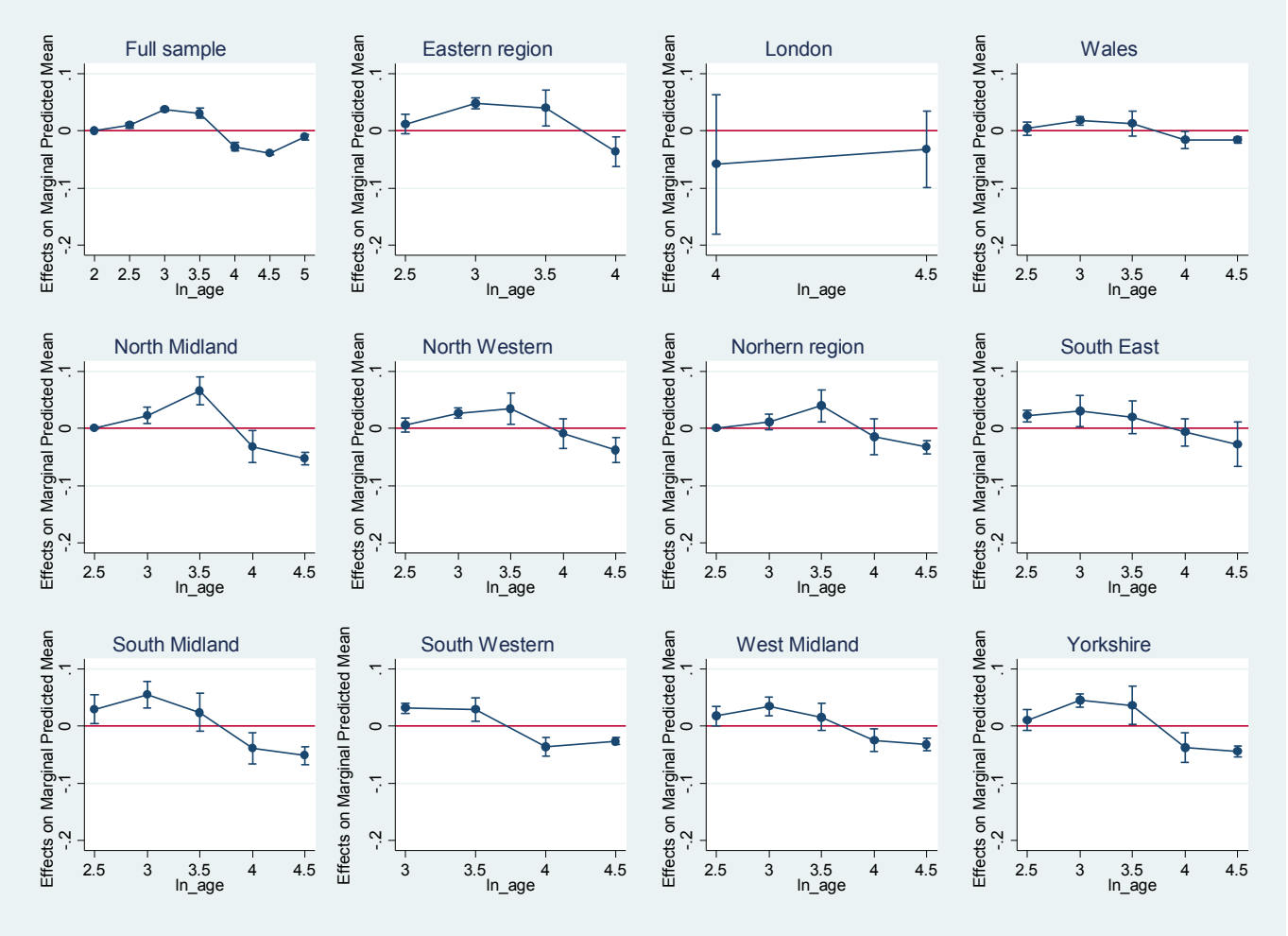

Fig. 4. Average Marginal Effects (AMEs) for variable *ln_age*.

beyond 'farmers as farmers' was mainly focused in urban fringes rather than being more widespread across the country.

Finally, we find the surprising result that there was no significant effect of local entrepreneurship rates that indicate any clustering or 'culture' effects on the probability of farm portfolios. It appears that differences in entrepreneurship for the farming community are already captured by inclusion of factors that measure differences in market opportunity (population density), scale of production (farm acreage), entrepreneurs' demographic characteristics such as gender and age, and three measures of resources availability (employee size, marital status, and household size). It may also be that farming was relatively self-contained from other entrepreneurship in the economy; again this may reflect a complacency in the middling and large farms to remain 'farmers as farmers'.

In addition, we find that regional heterogeneity had little influence on Victorian farm portfolio development; rather, most important was the locality, urban opportunity, individual or household characteristics (age, gender, marital status). The key finding from the regional analysis is the low level of variation between regions. There was also pervasive and strong significance across all regions of the key role of *firm size* on portfolios ('farmers and entrepreneurs'). The rank order of coefficients for *ln_total* also indicates that this was strongly related to level of regional urban development: London first, followed by Yorkshire, Eastern and Northern regions, and large highly significant the squared coefficients for *ln_total* in the North West and South Midland. In contrast, development of plurality for 'farmers as farmers' (indicated by *farm size*), although also very uniformly developed across all regions (except London), showed a duality of choices: between survival strategies on the smallest farms, and truer entrepreneurship on the medium-sized farms. Where there were regional differences these related chiefly to the exceptional urban market opportunities of London, some small differences of agricultural structure in the North West and Northern regions, and some indication of the effect of different by-employment opportunities in mining, or from outworking in the South Midlands which encourage further investigation.

Notwithstanding the contributions of the study, it suffers from limitations which can also serve as avenues for further research. First, given the nature of the data, we were unable to explore in full how human capital and risk attitudes of farmers affect their choice between single and multiple occupations (Parker, 2014; Wiklund and Shepherd, 2008). Second, our data is cross-sectional. With the availability of longitudinal, panel data, we could investigate growth dynamics over time with respect to continuity and succession of portfolio farm businesses (Kinsella et al., 2000).

Appendix A

Table A1
Variable description and summary statistics.

Variables	Variable description	Mean (standard deviation)							
		Full sample	Eastern region	London	Wales	North Midland	North Western	Northern region	South East
Portfolio	DV = 1 if a farmer has multiple occupations; zero otherwise	0.032 (0.176)	0.041 (0.198)	0.052 (0.223)	0.013 (0.115)	0.035 (0.184)	0.029 (0.167)	0.021 (0.142)	0.039 (0.193)
Size	Number of employees (in natural logarithm)	1.266 (0.939)	1.704 (1.011)	1.403 (1.088)	0.778 (0.677)	1.237 (0.928)	0.845 (0.729)	1.051 (0.843)	1.729 (0.980)
Age	Age of a farmer (in natural logarithm)	3.861 (0.306)	3.871 (0.314)	3.754 (0.289)	3.904 (0.304)	3.852 (0.311)	3.857 (0.296)	3.876 (0.302)	3.870 (0.305)
Acres	Farm size in acres (in natural logarithm)	4.602 (1.399)	4.667 (1.443)	0.745 (1.732)	4.513 (1.158)	4.778 (1.318)	3.945 (1.220)	5.010 (1.328)	4.571 (1.664)
Density	Population density per acre at parish level (in natural logarithm)	−1.287 (1.126)	−1.317 (0.756)	3.862 (1.103)	−1.805 (0.890)	−1.457 (0.965)	−0.578 (1.357)	−1.578 (1.409)	−1.057 (1.044)
Single men	DV = 1 if a farmer is a single man; zero otherwise	0.125 (0.330)	0.114 (0.318)	–	0.126 (0.332)	0.140 (0.347)	0.085 (0.279)	0.166 (0.372)	0.115 (0.318)
Single women	DV = 1 if a farmer is a single woman; zero otherwise	0.009 (0.097)	–	–	0.015 (0.121)	–	0.016 (0.125)	–	0.008 (0.090)
Married men (base category)	DV = 1 if a farmer is a married man; zero otherwise	0.719 (0.450)	0.747 (0.435)	0.914 (0.281)	0.663 (0.473)	0.725 (0.447)	0.737 (0.400)	0.680 (0.467)	0.746 (0.435)
Married women	DV = 1 if a farmer is a married woman; zero otherwise	0.005 (0.068)	0.004 (0.061)	0.012 (0.110)	–	0.004 (0.063)	–	–	0.005 (0.067)
Widows	DV = 1 if a farmer is a widow; zero otherwise	0.068 (0.251)	0.061 (0.240)	–	0.107 (0.310)	0.062 (0.238)	0.086 (0.280)	0.066 (0.249)	0.050 (0.219)
Widowers	DV = 1 if a farmer is a widower; zero otherwise	0.074 (0.261)	0.073 (0.261)	0.074 (0.262)	0.088 (0.283)	0.069 (0.254)	0.075 (0.263)	0.088 (0.283)	0.076 (0.264)
Household size	The size of a household	6.306 (3.050)	5.381 (2.768)	6.049 (2.793)	6.837 (2.839)	6.463 (2.864)	7.112 (3.606)	6.887 (2.812)	5.993 (3.099)
Entrepreneurial ratio	The ratio of the number of employers divided by the population in a parish	0.094 (0.031)	0.082 (0.023)	0.107 (0.019)	0.118 (0.032)	0.089 (0.030)	0.097 (0.033)	0.094 (0.040)	0.080 (0.021)
Eastern	DV = 1 if a farmer is located in Eastern England; zero otherwise	0.105 (0.306)							
London	DV = 1 if a farmer is located in London; zero otherwise	0.004 (0.065)							
Wales	DV = 1 if a farmer is located in Wales; zero otherwise	0.098 (0.298)							
North Midland	DV = 1 if a farmer is located in North Midlands; zero otherwise	0.094 (0.292)							
North Western	DV = 1 if a farmer is located in North Western; zero otherwise	0.074 (0.262)							
Northern	DV = 1 if a farmer is located in Northern England; zero otherwise	0.045 (0.207)							
South East (base category)	DV = 1 if a farmer is located in South East; zero otherwise	0.102 (0.303)							
South Midland	DV = 1 if a farmer is located in South Midland; zero otherwise	0.102 (0.303)							
South Western	DV = 1 if a farmer is located in South Western; zero otherwise	0.167 (0.373)							
West Midland	DV = 1 if a farmer is located in West Midland; zero otherwise	0.120 (0.325)							
Yorkshire	DV = 1 if a farmer is located in Yorkshire; zero otherwise	0.089 (0.285)							

