European Review of Agricultural Economics Vol **00 (00)** (2025) pp. 1–26
doi:https://doi.org/10.1093/erae/jbaf003

Transition dynamics of hybrid farmers: a survival analysis of exits and entries into full-time farming

Eleanor Johansson[†,‡,*], **Pia Nilsson**[†,‡] **and Helena Hansson**[‡]

[†]*Research Institute of Industrial Economics (IFN), Stockholm, Sweden;*
[‡]*Department of Economics, Swedish University of Agricultural Sciences, Uppsala, Sweden*

Accepted 24 January 2025

Abstract

Using Swedish-matched employer–employee data from 2001 to 2018 and parametric survival analysis, we examine how the share of off-farm wage income affects survival time in the state of hybrid farming. We find a non-linear relationship between the share of off-farm wage income and the risk of exit; at lower levels, the share of off-farm wage income increases the risk of exiting agriculture completely and exiting from hybrid farming into full-time farming, while at higher levels it decreases the risk of exiting the hybrid state. This indicates that at higher levels of off-farm income, hybrid farming can be a stable state.

Keywords: hybrid farmers, off-farm wage income, farm survival, individual heterogeneity, Sweden

JEL classification: Q12, J43, J62

1. Introduction

Developing the agricultural sector in Europe to ensure sufficient and stable food supply is a cornerstone of the Common Agricultural Policy (CAP) in the European Union (EU) (European Commission, 2023). Yet, over the last decades, European agriculture has witnessed structural change, leading to fewer but larger farms (Eurostat, 2022). This has spurred a discussion in EU Member States about what the future of agriculture will look like and who will be the farmers (Sutherland, 2023). In this paper, we contribute to this discussion by investigating the role of farmers' hybrid behaviours by focusing on

*Corresponding author: E-mail: Eleanor.johansson@slu.se

how they combine farming and off-farm wage work. It has long been debated whether off-farm wage work is a transitional state in or out of full-time farming or whether it can be a stable situation for farmers (Kimhi, 2000; Findeis, Hallberg and Lass, 1987). In particular, we test whether off-farm wage work functions as a substitute or a complement to the farming practice. Our premise is that understanding how farmers divide their time between agriculture and off-farm wage work as a means both to secure sufficient incomes and to be fully employed throughout the year is one of the keys to better understand the future development of the sector. In this paper, we focus on the transitional dynamics of farmers who are active in agriculture either as the sole operator at a farm, or principal or secondary operators at jointly operated farms. Our aim is to provide new insights about the hybrid behaviours of those who are active as part-time self-employed farmers, and how that affects their decisions to exit agriculture, enter into full-time farming or continue to combine activities.

It has become a common feature of agricultural labour markets in many countries to have a large proportion of farmers engaged in non-agricultural income-generating activities (Cavazzani and Fuller, 1982; Biørn and Bjørnsen, 2015; Mittenzwei and Mann, 2017; Nordin and Höjgård, 2019). In Sweden, from which we bring the empirical data for this study, 63 per cent of self-employed farmers had another occupation outside of farming in 2020 (The Swedish Board of Agriculture, 2022). This calls for further analysis of how structural differences in returns to labour in the farm sector vs. the non-farm sector contribute to a continued outflow of labour from agriculture, that is whether it puts the long-term survival of the sector at risk (Finger and El Benni, 2021). This trend might also exacerbate social inequalities by reducing the number of small farms (Mishra *et al*., 2002; Neuenfeldt *et al*., 2019).

The relationship between farm survival and the existence of off-farm income as a means of supporting farm incomes has been extensively studied in the agricultural economics literature (Gasson, 1986; Weiss, 1999; Breustedt and Glauben, 2007; Pfeiffer, López-Feldman and Taylor, 2009; Khanal and Mishra, 2014). The literature highlights that engaging in off-farm activities is important for farm survival and growth for several reasons. It can provide farmers with a more stable and reliable income stream compared to income solely derived from farming activities (Mishra and Goodwin, 1997; Vrolijk and Poppe, 2020). It can also supplement low agricultural incomes and provide farmers with additional financial resources, which can be invested in their farming operations (Evans and Ngau, 1991; El Benni and Schmid, 2022). This could be due to the inability of farm business to generate sufficient revenue or simply because some farming practices naturally occur part-year (e.g. a seasonal crop farm). However, off-farm wage work might also provide an incremental way out of farming, as indicated by Kimhi and Bollman (1999), for the case of Israeli family farms. Notwithstanding the contribution of previous research, there is still limited evidence on transitions from this type of farming to eventual exit or transition into full-time farming for the individual farmers. Investigating the mechanisms of these transitional behaviours is highly relevant to understanding the type of practices that farmers use and the type of employment policies that should be supported in the agricultural sector.

Therefore, in this paper, we take an individual-level approach and focus on the heterogeneity of farmers engaged in dual-income generating activities through 'hybrid entrepreneurship' or 'hybrid farming'. We build on the definition of hybrid entrepreneurship that was introduced by Folta, Delmar and Wennberg (2010) where hybrid entrepreneurs are defined as those individuals who engage in self-employment and at the same time have wage employment.[1] We modify this definition by focusing on those who are self-employed in agriculture while having either a main or a secondary job in non-agricultural wage work.[2] Our focus is motivated by the long-standing discussion whether hybrid farming is a way in or a way out of farming or whether it can be a stable situation for farmers (Kimhi, 2000; Findeis, Hallberg and Lass, 1987) and adds valuable knowledge to better understand how agriculture is likely to develop. Specifically, we use matched employer–employee data from Statistics Sweden (2001–2018) and parametric survival analysis to investigate how the share of off-farm wage income affects the probability that a farmer will stay in the state of hybrid farming or leave farming altogether. To understand how hybrid farmers transition in and out of farming, we separate the analysis into (i) farmers who exit farming completely after being hybrids and (ii) farmers who become full-time farmers after exiting as hybrids.[3]

Our data are detailed and allow us to observe individuals' occupational status and industrial belonging over time to separate out self-employed farmers and their main and secondary sources of income. We can also observe key characteristics of the individual farmers including education, labour market experiences, social status and family background. This allows us to account for intergenerational perspectives, such as the transfer of entrepreneurial and farm-specific human capital from parents to their children (Laband and Lentz, 1983; Dunn and Holtz-Eakin, 2000; Lazear, 2009). Our analysis takes into account factors that are specific to individuals and their farm operations, family background and external conditions, all of which affect heterogeneity in income opportunities due to, e.g., heterogeneous endowments with agricultural production factors, abilities and skills (Finger and El Benni, 2021).

Our results show a non-linear relationship between off-farm wage income and the risk of exit. For smaller shares of off-farm wage income, the risk of exiting increases for both those who exit hybrid farming to become full-time farmers and those who exit farming completely. At higher levels of off-farm wage income, the risk instead decreases for both those hybrid farmers who become full-time farmers and those who exit farming completely.

1 A phenomenon that has received increasing attention in the entrepreneurship literature (c.f. Luc *et al.*, 2018; Demir *et al.*, 2020; Gänser-Stickler, Schulz and Schwens, 2022).

2 This is common in Sweden and elsewhere (Nordin and Höjgård, 2019).

3 In this study, a farmer may be both the operator of the farm and a co-farmer. The distinguishing feature is that a farmer must be self-employed, and thus a spouse or children to the main farm operator can be part of the sample. We use the term farmer for all these individuals for the sake of brevity and completeness, as they are all self-employed farmers although not always the main operator at a specific farm.

This suggests that hybrid farming can act as a transitional state at low shares of off-farm wage income and be a stable situation for farmers with larger shares. Moreover, we find that higher individual income increases the risk of exiting the hybrid state and that family income (including the income of the spouse) increases the risk only for hybrids that exit farming completely. We perform several sensitivity analyses to confirm our results, including estimations that account for unobserved heterogeneity at the individual and family levels, which largely supports the main results. A direct implication of our findings is that encouraging hybrid farming can help farmers to remain in agriculture, thereby supporting the continuity and development of agricultural production and food supply.

