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Abstract

In a search of higher income and lower dependence on intermediaries in the food chain, family farms are increasingly adopting short food supply chains (SFSCs). The purpose of this paper is to investigate the role of farm entrepreneurs and their family in defining the implementation of SFSCs. We use the 2010 Exhaustive Agricultural Census of French farms and implement a logit model. The results underline the fact that young and educated farm entrepreneurs are more likely to promote SFSCs. The presence of the family on the farm as well as the involvement of family members play a key role in the choice of SFSCs. However, the marital status of a farm entrepreneur and the involvement of their spouse have no specific influence. This research sheds new light on the key role played by families in supporting productive and marketing strategies of farms.

Keywords: family-run management; short food supply chains; farming

1. Introduction

Over the last decade, farms have experienced rapid changes relating to their identity, the role of family and their institutional context (Fitz-Koch *et al.*, 2018). In light of the involvement of several generations who have settled in the same place, most farms are family-owned and family-operated businesses (Dorocki *et al.*, 2015; Glover and Reay, 2015; Jervell, 2011). They are generally managed by one or several nuclear family households (Lowder *et al.*, 2016). Despite changing social and economic pressures, the family unit fundamentally remains at the social and economic heart of farm ownership and operations (Pritchard *et al.*, 2007; Sgroi *et al.*, 2016). While many research studies centred on farm activities pay attention to the role of the family or the household, few studies explicitly focus on the farming family itself (Fitz-Koch *et al.*, 2018; Ratten *et al.*, 2018).

However, strategic and operational decisions rely on family considerations and involvement (Hanson *et al.*, 2013). Diversification of activities is one of the most important decisions taken at farm level, corresponding to an extension from core activities in order to remain in and grow the business (Dorocki *et al.*, 2015; McElwee and Robson, 2005). Farm entrepreneurs have been encouraged to diversify their activities in response to risks relating to their revenue (Hanson *et al.*, 2010; Sgroi *et al.*, 2016) and growing retailer concentration (Alsos & Carter, 2006). In that context, Carter (1999) showed that family labour represents an advantage in pursuing new opportunities, especially beyond strictly productive farm activities.

One means of diversifying is to extend the range of supply chains and exchanges with business partners (Tonner and Wilson, 2015). While marketing activities were not initially valued by farmers, they have become a distinctive feature among producers (Capt and Wavresky, 2014), enabling them to become entrepreneurs (Bayir *et al.*, 2022). The development of short food supply chains (SFSCs) has experienced remarkable growth among farmers over the last decade. SFSCs are defined by the French Ministry of Agriculture as “a means of marketing agricultural products by selling directly or indirectly to consumers, provided there is only one intermediary” (French Ministry of Agriculture, 2009). Other definitions of SFSCs can be found in the literature. In addition to the number of intermediaries, some authors consider the physical distance between producers and consumers (Coley *et al.*, 2009; Martinez *et al.*, 2010; Chaffotte and Chiffolleau, 2017). The latter definition involves considering the place of residence of both producers and consumers, and the purchasing context (French Ministry of Agriculture, 2009). SFSCs are a commercial strategy defined on a non-exclusive basis (Bazzani and Canavari, 2013). Producers may decide to sell all or part of their production through this marketing channel, which results in a diversification of food channels with the co-existence of short and long supply chains (Aguiar *et al.*, 2018; Chiffolleau *et al.*, 2019).

The significant adoption of SFSCs can be traced back to different sources, mainly at the initiative of consumers. First, food crises have reduced consumers’ trust in so-called long supply chains. In response to this, consumers have been looking for shorter marketing channels (Giampietri *et al.*, 2016). Hence SFSCs are considered as a relevant alternative able to meet their requirements (Kneafsey *et al.*, 2013). Second, SFSCs promote “local produce, tradition, authenticity which restores the social link between consumers and producers, [...] as well as knowledge of produce and the associated production process” (French Ministry of Agriculture, 2009). Consumers want to break with the anonymity associated with long marketing channels (Renting *et al.*, 2003). SFSCs create close ties between producers and customers (McNally, 2001) and develop the social capital of the farms (Ratten *et al.*, 2018). Third, SFSCs are associated with responsible consumption and promote certain ethical values such as better environmental practices (Aubert and Enjolras, 2016; Berti and Mulligan, 2016;

Gianpietri *et al.*, 2016).

The merits of SFSCs have encouraged recent public policies to support their development because they represent a way to meet the consumers' requirements for a stronger link with farmers (French Ministry of Agriculture, 2009). This aim is supported both at the European level, through the second pillar of the Common Agricultural Policy (CAP), and at national level through dedicated action plans. At the European level, the second pillar of the CAP promotes "the improvement of quality of life in rural areas and [...] diversification of economic activities". To implement it, measure 311 of the Rural Development Policy focuses directly on "diversification into non-agricultural activities" and supports direct marketing and selling. This measure is intended not only to maintain and develop economic activities, but also to promote employment in rural areas (European Commission, 2006).

At the European level, France is one of the leading agricultural producers. Some 19% of the 67 million inhabitants lived in rural areas in 2020. In the countryside, agriculture marks the landscape, even if it no longer structures the activity (Dana *et al.*, 2014). In France, public policies are mainly aimed at protecting the population (Dana, 2017). This phenomenon is all the more pronounced in the agricultural sector, where regulations protect consumers through production and marketing standards and farmers by promoting the distinctive characteristics of their production in a largely globalised market. The two main objectives of the 2009 national action plan in favour of SFSCs were to increase selling of seasonal products and to strengthen the proximity between producers and consumers (French Ministry of Agriculture, 2009). Sales through SFSCs are based on an agricultural production fabric that is now more open to marketing issues. According to the national survey on the structure of French farms conducted in 2016, 23% of farms had implemented sales through SFSCs, mainly direct sales. The proportion was particularly high for distinctive products (fruit and vegetables, wine-growing, flowers, sheep and goats).

The adoption of a marketing channel is therefore conditioned not only by the farmers' skills and resources but also by the environment in which they work. The literature has already considered the impact of these determinants, but few studies have examined the specific impact of the family and its members on marketing choices in detail (Neubaum, 2018). It is nevertheless acknowledged that family plays a significant role in farm management and innovation (Aguiar *et al.*, 2018; Dorocki *et al.*, 2015). The main contribution of this study is to consider the influence of both the members and the structure of the family, including the farmer, on the adoption of SFSCs. In particular, we consider the marital status of the farmer, the involvement and the number of family members present on the farm.

Our study relies on the exhaustive Agricultural Census of French farms conducted in 2010. All farms are surveyed, regardless of their productive orientation, their size and their location. The unit considered is the individual farm and the information collected relates to the farm, the farm owner, their family and employment on the farm. Precise information is provided regarding farm production and marketing.

This article is organized as follows. In the first part, we present the conceptual framework of our study. In the second part, we explain the empirical strategy used in this article. In the third part, we present the results of our study. In the fourth part, we conclude by presenting some perspectives related to this work.

2. Conceptual framework

The adoption of short food supply chains (SFSCs) is an individual marketing choice made by farm entrepreneurs in a changing environment (McElwee, 2006; Aubert and Enjolras, 2014). Putting the farm owner and their family at the heart of this process underlines that the farmer's intrinsic characteristics contribute to selecting the marketing channel implemented. Expanding productive activities, more specifically through marketing, relies on knowledge, skills and capabilities that are specific to each family (McElwee, 2006). Beyond these internal factors, many authors highlight the key role of the environment, in the broadest sense of the world, in which the farmer operates (Bowler *et al.*, 1996; Daskalopoulou and Petrou, 2002; Capt and Wavresky, 2014).

2.1. The farmer and their family's characteristics

The literature first outlines the role of the farm owner in the decision to innovate and diversify business activities (Dorocki *et al.*, 2015). New farmers, who are often young, prefer to sell through SFSCs. Hence, they seek to benefit from market opportunities offered by these marketing channels (De Wolf *et al.*, 2007).

Hypothesis 1.1. Young farm owners are more likely to sell their production through SFSCs.

The manager's education background plays a key role in a small business to professionalise and grow (Chang *et al.*, 2022). Selling through SFSCs translates into a need for additional skills which do not necessarily refer to agricultural skills (Fitz-Koch *et al.*, 2018). The productive activity mainly requires agricultural skills. Associating this activity with a marketing one translates into a need for new skills (Berti and Mulligan, 2016; De Wolf *et al.*, 2007). These skills can be developed through agricultural and general education, referring to a wide range of curricula and therefore to diverse skills that are complex to qualify (Aubert and Enjolras, 2018). The influence of the farmers' family on on-farm decisions is usually considered as an informal network which conditions their behaviour (Bultena and Hoiberg, 1983; Somda *et al.*, 2002; