The social and economic determinants of farm succession in Ireland

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Abstract

This study explores the multifaceted factors influencing farm succession in Ireland, emphasising the interaction among economic, social, and environmental aspects. With an ageing farm population, the need for effective succession strategies is critical to ensuring sustainable agricultural practices. We analyse the impact of drivers and barriers to succession, highlighting the importance of considering social factors along with economic factors using a probit model to examine these relationships. Our findings reveal that while farm size and dairy farming status show complex relationships with the likelihood of presence of a successor, social factors such as excessive workload impact decision-making. Our findings confirm expected relationships while offering

new insights into farm succession and the farmer's life cycle. Beyond profitability, social factors—such as workload and its perception by the next generation—play a crucial role in successor identification. Highlighting these dynamics, our study underscores the importance of social sustainability in securing farming's future.

JEL code J10, Q12, Q18

Keywords Farm Succession, Social factors, Farmer Ageing, Probit Model, Endogenous succession cycle

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1. Introduction

Improving the sustainability of agriculture, across economic, environmental, and social dimensions, is recognised as central to delivering the key objectives of the Common Agricultural Policy (CAP). One such objective is to support generational renewal. An ageing of the farm population is evident in Ireland (Meredith and Crowley, 2018) and across Europe (Bertolozzi-Caredio et al., 2020, May et al., 2019). The share of farm holders aged 65 or over is now almost one-third in Ireland compared to one-fifth in 1991 (CSO, 2021), underlining the extent of the challenge in the Irish context. Farm succession, the transfer of managerial control of the farm, is critical to continued farm sustainability (Leonard et al., 2017a,b, Russell, et al., 2020) with previous literature highlighting its importance from both the farm household and rural community perspectives. Farm succession is significant for the uptake of innovation, efficient and effective farm management (Nuthall and Old, 2017). Most farms in Ireland are family-owned, and entry into farming sector is primarily through inheritance (Hennessy and Rehman 2006; Deming et al 2019).

64 The complex nature of farmer decision making around succession and inheritance is
65 multifaceted, with a broad range of economic, personal and social factors at play
66 (Conway et al., 2016, 2021, 2022; Leonard, et al., 2017a, b; Góngora et al., 2019). These
67 factors can be classified as drivers and barriers to succession. Previous research has
68 highlighted the significance of individual farm circumstances (Conway et al., 2016;
69 Eistrup et al., 2019; Schlesser 2021; Rech et al., 2021). Conway et al. (2021, 2022) also
70 highlight the limited capacity of financial incentives alone in facilitating generational
71 renewal and land mobility and contend that policy also needs to address the emotional
72 and social wellbeing of older farmers, as well as their sense of purpose in later life. An
73 improved understanding of these influential factors is vital for the design of effective
74 policy to support generational renewal in the context of the new CAP.

75 To secure the farm for the next generation, it is also important to consider the
76 environmental performance, which is increasingly recognised as being integral to the
77 sustainability of agriculture (Barral and Detang-Dessendre 2023). Much recent research
78 points that younger farmers in Europe are more aware of environmental issues, quicker
79 to adopt eco-friendly technologies, and more adaptable to policy changes (Perez et al.,
80 2020; Läpple and Kelley, 2015). Despite the significant role of younger farmers in
81 sustainability, studies indicate that there remain barriers to new entrants taking over a
82 farm (Hartarska et al., 2021; Schlesser et al., 2021; Zagata et al., 2017).

83 Regarding the relationship between succession and sustainability, Potter and Lobley
84 (1996) coined the term *'succession, successor and retirement effects'* to describe the
85 processes whereby an identified successor or lack thereof, can significantly influence
86 the farm holder's level of interest and investment in the farm when approaching what
87 should be their own retirement from farming. Thus, the sustainability of the farm
88 business is influenced by the presence of successors. Furthermore, Leonard et al. (2017)

89 emphasises economic concerns, whether a farm can generate enough income to support
90 both the farmer and their successor, as well as the farmer's residual income if they
91 transfer the farm prior to death. Transfer decisions and procedures are often difficult
92 and stressful and may relate to the valuation of the farm as retiring farmers seek to sell
93 farmland at the highest possible price (Jeanneaux et al 2022).

94 Despite widespread recognition of the connection between socio-economic factors and
95 farm succession, there is considerable space in the academic literature for further
96 exploration of the potential association between social aspects and farm succession.
97 Previous research acknowledges the limited capacity of financial incentives alone in
98 facilitating generational renewal. Through this study, we expect to make
99 recommendations to policy makers on how social aspects should be considered in the
100 design of future generational renewal policies. This paper identifies the endogenous
101 nature of farm succession and examines the relationship between farm-level economic
102 and social factors and the identification of a successor. The factors are intricately
103 intertwined, making it challenging to consider these intertwined factors and the
104 presence of a successor. This paper is innovative in that it conceptualises farm
105 succession within the framework of the farm life cycle, elucidating the endogenous
106 factors. The significance lies not in listing barriers and drivers, but in analysing the
107 relationship between these factors within the farm life cycle and the presence or absence
108 of a successor. The objective of our study is to explore some of the drivers and barriers
109 to farm succession in the Irish context, with a particular emphasis on relevant social
110 and economic factors.
111 The next section discusses potential drivers and barriers to farm succession based on
112 the literature. Section 3 provides an overview of the data and methods used in this paper.

Section 4 contains the results of the data analyis, section 5 provides some discussion and conclusions.

2. Literature review

The general process of farm inter-generational transfer is well described in the existing literature, which distinguishes between three distinct but inter-related concepts. *Inheritance,* the legal transfer of ownership of farm business assets including land; *retirement,* the withdrawal of the existing manager from active managerial control and/or involvement in manual work on the farm and: *succession*, the transfer of managerial control over the use of these assets (Errington, 2002).

There exists particular policy instruments and financial incentives to encourage early-stage inter-generational farm transfer, however, delayed succession remains a concern throughout the world (Lobley et al 2010). The literature identifies barriers to land transfer to non-family members relating to the value that farmers place on identity, occupation, control, and status in the community (Duesberg et al. 2017). Schlesser et al. (2021) investigate social and economic factors affecting farm succession using focus groups, highlighting the complex challenges for both the older generation and successors. Understanding these obstacles is crucial for our study to improve insights into the issue.

2.1 Economic Factors

Farm succession may be anticipated by current farmers' behaviour in making additional investment to expand their farm business (Calus et al., 2008). Farmers with identified successors are more likely to invest or expand in anticipation of a takeover of the farm by a son or daughter than those who do not have a successor, which is known as the succession effect. The prospect of a successor often leads incumbent farmers to make management decisions they might not otherwise make, resulting in substantial

138 improvements to the farm's productivity and sustainability (Leonard et al., 2017; Lobley
139 et al., 2010; Uchiyama et al., 2008). On the other hand, they describe the *'retirement*
140 *effect'*, which generally has a negative impact on farms such that the farmer who has
141 not identified a successor attempts no additional investment and scales down the farm
142 business. Similarly, Carreira and Teixeira (2011) investigate that firms that exit the
143 market appear to exhibit a noticeable productivity disadvantage compared to those that
144 survive, not only in the year preceding exit but also for a significant number of years
145 leading up to the exit. This means that farmers who do not secure a successor will not
146 engage in investment activities for several years before the actual retirement. Much
147 economic research has dealt with the question of farm succession and non-succession
148 by highlighting important explanatory factors at the farm level such as farm holder's
149 age, off-farm employment, farm size, economic viability, farmer's education and
150 household composition (Kimhi and López, 1999; Stiglbauer and Weiss, 2000; Glauben
151 et al., 2006).

152 The economic viability of the farm is well documented as playing a central role in the
153 succession process (Glauben et al., 2009; Hennessy and Rehman 2007; Zagata and
154 Sutherland, 2015). Farm size is found to have a positive stable effect on farm succession
155 in the case of farming in Italy (Bertoni and Cavicchioli, 2016; Cavicchioli et al., 2018).
156 Successors on larger family farm (both in physical (area) and economic size) are more
157 likely to enter the farm as full-time.

158 Farmland ownership is also discussed as influencing the farm succession process.
159 Ireland has low land mobility as older farmers accumulate capital to secure their future
160 financial situation and are unwilling to transfer their farm assets (Leonard et al. 2017).
161 The major farm transfers occur with non-market arrangements, usually inheritance.

Irish farmers influence agricultural land markets as most farm transfers occur within the family and this is attributed to the strong emotional attachment to land in Ireland (Bradfield et al., 2023). Rented land (both conacre, the short-term, 11-month land leasing and long-term leasing) accounts for only 18% of Utilised Agricultural Area (UAA) in Ireland, that is the second lowest in EU (European Commission 2021). Policy measures to facilitate land transfer to younger generations have had limited success (Bika, 2007; Geoghegan and O'Donoghue, 2018; Geoghegan et al., 2021).

2.2 Social Factors

In addition to economic factors, the absence of successors is associated with older farmers' unwillingness to retire, which stems from emotional attachment to the farm (Conway et al. 2022). Farming is a way of life for many older farmers throughout the world and retirement from their daily routines and social circles in the farming community may affect their emotion negatively. Studies show that existing retirement incentives bring limited success in encouraging farmers to retire at or before pension age and seem not to change the traditional family farm transfer (Gilmore 1999; Contzen et al., 2017). Bika (2007) writes that in addition to financial reasons, Irish farmers' reticence in using the early retirement scheme[1] could have been due to 'sentimental bonds with the land'. Indeed, policy around generational renewal can often involve strategies to encourage older farmers to 'step aside' to facilitate new entrants while farmers often wish to remain 'rooted in place' on the farm (Conway et al., 2022) and work for as long as possible (Uchiyama et al. 2008). This farmers' 'never retire' attitude is associated with reduced likelihood of a successor being identified in several countries

[1] The Early Farm Retirement Scheme (EFRS) was introduced to encourage older farmers to retire and to attract younger farmers into the Industry. In Ireland, there have been three rounds to the EFRS scheme, in 1993, 2000 and 2007 but it ceased in 2009. These schemes enabled farmers to retire early (from age 55) and provided them with a pension (up to €15,000 a year for a maximum of 10 years) provided they retired from farming completely by transferring, selling or leasing their farm to a young trained farmer (Hayden et al 2021).

(Lobley et al., 2010). Thus, retirement in farming is not only influenced by economic factors, but also emotional and social status.

One such consideration is the desire for social inclusion and the avoidance of isolation. Social inclusion, driven by the concept of social capital, plays a crucial role in farmers' decision-making processes (Shortall 2008). This social capital is composed of resources from networks of relationships based on social structure and acknowledged as important component in farmers' decision-making (Arnott et al.2021; Cofré-Bravo et al. 2019). This facilitates discussions and the designation of a successor on the farm (Abdala et al. 2022)[2]. By maintaining these positive relationships, older farmers can navigate the complexities of succession planning more effectively, ensuring the continuity of their agricultural operations.