2. Background and previous studies

Off-farm wage employment has been recognised as a global phenomenon for several decades, particularly in industrialised countries where structural changes in agriculture have led to a decline in full-time farming (Zimmermann and Heckelei, 2012). Since the 1950s, the total number of farmers has decreased globally, while the number of part-time farmers has increased significantly (Nordin and Höjgård, 2019; Giller *et al.*, 2021; Zorn and Zimmert, 2022). Simultaneously, there has been an intensification in the amount of time spent to earn off-farm income (Cavazzani and Fuller, 1982; Lien *et al.*, 2006), which has largely stabilised over the past decade (Shahzad and Fischer, 2022). These trends highlight the growing importance of recognising off-farm activities and understanding their role in farmers' income strategies. In this study, we focus on individual off-farm wage employment as they represent a particular way of diversifying individual income risk compared to on-farm diversification or running non-farm enterprises along the farm business. Using individual panel data, we contribute new empirical evidence to this growing area of research that is critical to understand how farmers adapt to changing economic conditions.

Farmers can diversify their income through both on-farm and off-farm activities, which provide multiple streams of income that can strengthen the economic viability and hedge individual and/or family income against economic fluctuations (Khanal and Mishra, 2014). Off-farm activities, also referred to as 'pluriactivity', involve the generation of income from non-farm economic activities. These can be further categorised into two main types: wage employment and self-employment, where individuals run enterprises in addition to farming (Eikeland and Lie, 1999). This separation is particularly relevant for understanding off-farm income diversification strategies because wage work and self-employment present fundamentally different economic behaviours, risks and time commitments. Wage employment offers a more predictable and stable source of income, often linked to external labour market conditions, which may be attractive for farmers seeking to smooth income in times of low agricultural profitability (Mishra and Sandretto, 2002). In contrast, self-employment in non-farm enterprises may involve greater entrepreneurial risk and time investments, making it a less predictable but potentially more lucrative form of income (Meert *et al*., 2005). Because of this, it is more likely that choosing waged off-farm work is related to the survival of the farm business compared with the choice of having self-employed off-farm income. This, combined with the fact that farmers with off-farm wage employment represent the vast majority of hybrid farmers in our sample, leads us to focus the analysis on farmers with paid-off-farm employment.[4]

The decision to enter off-farm wage employment and become a hybrid farmer is often motivated by economic and risk management considerations. Furthermore, increased agricultural productivity, coupled with the finite nature of land, makes it possible for farmers to maintain output while dedicating less time to farming, thus freeing up labour for off-farm wage work (Corsi and Salvioni, 2017). Engaging in off-farm wage work can therefore be seen as an efficient use of labour resources. For many farmers, this is not only a way to improve household income but also a strategy for farm survival and growth, allowing them to invest in new technologies, expand landholdings or adopt more efficient farming practices (Meert *et al*., 2005; Key, 2020). However, the decision to engage in off-farm wage work may not always be voluntary or driven purely by economic optimisation (Bessant, 2006). For some farmers, off-farm employment may be a necessity rather than a choice, driven by the need to secure more stable or higher income to manage farm risks, especially when farm income is highly volatile. This may reflect a response to external constraints, such as financial pressure or insufficient farm revenue, rather than a proactive strategy. The involvement of other household members, such as a spouse choosing to work off the farm, can also shape the extent to which hybrid farming strategies are pursued (Bharadwaj, Findeis and Chintawar, 2013). Thus, the hybrid state may represent both a deliberate opportunity to diversify income and a constraint imposed by external economic conditions.

While balancing time and labour between farming and off-farm work can generate income stability, it may limit the capacity to make timely farming decisions during labour-intensive periods, such as sowing or harvesting. Off-farm wage income also serves as a risk management tool, helping farmers to stabilise household income in the face of farm output variability (Mishra and Sandretto, 2002; Darnhofer, 2010). Studies such as those by Mishra and Goodwin (1997) and Kwon, Orazem and Otto (2006) have found that off-farm wage income tends to increase with higher farm income variability, reinforcing the role of the hybrid state in reducing risk. These factors make the hybrid status especially appealing to young or beginning farmers, who face higher barriers to entry and more income uncertainty than established farmers (Bubela, 2016).

Once a farmer has entered the hybrid state, the decision to remain in this state is often driven by the ongoing balance between the benefits of off-farm wage work and the demands of the farm. Off-farm wage employment may

4 In our sample, 8.9 per cent of hybrid farmers are also self-employed outside of farming, which is not part of the analysis.

become a persistent state for farmers who find that it provides stable supplemental income without significantly affecting farm output (Corsi and Salvioni, 2017). In this context, the hybrid state can become an integral part of the individual farmer's long-term income strategy, allowing the farmer to hedge against farm income variability and invest in improvements to the farm. The hybrid state may also enable farmers to gradually accumulate capital for larger investments, such as agricultural land or expensive machinery, which could further improve farm efficiency (Meert *et al*., 2005; Key, 2020). For some farmers, the stability and predictability of off-farm wage incomes become crucial components of household financial planning, reducing the need to rely solely on fluctuating agricultural returns (Finger and El Benni, 2021). However, remaining in the hybrid state is also contingent on external factors, such as the availability of local off-farm jobs and broader market conditions (Reidsma *et al*., 2010, 2018).

The decision to exit the hybrid state can go in two directions: either into full-time farming or an exit from farming altogether. For some farmers, the hybrid state is a temporary state, used as a transitional step out of agriculture. This follows the traditional view that farmers leave farming due to increasing opportunity costs and higher wages outside of agriculture (Weiss, 1999; Zimmermann, Heckelei and Domínguez, 2009). As Cavazzani and Fuller (1982) suggest, if local labour markets do not offer sufficient opportunities for off-farm wage work, the hybrid state becomes unsustainable, potentially pushing farmers out of the agricultural sector entirely. On the other hand, some farmers can use the hybrid state as a pathway into full-time farming. In such cases, off-farm income serves as a financial buffer, while farmers make the investments needed to establish a profitable farm. This strategy mirrors hybrid entrepreneurship, where individuals maintain their wage work while gradually transitioning into full-time self-employment (Folta, Delmar and Wennberg, 2010; Demir *et al*., 2020). For farmers, off-farm wage work can be the primary source of income until the farm becomes profitable enough to support the household on its own (Thorgren *et al*., 2016). The decision to exit the hybrid state, therefore, depends on both internal factors (such as farm profitability and individual preferences) and external conditions (such as market trends and local employment opportunities).

The empirical evidence on the role of off-farm wage employment in farm survival is mixed, motivating further analysis. Several studies indicate that off-farm wage employment reduces farm exit rates, as it stabilises household income and supports continued farming (Kimhi and Bollman, 1999; Glauben, Tietje and Weiss, 2006; Breustedt and Glauben, 2007; Ferjani, Zimmermann and Roesch, 2015). However, others find that off-farm wage employment can also increase the likelihood of farm exit, particularly in regions experiencing overall declines in the farming population (Weiss, 1999; Goetz and Debertin, 2001). These mixed findings suggest that the impact of hybrid status on farm survival is context-dependent and may vary based on regional and individual factors.

Agricultural income can be viewed from two perspectives: production-side income and household-level income. On the production side, income is generated by the use of agricultural production factors such as labour, land and capital, leading to value-added through farming activities (Hill and Hirsch, 2019). At the household level, income determines the consumption possibilities for the family, which includes both agricultural and non-agricultural income components. Differences in farm household income arise due to heterogeneous endowments, including production factors, abilities and skills, as well as differences in the economic and biophysical environment and regional policies (Finger and El Benni, 2021). Thus, these factors are important to control for in an analysis focusing on the role of income. Moreover, there is an important difference in using aggregated regional data which can obscure individual farm dynamics and individual-level data. The latter is essential for capturing the full range of income diversification strategies. For example, Goetz and Debertin (2001) found that off-farm wage employment can either stabilise farm income or accelerate farm exit depending on the regional context, further underscoring the importance of incorporating both micro-level and regional analyses in studies of hybrid status. By using individual-level data on farmers and their incomes, as opposed to regional averages, this paper aims to uncover the dynamics behind farmers' decisions to remain in the hybrid state, either into full-time farming or out of farming completely.