Variables	Variable description	Mean (standard deviation)			
		South Midland	South Western	West Midland	Yorkshire
Portfolio	DV = 1 if a farmer has multiple occupations; zero otherwise	0.050 (0.217)	0.024 (0.152)	0.030 (0.171)	0.038 (0.190)
Size	Number of employees (in natural logarithm)	1.759 (0.935)	1.135 (0.858)	1.243 (0.863)	0.956 (0.802)
Age	Age of a farmer (in natural logarithm)	3.850 (0.309)	3.847 (0.301)	3.840 (0.309)	3.866 (0.301)
Acres	Farm size in acres (in natural logarithm)	4.736 (1.499)	4.651 (1.282)	4.713 (1.297)	4.599 (1.292)
Density	Population density per acre at parish level (in natural logarithm)	−1.164 (0.900)	−1.406 (0.873)	−1.294 (1.034)	−1.363 (1.387)
Single men	DV = 1 if a farmer is a single man; zero otherwise	0.132 (0.338)	0.119 (0.323)	0.141 (0.348)	0.131 (0.338)
Single women	DV = 1 if a farmer is a single woman; zero otherwise	0.008 (0.086)	0.006 (0.077)	0.013 (0.112)	–

Table A1 (*continued*)

Variables	Variable description	Mean (standard deviation)			
		South Midland	South Western	West Midland	Yorkshire
Married men (base category)	DV = 1 if a farmer is a married man; zero otherwise	0.715	0.750	0.698	0.717
		(0.452)	(0.433)	(0.459)	(0.450)
Married women	DV = 1 if a farmer is a married woman; zero otherwise	0.005	0.004	0.005	0.003
		(0.072)	(0.064)	(0.074)	(0.057)
Widows	DV = 1 if a farmer is a widow; zero otherwise	0.063	0.057	0.074	0.068
		(0.243)	(0.232)	(0.261)	(0.251)
Widowers	DV = 1 if a farmer is a widower; zero otherwise	0.077	0.063	0.069	0.081
		(0.267)	(0.243)	(0.253)	(0.272)
Household size	The size of a household	5.515	6.219	6.388	7.043
		(2.682)	(2.733)	(2.875)	(3.197)
Entrepreneurial ratio	The ratio of the number of employers divided by the population in a parish	0.086	0.100	0.093	0.098
		(0.030)	(0.025)	(0.027)	(0.033)

Table A2
Correlation matrix.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Size	1.000								
2. Age	−0.046***	1.000							
3. Acres	0.461***	−0.029***	1.000						
4. Density	−0.013***	−0.007*	−0.342***	1.000					
5. Single men	0.057***	−0.261***	0.050***	−0.038***	1.000				
6. Single women	−0.019***	0.007**	−0.025***	0.010***	−0.037***	1.000			
7. Married men	−0.008**	−0.038***	−0.006	0.034***	−0.603***	−0.156***	1.000		
8. Married women	−0.005	0.001	−0.015***	0.009**	−0.026***	−0.007**	−0.109***	1.000	
9.Widows	−0.049***	0.176***	−0.035***	−0.012***	−0.102***	−0.026***	−0.431***	−0.018***	1.000
10. Widowers	−0.002	0.223***	−0.006*	−0.004	−0.106***	−0.028***	−0.451***	−0.019***	−0.076***
11. Household size	0.178***	−0.071***	0.207***	−0.069***	−0.189***	−0.060***	0.227***	−0.001	−0.058***
12. Entrepreneurial ratio	−0.277***	0.017***	−0.108***	−0.111***	−0.002	0.008**	−0.019***	0.006*	0.021***

	10.	11.	12.
10. Widowers	1.000		
11. Household size	−0.073***	1.000	
12. Entrepreneurial ratio	0.010***	0.009***	1.000

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