Social factors such as stress or anxiety, and excessive workload are also among the factors that can be considered as barriers to farm succession. Due to the rapid expansion of the dairy sector following the removal of EU milk quotas in 2015, dairy farmers experience an increase in labour intensity in Ireland. Brennan et al. (2021) state that workload related stress was the second highest source of stress among farmers in Ireland, next to poor weather. This stress not only affects the mental well-being of older farmers but also influences the perspectives of potential successors, deterring them from considering a future on the family farm (Brennan et al. 2022). Conversely, strategies such as increasing human capital through workload and information sharing among family members and neighbours can help alleviate this problem, incentivizing potential successors to remain in the agricultural sector (Bertoni and Cavicchioli, 2016).

[2] Abdala et al (2022) refer to social capital as the willingness of individuals and groups to obtain information, influence, and nurture solidarity with other social actors through the structure and content of existing relationships (Adler and Kwon, 2002)

206 Human capital here is considered according to the OECD definition as the productive
207 wealth embodied in labour, skills and knowledge (Tan, 2014) or any stock of
208 knowledge or the innate/acquired characteristics a person has that contributes to his or
209 her economic productivity (Garibaldi, 2006). Given the increasing focus on quality of
210 life issues (Contzen and Häberli, 2021), there is a strong case for more emphasis on
211 collaborations that enable a more sustainable farm workload.

212 Although a wider range of social factors have emerged in the discussion of generational
213 renewal (Brennan et al., 2021; 2022), there are very few recent studies explicitly
214 accounting for social capital and farm succession, except for Abdala et al. (2022), which
215 identifies some relationships between farm succession and social factors in the case of
216 Brazil. Abdala et al. (2022) found that farmers with social capital, such as access to
217 information or networks with customers and suppliers, are more likely to identify a
218 successor. Such social capital includes agricultural education, which can enhance
219 farmers' ability to manage a farm more effectively (Läpple et al., 2015).

220 Engaging with farm advisory services through formal advisory contracts is another
221 form of social capital, as it involves leveraging networks to acquire knowledge and
222 information (Cofré-Bravo et al., 2019). However, despite recognition of the importance
223 of social aspects, studies addressing these factors remain insufficient.

224 The pursuit of better agricultural knowledge can be an indicator of a higher possibility
225 of farm succession as it may indicate willingness to improve and continue the farm
226 business.

227 Agri-environmental scheme (AES) participation is recognised as one of the strategies
228 for pursuing sustainable agriculture and these types of strategies may be translated into
229 a more sustainable agricultural business for future generations. Farmers with a

sustainable strategy tend to participate in AES. Various factors contribute to the decision to participate in AES, including economic concerns, the educational level of farmers, and the environmental features on farms. According to Cullen et al. (2020), farmers who are having a "forward-looking" self-identity are more likely to participate in AES. This type of identity influences AES participation, aligning with research that AES participation is favoured as one possible survival strategy when foreseeing the sustainability of agriculture (Ingram et al., 2013; Cullen et al., 2021). In this sense, motivations to join AES are shaped by the desire to continue the farm, which may be associated with the presence of a successor. In other words, the lack of a successor can be a reason not to enter AES due to a winding down and poor availability of labour with an inability to meet the AES management requirements (Riley, 2006).

2.3 Life cycle

The above mentioned drivers and barriers to succession are intertwined and emerge under different conditions at the farm level. Understanding this complexity can be facilitated by conceptualizing farm succession within a farm life cycle approach. Succession processes in family farming must be appreciated for their long duration (Fischer and Burton, 2014). In Ireland, where most new entrants inherit farms, the identity of successors fostered during the life cycle shapes the structure of farming. Potential successors develop their farm business skills by gradually getting involved in farming, influencing the current farm manager's behavior towards succession, such as making additional investments. This life-cycle approach shows that succession is an endogenous process, where practical involvement on the farm increases successor identification and vice versa (Fischer and Burton, 2014). Negative experiences can deter potential successors even if the farm is viable.

Socio-economic studies suggest that factors such as the presence of a male heir and the number of children influence farm transfer decisions (O'Gráda, 1980; Banovic et al., 2015; Kennedy, 1991). In Northern Ireland, Jack et al. (2019) found that succession decisions are shaped by the gender of children, with a preference for male farm employees. Econometric studies from various countries further indicate that a larger number of children increases the likelihood of farm transfer while also delaying farm closure (Väre, 2006; Banovic et al., 2015). Additionally, having more family members present on the farm enhances the probability of family succession (Stiglbauer and Weiss, 2000). However, regional differences exist, as Cavicchioli et al. (2015; 2018) found both weak positive and negative associations between the number of children and farm succession.

From these studies, we hypothesize that farmers with large land ownership and capital assets are more likely to identify successors; those with less social interaction are less likely; AES participation is associated with a higher likelihood of identifying successors; and farmers with identified successors are more likely to invest in their farm in anticipation of succession.

3. Data and Method

3.1 Data

The main dataset for this research is the Teagasc National Farm Survey (NFS) data from 2018[3]. This dataset contains detailed information about farms in terms of their economic, social and environmental performance in Ireland. The choice of time period is based on data availability as the 2018 data includes information about farm

[3] The Teagasc NFS is part of the EU Farm Accountancy Data Network (FADN), this data was collected in addition to the core FADN dataset.

276 succession and whether or not farm holders have identified a successor. The agricultural
277 sector in 2018 was affected by unusual weather with abnormal rainfall levels in spring
278 and drought in the summer. The drought had a more significant impact on the south and
279 east NUTS3[4] region relative to the Border, Midlands and West region (Falzoi et al.,
280 2019). Some of the survey responses may reflect the difficult conditions of this year
281 (particularly regarding incidence of farm related stress).

282 In the Teagasc NFS, a farm accounts book is recorded for each year for a nationally
283 representative survey of farms throughout Ireland, selected on the basis of a stratified
284 random sample using information provided by the Central Statistics Office. The sample
285 size is approximately 900 farms in recent years. This sample of farms is randomly
286 sampled each year to represent approximately 90,000 farms in Ireland. Each farm is
287 assigned a weighting factor based on the farm system and farm size so that the results
288 of the survey are representative of the national population of farms. The analysis
289 focuses on farms with holders over 50 years old, a critical age for succession decisions.
290 Farmers are actively shaping the future trajectory of their farms. This approach allowed
291 us to examine the factors influencing farm succession decisions while accounting for
292 the gradual and nuanced nature of the succession process. For instance, the decision-
293 making process for farm succession can begin several years before the actual succession
294 event takes place (Calus et al. 2008). Moreover, even at an earlier stage, forward-
295 looking farmers may undertake new investments to keep a fragile business afloat if they
296 pursue farm transfer to a known successor, while others may prefer to sell the business.
297 Such farmer's behaviour is observed and influenced by various factors even before
298 retirement age (Paroissien et al. 2021). Examining this age group allows for a larger

[4] The Nomenclature of Territorial Units for Statistics (NUTS) 3 corresponds to Border, West, Mid-west, South East, South-west, Dublin, Mid-east, and Midlands of Ireland.

299 and more representative sample for robust econometric analysis. This provides a sample
300 of 538 farmers representing approximately 58,000 farms nationally.

301 Succession decisions are made with factors influencing over a long-time frame (Lobley
302 et al, 2010). Teagasc NFS data from 2013 is used in our model to provide a lagged value
303 for the presence of young people in farm households. This variable is included to
304 examine the importance of family networks, which affect the number of farmers who
305 choose successors as of 2018. Young adults (aged 20 to 44 years) in the farm household
306 may move out of the farm household to enter third-level education or employment
307 elsewhere, but they may still be part of a family network and interested in contributing
308 to the farm. Thus, the presence of young adults in 2013 might be related to the status of
309 successor identification in 2018. Attrition is present in the Teagasc NFS data but most
310 farms participating in the 2018 survey provided data as part of the 2013 survey. The
311 year 2013 is chosen as important changes in household composition can take place in a
312 five-year period and the choice of this year limits the amount of attrition. In the 2018
313 dataset, 538 farms were available for analysis. To construct the lagged variable for the
314 presence of a young adult in the household, we used data from 2013. Among these, 371
315 farms could be matched across both years and had relevant information on young adults.
316 In addition, due to missing values—particularly arising from the creation of interaction
317 variables—the final sample size for Model 2 was reduced to 349. For Model 1, which
318 does not include the lagged variable but includes interaction terms, the sample size was
319 reduced to 501. This reduction is likely due to listwise deletion in cases with missing
320 values introduced by the interaction variables.

321 3.2 Methods

In order to analyse the drivers and barriers of farm succession, we use a probit model with the dependent variable being the presence of a chosen successor as a binary variable where successor =1, otherwise=0.

i) Econometric model

The probit model is used to test the potential relationship between a number of farm, farmer and farm household characteristics (economic and social) with the presence of a chosen successor. Note that due to the absence of adequate long-term survey data to conclusively verify whether the farmer in NFS has indeed undergone farm succession, the identification a successor is employed as a dependent variable for the analysis. The choice of explanatory variables is based on the need to account for particular farm, family and social factors. Farmer age, land quality, and an interaction between the presence of a dairy enterprise and the size of land ownership are included because much research indicates a positive relationship between farm size and farm succession (Uchiyama et al., 2008; Glauben et al., 2009; Wheeler et al., 2012). Average dairy farm income is higher than the income of other systems in Ireland (Donnellan et al., 2020). We therefore expect that higher farm income attracts more successors and thus we use the presence of a specialist dairy farm as an independent variable in this model.

A variable representing investment is included among the independent variables since investment indicates a willingness of the farm holder to further develop the farm. At the same time, investment is another factor that increases a potential successor's willingness to take over the farm business (Calus et al., 2008). The investment variable is based on Net New Investment, which is defined as all capital expenditure during the year less capital sales and grants. The cost of major repairs to farm buildings, plant and machinery as well as land improvements is also included. It does not include investments in land purchases (Dillon et al., 2021, p.89).

Many of the independent variables tend not to vary much in value over time and this reduces the likelihood of reverse causality. We attempt to account for the influence of past household composition by the inclusion of a lagged independent variable using data from the 2013 Teagasc NFS survey. We create a lagged variable indicating the presence of young adults aged 20 to 44 years old in the household in 2013. The NFS 2018 data provides information about social factors including isolation (defined as those farmers living alone) and the presence of workload stress/pressure[5]. These variables were ascertained as part of an additional special survey of Teagasc NFS farms in autumn 2018. These social variables are likely to be endogenous but are an important consideration given that they are likely to be closely linked to the construction of successor availability and identification. However, to avoid unnecessary sample loss and preserve statistical power, we presented Model 1, which focuses on the full 2018 dataset.

Farm income and farm viability (defined as the farm receiving at least the minimum wage for family labour and a 5% return on non-land assets) are likely to be associated with farm succession (Leonard et al., 2017). Both income and viability variables are likely to be highly endogenous in terms of their relationship with farm succession. Potential successors may play a very important role in influencing the current farm income and viability due to the labour provided on the farm. At the same time, higher farm income and farm viability may incentivise potential successors to seek to take over the farm business at some point in the future. Farm income has a number of components that are exogenous or weakly endogenous including soil quality, land ownership and

[5] Farmers are asked if they have experienced stress/anxiety from any aspect of their farm business in the last 5 years. Ten possible sources of stress/anxiety are listed in the questionnaire and farmers are requested to list the top three sources. Those who chose "Workload e.g. work life balance, seasonal demands (calving, lambing)" as one of the three sources are included in this variable.

agricultural training. In the econometric analysis, we therefore include these variables rather than the farm income or farm viability variables individually.

A binary variable representing whether farmers have formal advisory (extension) service contract is included since it could be an indicator of the willingness to improve farming practices, thus, continuation of the farm business.

Participation in an Agri-Environment Scheme (AES) is included since the motivations for participating in AES could be tied to the presence of a potential successor. Conversely, the absence of a successor can be associated with less likelihood of AES participation, as it may indicate a winding-down of the farm business operations, limited availability of labour, and an inability to meet the management requirements set by AES.

Figure 1 shows the average and median age of the farm holder by farm type in Ireland. It indicates that certain farm system faces more severe aging problem than others.

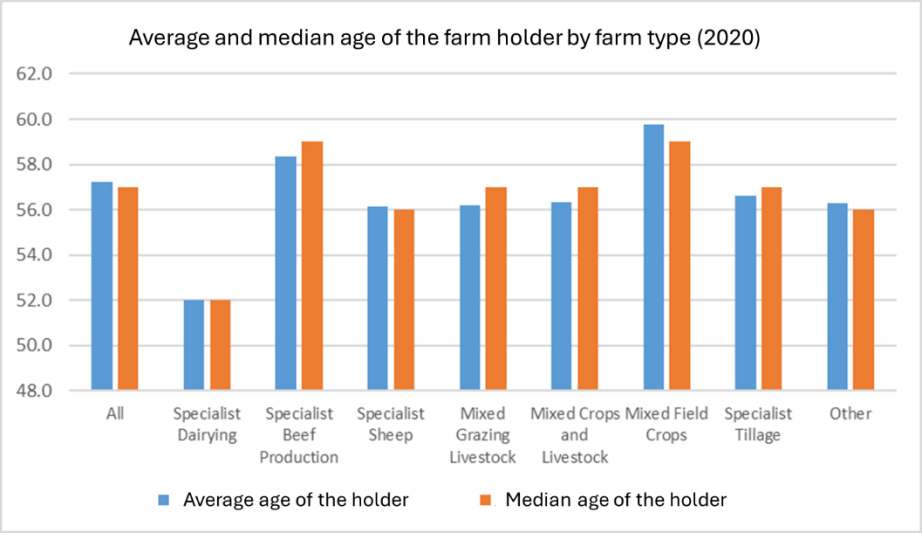

Fig. 1 Average and median age of the farm holder by farm type in 2020
Source: CSO Census of Agriculture 2020

385 3.3 Summary Statistics

386 We describe the summary statistics for the variables used in the econometric analysis.
387 Using the Teagasc NFS 2018 sample of farmers of at least 50 years old, the statistics
388 show that 57 per cent of farmers have identified a successor at that point in time (Table
389 1). Among them, 34% were dairy farmers. The proportion with a successor varies
390 between farming systems with 53.8 per cent in the case of sheep farms and 58.6 per
391 cent for dairy farms. For the purposes of the econometric modelling and due to the
392 limited sample size, we concentrate the succession analysis on farm holders aged over
393 50 years.

394 **Table 1**

395 Farmers who identified successor (over 50 years old)

Farm System	Share of successor farms in each system (%)
Dairy	58.6
Cattle rearing	55.7
Cattle other	57.2
Sheep	53.8
Tillage	54.3
Total	56.7

396 Source: Teagasc National Farm Survey 2018

397 The descriptive statistics are provided in Table 2. For this particular sample, the average
398 age is 63 years old. The average age of farm holders with a chosen successor is 65 years
399 old and without a successor is 60.4 years old. Dairy farms are similarly represented in
400 both succession and non-succession groups. Dairy farms account for 16 per cent of the
401 farms with a successor and 17 per cent of the farms without a successor. As expected,
402 the proportion of farms in the best soil quality category is higher for those with a
403 successor (32 per cent) relative to those without a successor (26 per cent).

404 The average Net New Investment is higher on farms with a chosen successor relative
405 to those farms without a successor (€8,085 per annum versus €5,777 per annum). This

suggests that investment is associated with the probability of farm succession although the direction of causality may not be clear. The presence of an excessive workload or evidence of farm related stress (as reported by the farm holder) is more common on farms without a successor (35 per cent) relative to farms with a successor (24 per cent). There is a notable difference between the two groups in terms of the share of farm holders living alone. Table 2 shows that 32 per cent of farm holdings without a chosen successor are living alone. This is much lower at 15 per cent for holdings where a successor is chosen.

Table 2

Descriptive statistics of variables used in the analysis

			All Farm Holdings (N=538)		Farm Holders with a chosen successor (N= 305)		Farm Holders without chosen successor (N=233)		Expected result[6]
Variable	Description	Unit	Mean	SD	Mean	SD	Mean	SD	
Chosen Successor	Whether or not the current farm holder has chosen a successor	(0 = No,1 = Yes)	0.56	0.50	1.00	0.00	N/A	N/A	
Independent Variables									
Dairy Farm	Farm is Specialist Dairy farm	(0 = No,1 = Yes)	0.16	0.37	0.16	0.37	0.17	0.37	+
Land Ownership	Amount of farmland owned	Hectares	37.15	28.92	37.30	30.25	36.95	27.16	+
Interaction of Dairy and Land Ownership	Interaction between Dairy farm and Land Ownership variables	Hectares	6.66	17.63	8.65	22.39	7.78	20.46	
Farmer Age	Age of the Farm Holder	Years	63.01	7.79	65.00	7.37	60.44	7.57	+
Best Soil Category	Farm is located on soils with wide range of use	(0 = No,1 = Yes)	0.30	0.46	0.32	0.47	0.26	0.44	+
Number of Household Members Age 20 to 44 in 2013*	Household members in this age category in 2013	Number of people	0.53	0.82	0.54	0.83	0.17	0.44	+

[6] This indicates the expected direction of influence each variable has on the probability of having a chosen successor, based on prior literatures mentioned earlier section.

			All Farm Holdings (N=538)		Farm Holders with a chosen successor (N= 305)		Farm Holders without chosen successor (N=233)		Expected result[6]
Variable	Description	Unit	Mean	SD	Mean	SD	Mean	SD	
Isolation of Living Alone	Farm Holder is living alone	(0 = No,1 = Yes)	0.23	0.42	0.15	0.36	0.32	0.47	-
Excessive workload	Self-reported presence of excessive workload	(0 = No,1 = Yes)	0.29	0.45	0.24	0.43	0.35	0.48	-
Net New Investment	Capital expenditure less capital sales and grants	Euro	7,080	21,683	8,085	24,783	5,777	16,797	+
Formal Advisory Contact	Farm Holder has a formal contract for advisory	(0 = No,1 = Yes)	0.44	0.50	0.43	0.50	0.46	0.50	+
Participation in AES	Farm Participates in an Agri-Environment Scheme (See ADAS 2020)	(0 = No,1 = Yes)	0.37	0.48	0.36	0.48	0.37	0.48	+

Source: Teagasc National Farm Survey 2018

SD – Standard Deviation

*Available for 371 observations

4. Result

In this section, we show the results of the probit model in Table 3. The lagged variable representing the presence of a young adult within the household is available only for 371 observations. This is because the creation of the lagged variable relied on 2013 data, and the number of farms that existed in both 2013 and 2018 was smaller than those present only in 2018, leading to a reduced sample size in Model 2 compared to the full sample. However, this remains an important variable for examining the potential role of household composition in influencing succession. We therefore present the results of the probit model both excluding and including the lagged variable (shown as Model 1 and Model 2, respectively). This way allows us for greater statistical power in

430 estimating the core relationships. Marginal effects are calculated to show the change in
431 the probability of succession due to a change in the value of the independent variables.

432 Farm income has components that are exogenous or weakly endogenous including soil
433 quality, land ownership and agricultural training. In addition, land ownership is
434 included since Irish farm succession mostly occurs via inheritance. The area of owned
435 land could be associated positively with identification of a successor. In this model, we
436 use these variables rather than the reported farm income.

437 We analyse whether the presence of a dairy farm or the farm size influences the
438 likelihood of succession. We expected that the presence of a dairy farm would increase
439 the likelihood of succession due to the relatively higher farm income on dairy farms
440 relative to non-dairy farms (Donnellan et al., 2020). However, our model finds land
441 ownership (as opposed to rent) is not statistically significant as shown in Table 4 in
442 Appendix, even though these factors are considered positive indicators for identifying
443 a successor. This is not consistent with previous studies showing a positive relationship
444 between farm size and the probability of farm succession (Kimhi and Bollman, 1999;
445 Breustedt and Glauben, 2007; Morais et al., 2018).

446 The absence of a significant relationship between land ownership size and succession
447 and between dairy farming and succession motivated us to explore the possible
448 interaction of dairy farming and (owned) farm size. We therefore add an interaction
449 variable for the presence of a dairy farm with land ownership (hectares). As a result of
450 this interaction, farm size is not significant for non-dairy but is significant for dairy
451 farms. This indicates that only larger dairy farms are associated with a higher
452 probability of farm succession. These results are presented in Table 3, which we regard
453 as our main results because the model better captures system-specific succession
454 dynamics and reveals patterns that were not evident in the initial specification shown

in Table 4. The results from the 2020 CSO Census of Agriculture point to an increase in the average size of dairy farms with a reduction in the number of farms classified as specialist dairy. This indicates a rising concentration within dairy farming. The inclusion of the interaction term in Table 3 provides greater explanatory power and offers a more nuanced understanding of the conditions under which farm size matters. For this reason, we present Table 3 as our main model.

The age of the farm holder is positive and statistically significant. This is expected given that older farmers are more likely to have reached the point of identifying a successor (May et al., 2019). The marginal effect indicates that the probability of having a successor increases by approximately 2 per cent per year. Stiglbauer and Weiss (2000) also found a positive relation between the age of the farm holder and farm succession.

The soil quality variable is positive and statistically significant in the farm succession decision. It indicates that better soil quality brings higher productivity, that provide sufficient income to support two generations during succession process.

Table 3
Probit Model Results: Determinants of Farm Succession in 2018

	Model 1			Model 2		
VARIABLES	Coef.	sig	Marginal effect	Coef.	sig	Marginal effect
Interaction of Dairy Farm and Land Ownership	0.0095	**		0.0092	*	
Farmer Age	0.0535	***	0.02	0.0585	***	0.02
Best Soil Category	0.2139	*	0.08	0.198		0.07
Excessive Workload	-0.262	**	-0.09	-0.160		-0.06
Isolation of Living Alone	-0.13		- 0.05	-0.109		-0.04
Net New Investment (€)	0.004		0.001	0.002		0.0009
Formal Advisory Contract	0.0170		0.006	0.025		0.009
Participation in AES	0.317	**	0.11	0.226		0.08
Number of Household Members Age 20 to 44 in 2013**	-		-	0.0003		0.0001
Constant	-3.318	***		-3.645	***	
Observations	501			349		

*** p<0.01, ** p<0.05, * p<0.1

474 The results in Table 3 point to the importance of social factors, including excessive
475 workload. Farmers who report excessive workload and related stress are less likely to
476 have identified a successor. While this may seem intuitive, its importance lies in the
477 broader context of succession as a long-term, endogenous process. May et al. (2019)
478 found that farmers experiencing hardship may be reluctant to encourage their children
479 to pursue farming, reinforcing the idea that such stress has cumulative intergenerational
480 effects. Succession is a gradual process shaped by accumulated experiences, evolving
481 identities, and intergenerational interactions (Fischer and Burton, 2014). Continuous
482 exposure to workload stress as observed by the next generation, can alter perceptions
483 of farming as a viable or desirable career. Such social aspects therefore warrant
484 consideration alongside economic drivers to inform more holistic policy and advisory
485 strategies.

486 Isolation is not statistically significant in both model (with/without lagged variable) and
487 has a negative coefficient as expected. It is noteworthy that a substantial proportion of
488 the sampled farmers, approximately 23%, live alone, and these farmers tend to be less
489 likely to identify successors. The marginal effect of isolation is relatively substantial at
490 -5%, compared to other binary variables. While this finding does not reach statistical
491 significance, it aligns with previous research by Dudek (2016), which emphasises the
492 importance of household composition in farm succession based on panel data from
493 Poland. One possible reason for the lack of significance in our case could be sample
494 size limitations. Nonetheless, the results suggest that social factors, particularly
495 household structure, may play an important role in farm succession decisions.
496 Therefore, incorporating social dynamics into succession models remains a relevant
497 avenue for further research.

Investment was expected to have a strong association with the probability of succession as reported in a previous study in Belgium (Calus et al., 2008). Here it is found to be positive and not significant. Investment could be potentially endogenous given that the presence of a successor could motivate the current holder to invest more. However, we include investment in our model considering its importance, and the fact that farm succession itself has been verified as an endogenous cycle (Fischer and Burton, 2014). Although the investment was not statistically significant in our results, previous research has established it as a key indicator of farm succession. For instance, Calus et al. (2008) found that succession intentions begin influencing farm investment decisions up to ten years before the actual transfer. This suggests that even if this variable does not appear significant in our model, it remains a crucial factor in succession planning, reinforcing the need for early successor identification to ensure farm continuity. The lack of statistical significance in our findings may be partly attributed to sample size limitations. Further research with larger datasets would be beneficial to fully capture the role of investment in farm succession dynamics.

We expected that formal advisory (extension) contract could be an indicator of a higher possibility of farm succession since it may indicate openness or willingness to improve farming activities. While it is not statistically significant, it showed a positive coefficient. Including this variable is valuable, as research on farm succession has often placed less emphasis on social factors. Access to advisory services can be seen as a form of social capital, potentially influencing farm succession decisions by providing guidance and strategic planning support as Abdala et al., (2022) investigated. The lack of statistical significance in our model could be due to heterogeneity in how advisory services are utilised, such as the timing of advisory service use may vary, with some

farmers engaging with advisors too early or too late in the succession process for measurable effects to be captured within our dataset.

Farmer participation in an AES is found to be positive and statistically significant in model 1. This supports the conclusion of Cullen et al. (2020) that participation in such schemes has a positive association with the willingness to continue farming. Participation in environmental schemes can also provide economic incentives to younger farmers.

Finally, the lagged independent variable for the presence of young adults in the farm household is positive and not significant, which is only included in model 2. Although this lagged variable is not statistically significant, it is retained in Model 2 due to its conceptual importance in succession literature and to test robustness. While this result does not provide strong evidence in our model, the presence of young adults is often considered a key factor in succession decisions. The use of this lagged variable allows us to capture long-term household dynamics that may influence successor availability. The lack of significance in our results could be due to sample size, timing differences in succession planning, or unobserved factors influencing young adults' career choices around the age categories. Nevertheless, as previous research of Fischer and Burton (2014) suggests, early exposure to farm life and involvement in decision-making processes play a crucial role in the eventual transfer of farm management.

5. Discussion and Conclusion

In this study, we use econometric methods to explore the drivers and barriers to farm succession, incorporating both social and economic factors. While profitability and land ownership are often key drivers of succession decisions (Pitson et al., 2020), our findings indicate that social factors, such as workload stress and participation in agri-

546 environmental schemes (AES), also play a significant role in shaping succession
547 outcomes. These insights suggest the importance of considering social sustainability
548 alongside economic factors in the farm succession process.

549 Our results reveal that economic characteristics, particularly land ownership size and
550 soil quality, are key determinants in identifying successors associated with greater
551 successor potential. However, social factors also influence succession decisions by
552 shaping both the current farmer's management practices and the potential successors'
553 perceptions of the farm's long-term viability. For example, workload stress can affect
554 how farmers operate day-to-day, while participation in AES may reflect a more future-
555 oriented outlook, which may appeal to younger generations.

556 Succession should not be viewed as a one-time decision but as a continuous process,
557 influenced by ongoing actions and experiences. The decisions of the current farm
558 manager, such as improving soil quality or expanding land, directly affect how potential
559 successors view the farm's future and their potential role. These accumulated
560 experiences contribute to the successor's identity formation and long-term engagement
561 with the farm.

562 In line with Calus (2009), our findings challenge the traditional view that succession is
563 driven solely by economic incentives. Instead, we show that succession unfolds
564 gradually, shaped by evolving social and familial dynamics. Social and economic
565 elements interact over time, making succession a dynamic process rather than a fixed
566 event. Supporting this view, findings from a cluster analysis of Irish farm types further
567 confirm that succession decisions are nuanced and shaped by farm-specific economic
568 viability and household or workload-related social conditions (Loughrey et al., 2025).

569 Notably, our study contributes to the growing body of literature by quantitatively
570 examining social factors (Abdala et al., 2022; Špička and Berg, 2022) and providing
571 unique insights into their role in farm succession dynamics. High work intensity,

572 especially in demanding systems like dairy farming, can contribute to farm exits
573 (Ferjani et al., 2015), further influencing succession dynamics. In addition, succession
574 decisions evolve gradually, shaped by long-term experiences rather than isolated events
575 (Lobley, 2010). The long-term impact of witnessing parental stress from farming can
576 influence the decisions of potential successors, underlining the importance of resilience
577 across both social and material dimensions (Darnhofer, 2020).

578 Further supporting this perspective, Bertolozzi-Caredio (2024) confirms that the
579 presence of a successor influences the behaviour of incumbent farmers, reinforcing the
580 idea that farm succession is a dynamic and mutual process. To facilitate smoother
581 transitions, targeted strategies are needed to support both successors and incumbents.
582 One such approach includes fostering farmer partnership agreements or hiring
583 additional labour that have proven beneficial but remain underutilized (Conway et al.,
584 2017; Garcia et al., 2023; Shin et al., 2023). These measures not only alleviate excessive
585 workloads but also enhance the attractiveness of farming as a viable career path for the
586 next generation.

587 Farms with lower incomes can seek to improve farm viability through participation in
588 AES schemes for example as an economic incentive, particularly on less intensive
589 farms, to stabilise farms. Cullen et al. (2020) notes that a forward-looking self-identity
590 is linked to greater AES participation, ensuring farm continuity for future generations.
591 Furthermore, innovative environmental practices, such as organic farming, may attract
592 younger farmers with new financial incentives through the CAP (Farrell et al., 2022).

593 Policy should broaden its focus to enable succession not only within families but also
594 through hired labour or non-relatives. Our findings imply that policies should address
595 the pathways for both new entrants and incumbents, potentially facilitating partnerships

596 to share workload, knowledge, and profits, thereby ensuring the sustainable
597 continuation of farming enterprises.

598 A limitation of this study is that that it relies on farmers' self-reports about whether
599 they have identified a successor, rather than tracking actual succession events. In
600 addition, capturing farm succession over a longer period would be beneficial. The
601 endogenous cycle of farm succession highlights the link between farmers' identity
602 development and the farm business ladder, which could be better understood using a
603 panel data framework, as in Dudek and Pawłowska (2022). This would help establish
604 the cause-and-effect relationship over time and provide more evidence on the impact of
605 succession on farm continuity, productivity, and sustainability.

606 This study provides valuable insights into farm succession by utilizing a nationally
607 representative dataset. While the dataset used is from 2018, making it one of the most
608 recent sources available for analyzing long-term succession trends, it does not capture
609 the potential impacts of recent economic and social changes, such as the COVID-19
610 pandemic or the ongoing inflationary crisis. These events may have influenced
611 succession decisions by altering economic stability, labour availability, and
612 generational attitudes toward farming. Future research should incorporate more recent
613 data to assess these effects.

614 The statistical significance of some results is limited, partly due to the sample size
615 constraints. Expanding the dataset or complementing quantitative findings with
616 qualitative approaches, such as interviews with farmers and advisors, could provide
617 deeper insights into the role of social capital in succession planning.

618 Despite these limitations, this study highlights the importance of understanding both
619 economic and social factors in farm succession. Future research should continue

exploring these aspects, particularly in the context of evolving economic conditions and policy changes that shape generational renewal in agriculture.

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Appendix

Table 4
Probit Model Results: Determinants of Farm Succession in 2018

	Model 1			Model 2		
	Coef.	Sig	Marginal effect	Coef.	Sig	Marginal effect
Dairy Farm	0.3019		0.12	0.3504	*	0.12
Land Ownership	-0.0008203		0.00	-0.000959		0.00
Farmer Age	0.05858	***	0.02	0.05407	***	0.02
Best Soil Category	0.1991		0.07	0.2050		0.07
Isolation of Living Alone	-0.1683		-0.05	-0.1717		-0.06
Excessive Workload	-0.1421		-0.05	-0.2589	*	-0.09
Net New Investment	0.000000949 8		0.00	0.0000008113		0.00
Formal Advisory Contract	0.01844		0.01	0.008074		0.00
Participation in AES	0.1900		0.07	0.2910	*	0.1
Number of Household Members Age 25 to 44 in 2013**	-0.005908		-0.00			
Constant	-3.736	***		-3.443	***	
Number of obs			349			501
Pseudo r-squared			0.161			0.124

*** p<.01, ** p<.05, * p<.10