3. Data and summary statistics

We use population-based register data from Statistics Sweden to distinguish hybrid farmers between 2001 and 2018. The data are detailed and contain demographic and financial information on all legal residents in Sweden over the age of 16 years from 1990 onwards, collected from a number of sources including individual tax statements, birthplace registries, financial records and school records. We use data on occupational status and industrial belonging to separate out self-employed farmers and measure their characteristics in several key dimensions including age, education, experience, income, social status and type of income-generating occupations. We merge data from additional sources to control for characteristics of their farm operation and factors external to the farm. This includes data from the Land Parcel Identification System (LPIS) and the Property Price Register (Fastighetsprisregistret) to obtain information about farm size (in hectares), land ownership in terms of the value of both farm buildings and agricultural land (at the individual level), as well as agricultural land prices measured at the county level.[5] We also utilise the multigeneration registry to link individuals with their parents to create variables that account for parents' self-employment experience, further described in Section 3.2.[6]

5 This is the most disaggregated data on agricultural land prices in Sweden.

6 This register includes all individuals born from 1932 onwards who have been Swedish registered at any time since 1961.

3.1. Definition of hybrid farmers and off-farm income

Our definition of hybrid farmers is contingent on two classifications. Firstly, we use Swedish Standard Industrial (SNI) Classification codes to distinguish individuals who derive any labour and/or business income from agricultural activities, across sub-industry sectors. The data allow us to determine whether these activities are primary or secondary sources of income[7] for the individual, i.e. the largest and second-largest incomes, respectively. This means we can determine what part of an individual's income comes from farming and what comes from off-farm wage work, i.e. the size of the income is not important for the definition, but rather the possibility to separate the income sources. Secondly, information on individuals' self-employment status allows us to ascertain that the farming income comes from self-employment. As mentioned earlier, our definition of hybrids is based on Folta, Delmar and Wennberg (2010), i.e. we define hybrid farmers as those who engage in farming as self-employed while having a primary or secondary job in non-agricultural wage work. Our approach of using SNI Classification codes to distinguish the industry belonging to the occupations allows us to study farmers who work on their own farm, but also a co-farmer such as a spouse or child can be included in the sample as long as they are self-employed. The hybrid state can be volatile, and farmers can change their occupation over time, for instance by letting the farm rest for a year. This can cause problems with multiple entries and exits. We explain how this is handled in the model in Section 4.2.

Based on this definition of hybrid farmers, the central variable in the analysis measures wage income outside the farm. This is defined as the share of income earned from off-farm wage work relative to the total income, which can range between zero and one. We measure this using information on gross salary and/or business income from off-farm wage work and agriculture, which allows us to examine how the relative dependence on off-farm wage employment may be important for surviving in the hybrid state. Because income differs across professions for the same number of hours worked, it would be better to measure main and secondary occupations based on hours worked. However, these data are not available, and thus we use the taxable labour income as the basis for the definition, which is closely related to hours worked since it includes salary from employment and business, social insurance benefits and pension payments. Since engaging in off-farm wage work can be a transition in or out of farming or potentially a stable state, we considered both a linear and a non-linear effect and found the latter to provide a better fit. Thus, the model is estimated with the share of off-farm income as well as its squared covariate.

7 A secondary source of income can be up to 50 per cent of the total income, i.e. it is determined on income and not hours worked.

3.2. Control variables

Other important income variables are total declared income and family income.[8] Total declared income is included to control for the size of income and not only the relative importance of the two incomes. Several studies highlight the importance of the spouse in the off-farm labour decision (Benjamin and Kimhi, 2006). We therefore include family income to account for the income of other family members that can serve as a way to support farming practices. Family income is constructed based on family identities available in the data. Since the dataset tracks individuals over time, this variable evolves as individuals change their family belonging, such as when they move out of their parents' household or alter their social status through marriage or cohabitation. Incomes of the spouse are thereby included and alleviate concerns that our results may be biased with regard to the spouse (Blumberg and Pfann, 2016). Additionally, we also run the regressions with standard errors clustered at the family level to further account for within-family correlation.

It is well established that human capital is highly important for the individual's decision to become and remain self-employed (Dunn and Holtz-Eakin, 2000; Unger *et al*., 2011). Human capital can be acquired by individuals from on-the-job training and from formal education, but it can also be informally transferred in the family (Becker and Tomes, 1986; Laband and Lentz, 1983; Dunn and Holtz-Eakin, 2000). Intergenerational knowledge transfer is especially important to control for in the context of agriculture, which is largely an inherited occupation.[9] We consider several time-varying covariates to account for human capital, including individuals' labour market experience and formal education, such as employment experience within and outside the agricultural industry and years of schooling (Müller and Arum, 2004). We use an indicator variable measuring if the individual has any type of agriculture-specific education either at upper secondary school or at the university level. Previous literature has measured informal knowledge transfer from parents by indicators of parents' self-employment experience (c.f. Blumberg and Pfann, 2016; Lindquist, Sol and Van Praag, 2015; Markussen and Røed, 2017). We follow such approaches and include variables to measure both the fathers' and the mothers' self-employment experience and experience in agriculture to proxy the intergenerational transfer of entrepreneurial human capital and farm-specific human capital. Including both parents extends the literature as previous studies on agriculture have relied solely on information on fathers to proxy intergenerational knowledge transmission (c.f. Laband and Lentz, 1983; Lentz and Laband, 1990; Colombier and Masclet, 2008).

8 All income variables have been discounted by the consumer price index as reported for Sweden by Statistics Sweden.

9 Swedish agriculture is governed by family farms and the greater part of all individuals who are self-employed in agriculture have carried over the ownership of their family farm (Joosse and Grubbström, 2017).

We merge data from additional registers to control for characteristics of the farm operation in terms of farm size (in hectares) and the estimated market value of land and buildings in ownership of the individual.[10] Considering the dominance of family farms in Sweden and the fact that agricultural assets (such as land and farm holdings) tend to be passed over within the family (Joosse and Grubbström, 2017), these variables might also serve as proxies for inherited farm assets and capture the scope for transmission of farm-specific human capital. We include other common individual controls like gender, and marital status (married or cohabitated). Additionally, we include age and its squared covariate to control for non-linear effects and adjust for the length of expected remaining life, which is important for the farmer making costly changes with anticipation of future benefits (Goetz and Debertin, 2001). Many farmers continue their practice after the retirement age of 65 years. Thus, the main regression includes all farmers, but to account for exits that may be due to retirement we also run the regression on a subsample where all farmers who turn 65 years during the period are removed. The number of children under the age of 18 years in the household is included as an ordinal variable that varies over time and status as married and/or in cohabitation is included as a dichotomous variable (Blundell, Pistaferri and Saporta-Eksten, 2016). We also include an indicator for previous self-employment as such experience can increase the chance of engaging in self-employment in the future (Frederiksen, Wennberg and Balachandran, 2016).

Lastly, we follow Schaak *et al.* (2023) and include a set of factors external to the individual, including land prices at the county level and indicators for changes in the European CAP via dummy variables for the periods 2007–2013 and 2014–2018, where 2001–2006 is the reference period. Additionally, the model includes year controls for 2004, 2014 and 2018 when there were major droughts in Sweden and a control for population density at the municipality level to account for varying market-related conditions to operate a farm. Detailed variable definitions can be found in Supplementary Table S1.

3.3. Summary statistics

Table 1 displays summary statistics for the variables described earlier in terms of means for all observations over the period of investigation. Detailed summary statistics and a correlation matrix can be found in Supplementary Tables S2 and S3. In Table 1, column 1 shows the hybrid farmers who remain in the hybrid state after 2018, column 2 shows those who enter into full-time farming after exiting the hybrid state and column 3 shows the individuals who after exit leave farming completely. This distinction is used to examine transitional dynamics and address some of the discrepancies in the literature in this regard (Kimhi, 2000). The sample is based on the population of all hybrid farmers from 2001 to 2018. However, if there are missing values in key variables for some years, this will cause the individual to be removed from the sample.

10 The LPIS and the Swedish Property Tax registry (see Supplementary Table S1 for detailed variable definitions).

This leads to a sample that contains around 300 thousand observations representing 54,107 individual hybrid farmers. The average time in the hybrid state is 5.5 years, and of the hybrids that exit, almost 50 per cent of the individuals left farming completely during our period of investigation and about 40 per cent transitioned into full-time farming. The 10 per cent of hybrid farmers that remained in the hybrid state beyond 2018 represent about a third of all observations in the sample.

Summary statistics show that the share of the off-farm income is relatively high for all groups in the sample and the highest for those hybrid farmers who later exit farming altogether. These individuals also have the highest declared income. The farmers who remain in the hybrid state have higher family income, indicating that hybrid farming is not only an individual decision but also depends on the family. The hybrids who remain also have a higher value of their agricultural fixed assets in terms of land and agricultural buildings. The value of land and buildings is the lowest for those hybrids who exit farming completely, perhaps indicating that they sell off their land before eventually exiting completely. Alternatively, this could represent farmers who did not acquire enough agricultural assets through, e.g., inheritance and thus decided not to continue. The proportion of women is relatively low in all groups, the highest among those who leave agriculture entirely (35 per cent) and the lowest among those who enter full-time agriculture (17 per cent).[11]

Hybrid farmers who exit farming completely less often have agricultural-specific education, at the upper secondary school or university level. They also have less agriculture-specific work experience. The agricultural-specific experience is the highest among the farmers who remain in the hybrid state and slightly lower among those who exit into full-time farming. This could indicate that some farmers become hybrids to gain experience and then enter into full-time farming. As expected, we also see that the farmers who remain in the hybrid state have a higher prevalence of parents (both mother and father) with experience as self-employed and with agricultural experience. The hybrid farmers who exit farming completely more often have self-employed farming as their secondary income source, i.e. the income is less than 50 per cent of the total income. This could be an indication that there is a 'shadow of death' effect for their farms with a decline in farm performance because of, e.g., reduced investments and market pressures before an eventual exit from the market (Griliches and Regev, 1995). For these farmers, this process could involve gradually decreasing their time dedicated to their farm, which in turn leads to a decline in their farm income. This share is smaller for hybrid farmers who exit into full-time farming and the smallest for farmers who remain hybrids.

Looking at the types of farming in the sample, we see that mixed farming is the most common followed by crop farming for all groups. Cattle or

11 We also performed the analysis with the sample split between males and females, which rendered similar results. However, analysing through the lens of gendered differences in agriculture is beyond the scope of the present analysis.

Table 1. Summary statistics and mean values over the period of investigation

	(1) Hybrids who remain in the hybrid state	(2) Hybrids who exit into full-time farming	(3) Hybrids who exit farming completely
Share off-farm income	0.52	0.49*	0.77*
Declared income (100s SEK)	1,167.9	938.1*	1,666.9*
Family income (100s SEK)	3,801.1	3,289.9*	3,565.8*
Female (=1)	0.25	0.17*	0.35*
Age	50.6	52.5*	51.1*
Years of education	12.0	11.7*	12.1*
Agricultural education (0/1)	0.36	0.39*	0.17*
Work experience (years)	21.7	18.2*	18.5*
Agricultural work experience (years)	12.7	11.3*	6.65*
Married or cohabited (0/1)	0.64	0.65	0.64
Number of children	0.36	0.13*	0.14*
Family member engaged in farming (0/1)	0.61	0.61*	0.45*
Self-employment prior to becoming hybrid (0/1)	0.75	0.79*	0.56*
Self-employed mother (0/1)	0.16	0.093*	0.098*
Self-employed father (0/1)	0.23	0.14*	0.14*
Agricultural experience mother (0/1)	0.089	0.053*	0.037*
Agricultural experience father (0/1)	0.15	0.091*	0.064*
Value of land and buildings (100s SEK)	4479.6	3373.4*	2179.0*
Farm size (Ha)	77.5	84.5*	43.4*
Land price (1,000s SEK/Ha)	479.3	353.2*	359.0*
Population density municipality	93.8	79.6*	115.1*
Self-employed farming as secondary income (0/1)	0.24	0.34*	0.36*
Self-employed farming as primary income (0/1)	0.31	0.38*	0.094*
Crop farming (0/1)	0.19	0.23*	0.20*
Livestock farming (0/1)	0.15	0.15*	0.12*
Poultry farming (0/1)	0.01	0.01*	0.006*
Dairy farming (0/1)	0.16	0.13*	0.13*
Mixed farming (0/1)	0.49	0.48*	0.54*
Observations	94 049	82 507	122 959

*t-test for difference in means compared to column 1 at 1 per cent significance.

dairy farming follows, and lastly, only a few engage in poultry farming. Different types of farming could be important in the decision to engage in off-farm work.[12] Certain farming activities, particularly those that are less labour-intensive or have shorter growing seasons, may naturally lend themselves to part-time work. For instance, crop farming often follows seasonal patterns where peak labour demands are concentrated in specific periods, allowing farmers to pursue off-farm employment during slower periods. In contrast, livestock farming, especially dairy, requires year-round attention, which may limit opportunities for consistent off-farm employment. This suggests that for some farmers, hybrid farming is not merely a transitional state but a long-term strategy. Farmers who operate in less time-intensive types of farming may be better positioned to sustain hybrid employment in the long run without experiencing a decline in either their farm or off-farm income. It is interesting that such a large share engages in mixed farming as this is another type of diversification strategy and may indicate that certain farmers have a strong preference for diversification of any type.

4. Empirical model

We use a parametric survival model to estimate how different risk factors influence the survival time, or duration, in the state of being a hybrid farmer. Parametric survival analysis is an alternative to the traditional semi-parametric Cox model and can directly estimate the baseline hazard function without restrictive assumptions and thereby obtain more efficient estimates (Crowther and Lambert, 2014). We estimate a Weibull parametric survival model characterised by the following hazard function $h_i(t)$[13]:

$$h_i(t) = exp(x_{it}\beta)\rho t^{\rho-1} \tag{1}$$

where $h_i(t)$ denotes the hazard function at time t for individual i with covariate vector x_{it} and coefficient vector β, and the shape parameter ρ, estimated from the data, provides the slope of the function to represent the hazard's trend over time. Specifically, if $\rho > 1$, the risk of exit increases over time, if $\rho < 1$, it decreases and if $\rho = 1$, the risk of exit is constant, and the Weibull model reduces to an exponential model $h_i(t) = \lambda$. The hazard function can be interpreted as the instantaneous rate of failure given survival up until time t such that $h_i(t) = \frac{f(t)}{S(t)}$, where $S(t)$ denotes the survival function. This follows common survival analysis notation $S(t) = P(T > t) = 1 - F(t)$, where T denotes random time-to-failure with cumulative distribution function $F(t) = P(T \leq t)$. Moreover, $f(t)$ denotes the probability density function of the time-to-failure and T denotes a random variable representing the likelihood of failure occurring at time t. We also note that $f(t)$ is the derivative of the cumulative

12 We run the regressions for each type of farming. The results are found in Supplementary Table S7 in the appendix.

13 This is suitable with data that exhibit monotone hazard rates that increase or decrease with time, which is the case for our data (Figure 1) (Crowther and Lambert, 2014).

distribution function $F(t)$, which can also be expressed as $f(t) = -\frac{d}{dt}S(t)$ (Kleinbaum and Klein, 1996).

Following the model in Equation (1), our estimated model is specified as follows:

$$h_i(t) = exp\left(\beta_0 + \beta_1 OFFINC_{it} + \beta_2 OFFINC_{it}{}^2 + \beta_3 IND_{it} + \beta_4 FAM_{it} + \beta_5 FARM_{it} + \beta_6 REGION_{it}\right)\rho t^{\rho-1} \quad (2)$$

where β_1 and β_2 denote the estimated coefficients for the variables of interest. Specifically, *OFFINC* measures the share of off-farm income relative to the total income for individual i at time t, ranging between zero and one, and $OFFINC^2$ denotes its squared covariate. Moreover, β_0 denotes the intercept term and $\beta_3 - \beta_6$ denote vectors of regression coefficients for the individual-, family-, farm- and regional-specific controls included in the model (defined and summarised earlier). The baseline hazard specified parametrically is provided by $exp(\beta_0)\rho t^{\rho-1}$. In estimating Equation (2), we obtain information on how the survival time in the state of hybrid farming is influenced by the covariates or the 'risk factors'.

4.1. Unobserved heterogeneity at the individual and family levels

Although the model in Equation (2) is specified to account for a range of individual characteristics and family background factors, there is a possibility that unobserved factors are left unaccounted. This might, for example, include a risk component and innate managerial skills such as 'entrepreneurial ability' or unobserved factors at the level of the family (Lucas, 1978; Lazear, 2004). Our approach to account for within-group variation is to conduct sensitivity analyses and estimate a survival model incorporating shared frailty (Gutierrez, 2002).[14] A frailty model accounts for the presence of a latent multiplicative effect on the hazard, represented by α, which is assumed to have mean one and variance θ. In the shared frailty model, this unobserved frailty is shared among groups of individuals. In our analysis, individuals are grouped based on their family belonging. We would preferably use the childhood family, but this limits the sample size and is instead incorporated into the baseline regression as a robustness test. By grouping on family belonging, the model accounts for heterogeneity that arises due to genetic or environmental factors that affect an individual's entrepreneurial or agricultural ability.

Individuals with $\alpha > 1$ have a higher frailty and thus an increased probability of exiting compared with those of average frailty, while those with $\alpha < 1$ have a decreased probability of exiting compared with the population average (Kleinbaum and Klein, 1996). The model used in the sensitivity analyses is identical to Equation (2) with the difference that it includes a frailty term α_j for each family j. We note that in the regression output, alpha refers to the estimated variance of the frailty term across families, not the family-specific

14 See Gutierrez (2002) for a detailed representation of the survival time frailty model.

parameter α_j. The estimated model is specified as follows:

$$h_{ij}(t) = \alpha_j exp(\beta_0 + \beta_1 OFFINC_{it} + \beta_2 OFFINC_{it}{}^2 + \beta_3 IND_{it} + \beta_4 FAM_{ijt} + \beta_5 FARM_{it} + \beta_6 REGION_{it}) \rho t^{\rho-1} \quad (3)$$

where $h_{ij}(t)$ denotes the hazard at time t for individual i belonging to family j and where the remaining variables are defined in accordance with Equation (2).

4.2. Survival time

The survival is measured in years from the first time we code an individual as a hybrid farmer to the last year we observe them as any type of hybrid in the data. We use this more general hybrid definition to determine the exit because many farmers have their farms resting while they for instance acquire an education. This would mean that they appear to exist in the data when in fact they are not. By allowing for this wider definition after entry, we avoid getting false exits and multiple exits per individual. Regarding entries, we have delayed entries in the data since not all farmers became hybrid farmers in 2001, and the data are left-censored since some hybrids could have been in this state before 2001. The data are also right-censored since not all individuals have exited as hybrids in 2018. Both left- and right-censoring can affect the likelihood estimates and bias the results (Klein and Moeschberger, 2006). To account for both these types of censoring, we have made the appropriate adjustment in the regression analysis.

The Kaplan–Meier survival estimate is depicted in Figure 1 and illustrates the probability of survival as a function of time. It is split between the hybrid farmers who exit into full-time farming and those who exit farming completely. This graphical representation shows the time-to-event distribution, allowing us to observe the proportion of individuals surviving at different time intervals, while also managing censored observations to provide a comprehensive view of survival trends across the studied period. The probability of surviving as a hybrid past a certain number of years is indicated to decrease for both groups, but initially faster for the hybrid farmers than those that exit farming completely.

5. Results and discussion

The regression results are displayed in Table 2. Columns 1 and 2 show the results of estimating Equation (2) for the whole sample split on the hybrids who exit into full-time farming and those who exit farming completely. Columns 3 and 4 are the same categories for the shared frailty model equation (3) accounting for within-family heterogeneity. Including frailty in the survival model allows us to account for unobserved heterogeneity across farmers, which could influence their likelihood of engaging in off-farm work. The estimated alpha parameters, which capture the variance of the frailty term, suggest that there is notable heterogeneity among farmers in terms of their likelihood to engage

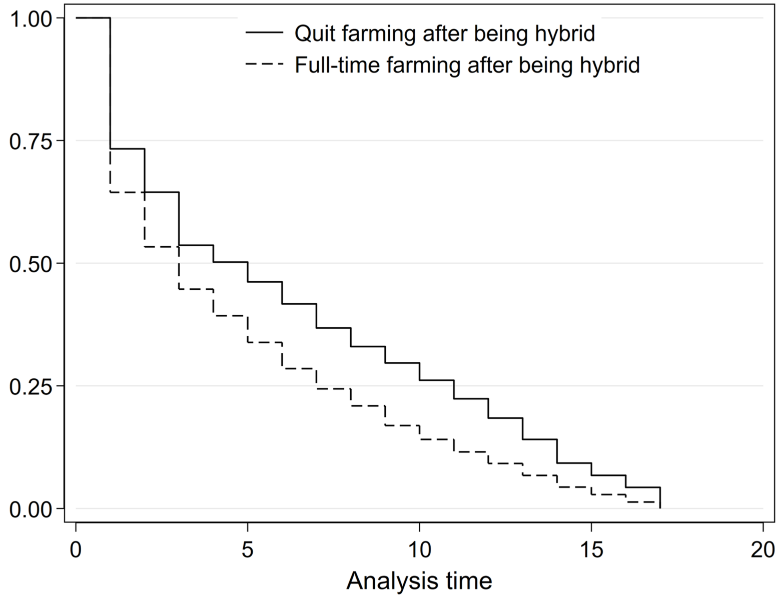

Figure 1. Kaplan–Meier survival estimate for hybrid farmers who exit into full-time farming and hybrid farmers who exit farming completely.

in off-farm work. The fact that these alpha terms are negative and significant indicates that some farming households are less likely to exit hybrid farming, for reasons not explained by the observable characteristics. Such family-level effects could include shared resources, farming traditions or other unobserved family-specific factors. As described earlier, these unobserved factors create clustering in the data—as farmers within the same family can share resources and are presumably more alike in several key dimensions—which is accounted for by the frailty term. Using this approach, we can analyse the individual characteristics that are important without disregarding the role of the family.

5.1. Income

Results indicate that the share of off-farm income at low levels increases the risk of exiting and, at some point, changes and decreases the risk. This holds for both the hybrids who exit into full-time farming and those who exit farming completely, but the magnitude of the coefficients is larger for the latter. We calculate the turning point around 0.3 for those who become farmers after exiting the hybrid state and slightly above 0.5 for those who exit farming completely.[15] Thus, those who exit farming completely are dependent on a larger share of off-farm income to sustain the hybrid state, but as the off-farm income falls below 0.5 the increase in the likelihood of exit is stronger compared to the turning point for those who exit into full-time farming. This shows that

15 The exact values for the share of off-farm income where the term changes from positive to negative are for models 1–4, respectively, 0.32, 0.53, 0.29 and 0.54.

Table 2. Results from survival analysis

	Standard survival regression		Regression with shared frailty	
	(1) Exit hybrid farming into full-time farming	(2) Exit farming completely	(3) Exit hybrid farming into full-time farming	(4) Exit farming completely
Share off-farm income	1.105***	3.215***	1.058***	4.241***
	(0.098)	(0.108)	(0.118)	(0.146)
Share off-farm income squared	−1.707***	−3.057***	−1.817***	−3.951***
	(0.087)	(0.086)	(0.104)	(0.112)
Declared income (ln)	0.052***	0.059***	0.067***	0.070***
	(0.005)	(0.006)	(0.007)	(0.008)
Family income (ln)	0.014	0.143***	0.012	0.197***
	(0.013)	(0.013)	(0.016)	(0.016)
Female (=1)	0.005	−0.070***	0.003	−0.147***
	(0.022)	(0.015)	(0.027)	(0.022)
Age	−0.060***	−0.090***	−0.093***	−0.157***
	(0.007)	(0.006)	(0.009)	(0.009)
Age squared	0.001***	0.001***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Years of education	−0.042***	−0.026***	−0.060***	−0.034***
	(0.004)	(0.003)	(0.006)	(0.005)
Agricultural education (0/1)	−0.041**	0.033	−0.063**	0.093***
	(0.020)	(0.021)	(0.026)	(0.033)
Work experience (years)	0.025***	0.066***	0.036***	0.108***
	(0.005)	(0.005)	(0.006)	(0.007)
Agricultural work experience (years, ln)	−0.528***	−0.422***	−0.685***	−0.821***
	(0.018)	(0.014)	(0.020)	(0.021)
Married or cohabited (0/1)	−0.094***	−0.123***	−0.097***	−0.146***
	(0.019)	(0.016)	(0.024)	(0.022)
Number of children	0.031**	−0.034***	0.017	−0.020
	(0.014)	(0.012)	(0.019)	(0.018)
Family member engaged in farming (0/1)	−0.096***	−0.092***	−0.121***	−0.091***
	(0.019)	(0.016)	(0.024)	(0.023)
Self-employment prior to becoming hybrid (0/1)	−0.130***	−0.170***	−0.183***	−0.256***
	(0.023)	(0.017)	(0.029)	(0.025)
Self-employed mother (0/1)	0.128***	0.050*	0.188***	0.067*
	(0.039)	(0.027)	(0.048)	(0.040)
Self-employed father (0/1)	0.019	0.102***	0.005	0.134***
	(0.037)	(0.025)	(0.045)	(0.036)
Agricultural experience mother (0/1)	−0.011	−0.064	−0.052	−0.079
	(0.051)	(0.044)	(0.066)	(0.065)

(continued)

Table 2. (Continued)

	Standard survival regression		Regression with shared frailty	
	(1) Exit hybrid farming into full-time farming	(2) Exit farming completely	(3) Exit hybrid farming into full-time farming	(4) Exit farming completely
Agricultural experience father (0/1)	0.033	0.016	0.050	0.016
	(0.044)	(0.035)	(0.057)	(0.052)
Value of land and buildings (ln)	−0.134***	−0.154***	−0.193***	−0.285***
	(0.009)	(0.008)	(0.012)	(0.012)
Farm size (Ha, ln)	0.053***	0.045***	0.068***	0.077***
	(0.004)	(0.003)	(0.005)	(0.005)
Land price (1,000s SEK/Ha)	0.002***	0.002***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Population density municipality	0.001	−0.045***	−0.010	−0.063***
	(0.018)	(0.012)	(0.025)	(0.020)
Constant	0.765***	−1.149***	2.162***	0.842***
	(0.196)	(0.174)	(0.241)	(0.232)
ln *p*	0.204***	0.258***	0.433***	0.650***
	(0.007)	(0.006)	(0.013)	(0.016)
ln alpha			−0.723***	−0.110*
			(0.069)	(0.060)
Observations	176,556	217,008	176,556	217,008

Standard errors are in parentheses.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.
Stata reports p which corresponds to ρ in the hazard equation. Alpha is the estimated variance of the frailty term across families.

hybrid farming can be a stable situation for farmers in cases where the off-farm income contributes to a sufficiently large share of the total income (Mishra and Goodwin, 1997; Vrolijk and Poppe, 2020). Therefore, hybrid farming may not only be a transitional state in or out of farming. These main results are illustrated in Figure 2, which shows the predicted hazard ratios for different levels of off-farm income across the four models. The hazard is generally lower in the models with frailty, and there is a stronger non-linear relationship for hybrid farmers that exit farming completely.

Having a larger total income on the other hand appears to increase the risk of exiting in all four models. For the hybrids who exit into full-time farming, this could reflect that for some farmers the hybrid state is a necessity where they cannot survive solely on the farm income (Zimmermann, Heckelei and Domínguez, 2009), and for others, who are successful in their farming operations, they can transition into full-time farming. These results are in line with previous findings in the literature on hybrid entrepreneurs in a non-agricultural

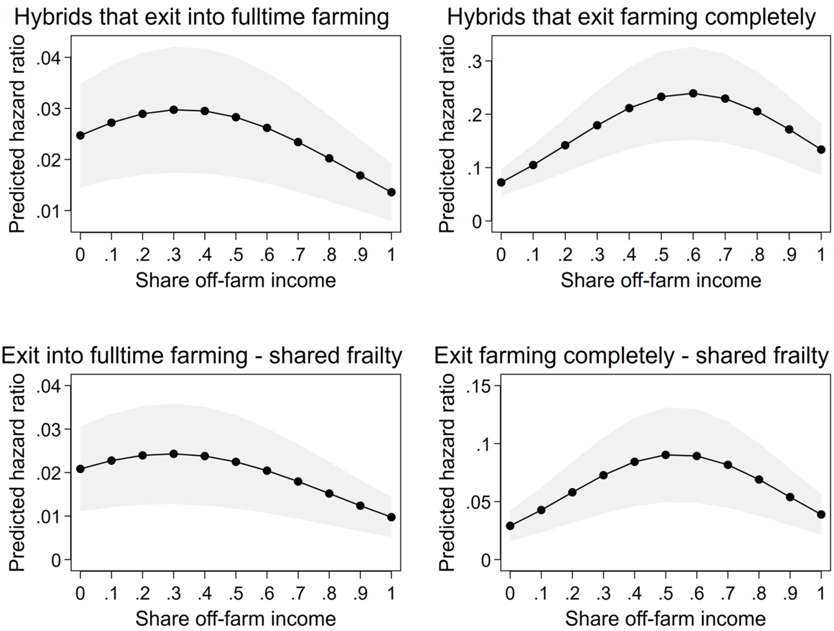

Figure 2. Predicted hazard ratios for different levels of off-farm income.

context (Thorgren *et al*., 2016). Regarding family income, results show that it increases the likelihood of exiting as a hybrid for the hybrids who exit farming completely, which suggests that family income does not support the survival of the farming business. This could be because hybrid farmers already have support from their off-farm income, and thus the family income is less important. Results also show a positive relation between the value of land and farm holdings in ownership of individuals, indicating that such resources are important for maintaining production, regardless of whether the individual runs the farm as a hybrid or full time.

5.2. Knowledge and experience

Years of education appear to reduce the risk of exiting as a hybrid for both groups, and so does having an agricultural-specific education for those who become full-time farmers. Non-agricultural work experience increases the likelihood of exiting in most models, indicating that such experience makes it more attractive (or lucrative) to work outside of farming. Agricultural work experience, on the other hand, reduces the likelihood of exiting across all four models, which shows the importance of industry-specific experience (Laband and Lentz, 1983; Lazear, 2009). Results also confirm the important role played by entrepreneurial experience (previous self-employment) in reducing the likelihood of exit (Toft-Kehler, Wennberg and Kim, 2014). Contrary to expectations, we find that the parents' self-employment experience increases the likelihood of exiting, when significant, and that their agricultural experience is never significant. This is likely to reflect that the variables specified at the individual level (agricultural experience and education) effectively capture family background characteristics. This is a plausible interpretation given that individuals who attend an upper secondary school or university with specialisation in agriculture often have a background in a family farm (Joosse and Grubbström, 2017). We do find, however, that having a family member engaged in farming reduces the likelihood of exiting across all models, confirming the importance of the family. While the other parent-related variables reflect their experience that could be transferred to children, this additional family variable accounts for the immediate support provided by actively engaged family members, such as a spouse, children or siblings, on the same farm in the same year.

5.3. Additional findings

In addition to these main results, we also comment on the age variable for which we also predict a non-linear relationship. For all models, we can confirm a non-linear relationship, i.e. that age initially decreases the risk of exit and then increases it. Results show that for hybrid farmers who exit into full-time farming, age starts to increase the risk around 43 years. For those who exit farming completely, age starts to increase the risk of exit around 50 years.[16] Thus, hybrid farmers transitioning to full-time farming potentially use hybrid methods early in their careers while establishing their farms. As a result, their turning point happens earlier than those who completely leave farming. Although our study does not focus specifically on the role of gender, we note that while gender appears insignificant in explaining exits into full-time farming, it seems like women are associated with a lower likelihood of exiting farming completely compared to men. This could indicate that the hybrid state offers flexibility, which is relatively more important among women. In line with expectations, we can confirm the role of marital status (being married or in cohabitation) in decreasing the risk of exits for all models, indicating the role played by a spouse on farms (e.g. via shared responsibilities).

Farm size increases the risk of exit across all models. This could be because large farms are difficult to maintain in the hybrid state. There is a small positive increase in the chance of exit from the land price, indicating the opportunity cost of owning the land compared to selling it. Lastly, population density has a small negative effect on the risk of exit for hybrid farmers who exit completely. This could indicate that in more densely populated areas there are more abundant labour market opportunities outside of farming that make a complete exit easier.

5.4. Sensitivity analyses

In addition to the main analysis, we perform a series of sensitivity analyses to determine the robustness of the results. Firstly, we run the baseline and shared frailty regression on a smaller sample of hybrids who remain hybrids

16 We also attempted to use age classes, which did not reveal a more complex relationship.

continuously until they exit or the period of analysis ends. This is a stricter definition of hybrid farmers which implies we do not have to consider repeated exits. Secondly, we perform the baseline regression on a sample where all individuals past the age of 65 years are removed. Farmers are getting older in Sweden, and elsewhere, and many continue farming well past the Swedish legal retirement age of 65 years. However, if these farmers exit due to retirement, it could distort the results, particularly among those who exit farming completely. Lastly, we run a regression where we cluster on childhood family belonging to capture the unobserved heterogeneity at the family level in a different way. Specifically, we use the family belonging when an individual is 16 years old. This implies that the oldest farmers in this sub-sample are 45 years old (those who were 16 years old in 1990). Lastly, we also run the regression for different types of production orientations: crops, cattle, dairy, poultry and mixed production (crop-livestock). The results are shown in Supplementary Tables S4–S7, respectively. Overall, the results are very similar across all three sub-samples with only a few variables changing significance level. The main income variable, share of off-farm income, has the same direction as in the baseline model in all cases except in the continuous hybrid sample for hybrids who exit into full-time farming. Additionally, when dividing the sample by farming type, the non-linear relationship for off-farm income does not appear for dairy and poultry farmers, which makes sense as these represent production orientations that are generally more difficult to pursue on a part-time basis (Lien *et al*., 2006).

6. Conclusion

This study highlights the dynamics of hybrid farming, particularly focusing on its potential as either a transitional phase or a stable, long-term state for farmers. By using individual-level data from both farmers and co-farmers engaged in hybrid farming in Sweden from 2001 to 2018 and employing parametric survival analysis, we provide novel insights into the factors influencing farmers' decisions to remain in or exit hybrid farming.

We find that the relationship between off-farm income and the risk of exiting hybrid farming is non-linear. While a lower share of off-farm income increases the likelihood of exit, particularly for those transitioning to full-time farming, a larger share of off-farm income increases the likelihood to remain in a hybrid state. However, those who exit farming completely are dependent on a higher threshold of off-farm income, which suggests that hybrid farming may provide a sustainable financial structure under certain conditions. This indicates that hybrid farming is not always a transitional phase but can be a stable state where off-farm income plays a critical role in maintaining the long-term financial viability of the farm.

We also find that higher family income tends to increase the likelihood of exiting farming altogether. This might reflect situations where non-farm income sustains the household while farm income remains insufficient, eventually leading to a full exit. Agricultural assets, such as land and buildings, serve as a protective factor, reducing the risk of exit from the hybrid state for both groups. Educational background and prior agricultural work experience are critical in reducing the risk of exiting hybrid farming. Non-agricultural work experience, on the other hand, increases the attractiveness of other work, increasing the risk of exit. Interestingly, while individual self-employment experience lowers the risk of exit, parental self-employment experience seems to have the opposite effect, indicating intergenerational dynamics.

The results are highly relevant for policy discussions about how future agriculture is likely to develop and how individual farmers respond to changing economic conditions in finding stable financial conditions, employment and income year-round. These results also underscore the need to consider hybrid farming as a potential long-term state rather than merely a temporary phase. Supporting hybrid farmers with policies that encourage the balance between on-farm and off-farm income could promote the continuity of agricultural production. This could for instance be through tax incentives for dual employment or rural employment programmes to expand off-farm employment opportunities.

Our study naturally leads to additional questions for further research on what happens to hybrid farmers who exit farming completely after maintaining a hybrid state but do not retire. Understanding their transition to other sectors or occupations could provide important further insights into how hybrid farming serves as either a stepping stone or a permanent exit from agriculture. Comparative studies between full-time farmers and hybrid farmers could further illuminate the specific factors that drive the decision to either fully commit to farming or exit entirely.

Supplementary data

Supplementary data are available at *ERAE* online.

Conflict of interest

We are not aware of any conflicts of interest associated with this manuscript and the funding indicated for this research is without any influence on the outcome. Helpful comments by the anonymous reviewers are gratefully acknowledged.

Funding

This research is funded by Formas 2023-02530.

References

Becker, G. S. and Tomes, N. (1986). Human capital and the rise and fall of families. *Journal of Labor Economics* 4(3): S1–S39.

Benjamin, C. and Kimhi, A. (2006). Farm work, off-farm work, and hired farm labour: estimating a discrete-choice model of French farm couples' labour decisions. *European Review of Agricultural Economics* 33(2): 149–171.

Bessant, K. C. (2006). A farm household conception of pluriactivity in Canadian agriculture: motivation, diversification and livelihood. *Canadian Review of Sociology* 43(1): 51–72.

Bharadwaj, L., Findeis, J. L. and Chintawar, S. (2013). Motivations to work off-farm among US farm women. *The Journal of Socio-Economics* 45: 71–77.

Biørn, E. and Bjørnsen, H. M. (2015). What motivates farm couples to seek off-farm labour? A logit analysis of job transitions. *European Review of Agricultural Economics* 42(2): 339–365.

Blumberg, B. F. and Pfann, G. A. (2016). Roads leading to self-employment: comparing transgenerational entrepreneurs and self-made start-ups. *Entrepreneurship Theory and Practice* 40(2): 335–357.

Blundell, R., Pistaferri, L. and Saporta-Eksten, I. (2016). Consumption inequality and family labor supply. *American Economic Review* 106(2): 387–435.

Breustedt, G. and Glauben, T. (2007). Driving forces behind exiting from farming in Western Europe. *Journal of Agricultural Economics* 58(1): 115–127.

Bubela, H. J. (2016). Off-farm income: managing risk in young and beginning farmer households. *Choices* 31(3): 1–8.

Cavazzani, A. and Fuller, A. M. (1982). International perspectives on part-time farming: a review. *GeoJournal* 6(4): 383–389.

Colombier, N. and Masclet, D. (2008). Intergenerational correlation in self-employment: some further evidence from French ECHP data. *Small Business Economics* 30: 423–437.

Corsi, A. and Salvioni, C. (2017). Once part-timer always part-timer? Causes for persistence in off-farm work state of farmers. *Bio-based and Applied Economics* 6(2): 159–182.

Crowther, M. J. and Lambert, P. C. (2014). A general framework for parametric survival analysis. *Statistics in Medicine* 33(30): 5280–5297.

Darnhofer, I. (2010). Strategies of family farms to strengthen their resilience. *Environmental Policy and Governance* 20(4): 212–222.

Demir, C., Werner, A., Kraus, S. and Jones, P. (2020). Hybrid entrepreneurship: a systematic literature review. *Journal of Small Business and Entrepreneurship* 34(1): 29–52.

Dunn, T. and Holtz-Eakin, D. (2000). Financial capital, human capital, and the transition to self-employment: evidence from intergenerational links. *Journal of Labor Economics* 18(2): 282–305.

Eikeland, S. and Lie, I. (1999). Pluriactivity in rural Norway. *Journal of Rural Studies* 15(4): 405–415.

El Benni, N. and Schmid, D. (2022). Off-farm income and direct payments—an indispensable diversification strategy of Swiss farmers. *Q Open* 2(1): qoab019.

European Commission. (2023). The common agricultural policy at a glance. https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-glance_en. Accessed 6 November 2023.

Eurostat. (2022). Farms and farmland in the European Union – statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farms_and_farmland_in_the_European_Union_-_statistics#The_evolution_of_farms_and_farmland_between_2005_and_2020. Accessed 10 November 2023.

Evans, H. E. and Ngau, P. (1991). Rural-urban relations, household income diversification and agricultural productivity. *Development and Change* 22(3): 519–545.

Ferjani, A., Zimmermann, A. and Roesch, A. (2015). Determining factors of farm exit in agriculture in Switzerland. *Agricultural Economics Review* 16: 59–72.

Findeis, J. L., Hallberg, M. C. and Lass, D. (1987). Off-farm employment: research and issues. Staff Paper Series 256841, Pennsylvania State University, Department of Agricultural Economics and Rural Sociology.

Finger, R. and El Benni, N. (2021). Farm income in European agriculture: new perspectives on measurement and implications for policy evaluation. *European Review of Agricultural Economics* 48(2): 253–265.

Folta, T. B., Delmar, F. and Wennberg, K. (2010). Hybrid entrepreneurship. *Management Science* 56(2): 253–269.

Frederiksen, L., Wennberg, K. and Balachandran, C. (2016). Mobility and entrepreneurship: evaluating the scope of knowledge-based theories of entrepreneurship. *Entrepreneurship Theory and Practice* 40(2): 359–376.

Gänser-Stickler, G. M., Schulz, M. and Schwens, C. (2022). Sitting on the fence—untangling the role of uncertainty in entrepreneurship and paid employment for hybrid entry. *Journal of Business Venturing* 37(2): 106176.

Gasson, R. (1986). Part-time farming: strategy for survival? *Sociologia Ruralis* 26(3–4): 364–376.

Giller, K. E., Delaune, T., Silva, J. V., Descheemaeker, K., van de Ven, G., Schut, A. G., van Wijk, M., Hammond, J., Hochman, Z., Taulya, G. and Chikowo, R. (2021). The future of farming: who will produce our food? *Food Security* 13(5): 1073–1099.

Glauben, T., Tietje, H. and Weiss, C. (2006). Agriculture on the move: exploring regional differences in farm exit rates in Western Germany. *Jahrbuch für Regionalwissenschaft* 26: 103–118.

Goetz, S. J. and Debertin, D. L. (2001). Why farmers quit: a county-level analysis. *American Journal of Agricultural Economics* 83(4): 1010–1023.

Griliches, Z. and Regev, H. (1995). Firm productivity in Israeli industry, 1979-1988. *Journal of Econometrics* 65: 175–203.

Gutierrez, R. G. (2002). Parametric frailty and shared frailty survival models. *The Stata Journal* 2(1): 22–44.

Hill, K. and Hirsch, D. (2019). *Family Sharing: A Minimum Income Standard for People in Their 20s Living with Parents*. Loughborough: Centre for Research in Social Policy, Loughborough University.

Joosse, S. and Grubbström, A. (2017). Continuity in farming—not just family business. *Journal of Rural Studies* 50: 198–208.

Key, N. (2020). Off-farm income, credit constraints, and farm investment. *Journal of Agricultural and Applied Economics* 52(4): 642–663.

Khanal, A. R. and Mishra, A. K. (2014). Agritourism and off-farm work: survival strategies for small farms. *Agricultural Economics* 45(51): 65–76.

Kimhi, A. (2000). Is part-time farming really a step in the way out of agriculture? *American Journal of Agricultural Economics* 82(1): 38–48.

Kimhi, A. and Bollman, R. (1999). Family farm dynamics in Canada and Israel: the case of farm exits. *Agricultural Economics* 21(1): 69–79.

Klein, J. P. and Moeschberger, M. L. (2006). *Survival Analysis: Techniques for Censored and Truncated Data*. New York, NY: Springer Science & Business Media.

Kleinbaum, D. G. and Klein, M. (1996). *Survival Analysis: A Self-learning Text*. New York, NY: Springer.

Kwon, C., Orazem, P. F. and Otto, D. M. (2006). Off-farm labor supply responses to permanent and transitory farm income. *Agricultural Economics* 34(1): 59–67.

Laband, D. N. and Lentz, B. F. (1983). Occupational inheritance in agriculture. *American Journal of Agricultural Economics* 65(2): 311–314.

Lazear, E. P. (2004). Balanced skills and entrepreneurship. *American Economic Review* 94(2): 208–211.

Lazear, E. P. (2009). Firm-specific human capital: a skill-weights approach. *Journal of Political Economy* 117(5): 914–940.

Lentz, B. F. and Laband, D. N. (1990). Entrepreneurial success and occupational inheritance among proprietors. *Canadian Journal of Economics* 23: 563–579.

Lien, G., Flaten, O., Jervell, A. M., Ebbesvik, M., Koesling, M. and Valle, P. S. (2006). Management and risk characteristics of part-time and full-time farmers in Norway. *Applied Economic Perspectives and Policy* 28(1): 111–131.

Lindquist, M. J., Sol, J. and Van Praag, M. (2015). Why do entrepreneurial parents have entrepreneurial children? *Journal of Labor Economics* 33(2): 269–296.

Luc, S., Chirita, G. M., Delvaux, E. and Kepnou, A. K. (2018). Hybrid entrepreneurship: employees climbing the entrepreneurial ladder. *International Review of Entrepreneurship* 16(1): 89–114.

Lucas, R. E., Jr (1978). On the size distribution of business firms. *Bell Journal of Economics* 9: 508–523.

Markussen, S. and Røed, K. (2017). The gender gap in entrepreneurship—the role of peer effects. *Journal of Economic Behavior & Organization* 134: 356–373.

Meert, H., Van Huylenbroeck, G., Vernimmen, T., Bourgeois, M. and Van Hecke, E. (2005). Farm household survival strategies and diversification on marginal farms. *Journal of Rural Studies* 21(1): 81–97.

Mishra, A. K., El-Osta, H. S., Morehart, M. J., Johnson, J. D. and Hopkins, J. W. (2002). Income, wealth, and the economic well-being of farm households. Agricultural Economic Report No. AER-812. US Department of Agriculture.

Mishra, A. K. and Goodwin, B. K. (1997). Farm income variability and the supply of off-farm labor. *American Journal of Agricultural Economics* 79(3): 880–887.

Mishra, A. K. and Sandretto, C. L. (2002). Stability of farm income and the role of nonfarm income in US agriculture. *Applied Economic Perspectives and Policy* 24(1): 208–221.

Mittenzwei, K. and Mann, S. (2017). The rationale of part-time farming: empirical evidence from Norway. *IJSE* 44: 53–59.

Müller, W. and Arum, R. (2004). Self-employment dynamics in advanced economies. In: R. Arum and W. Müller (eds.), *The Reemergence of Self-Employment: A Comparative Study of Self-employment Dynamics and Social Inequality*. New Jersey: Princeton University Press. 1–35.

Neuenfeldt, S., Gocht, A., Heckelei, T. and Ciaian, P. (2019). Explaining farm structural change in European agriculture: a novel analytical framework. *European Review of Agricultural Economics* 46(5): 713–768.

Nordin, M. and Höjgård, S. (2019). Earnings and disposable income of farmers in Sweden, 1997–2012. *Applied Economic Perspectives and Policy* 41(1): 153–173.

Pfeiffer, L., López-Feldman, A. and Taylor, J. E. (2009). Is off-farm income reforming the farm? Evidence from Mexico. *Agricultural Economics* 40(2): 125–138.

Reidsma, P., Ewert, F., Lansink, A. O. and Leemans, R. (2010). Adaptation to climate change and climate variability in European agriculture: the importance of farm level responses. *European Journal of Agronomy* 32(1): 91–102.

Reidsma, P., Janssen, S., Jansen, J. and van Ittersum, M. K. (2018). On the development and use of farm models for policy impact assessment in the European Union: a review. *Agricultural Systems* 159: 111–125.

Schaak, H., Bommarco, R., Hansson, H., Kuns, B. and Nilsson, P. (2023). Long-term trends in functional crop diversity across Swedish farms. *Agriculture Ecosystems and Environment* 343: 108269.

Shahzad, M. A. and Fischer, C. (2022). The decline of part-time farming in Europe: an empirical analysis of trends and determinants based on Eurostat panel data. *Applied Economics* 54(42): 4812–4824.

Sutherland, L. A. (2023). Who do we want our 'new generation' of farmers to be? The need for demographic reform in European agriculture. *Agricultural and Food Economics* 11(1): 3.
The Swedish Board of Agriculture (2022). Employment in farming 2020. https://jordbruksverket.se/om-jordbruksverket/jordbruksverkets-officiella-statistik/jordbruksverkets-statistikrapporter/statistik/2021-06-15-sysselsattning-i-jordbruket-2020. Accessed 2 June 2023.
Thorgren, S., Sirén, C., Nordström, C. and Wincent, J. (2016). Hybrid entrepreneurs' second-step choice: the nonlinear relationship between age and intention to enter full-time entrepreneurship. *Journal of Business Venturing Insights* 5: 14–18.
Toft-Kehler, R., Wennberg, K. and Kim, P. H. (2014). Practice makes perfect: entrepreneurial-experience curves and venture performance. *Journal of Business Venturing* 29(4): 453–470.
Unger, J. M., Rauch, A., Frese, M. and Rosenbusch, N. (2011). Human capital and entrepreneurial success: a meta-analytical review. *Journal of Business Venturing* 26(3): 341–358.
Vrolijk, H. and Poppe, K. (2020). Impact of off-farm income and paid taxes on the composition and volatility of incomes and wealth of dairy farmers in the Netherlands. *Studies in Agricultural Economics* 122(2): 57–65.
Weiss, C. R. (1999). Farm growth and survival: econometric evidence for individual farms in Upper Austria. *American Journal of Agricultural Economics* 81(1): 103–116.
Zimmermann, A. and Heckelei, T. (2012). Structural change of European dairy farms: a cross-regional analysis. *Journal of Agricultural Economics* 63(3): 576–603.
Zimmermann, A., Heckelei, T. and Domínguez, I. P. (2009). Modelling farm structural change for integrated ex-ante assessment: review of methods and determinants. *Environmental Science & Policy* 12(5): 601–618.
Zorn, A. and Zimmert, F. (2022). Structural change in the dairy sector: exit from farming and farm type change. *Agricultural and Food Economics* 10(1): 7.

European Review of Agricultural Economics Vol 00 (00) (2025) pp. 1–26, doi:https://doi.org/10.1093/erae/jbaf003,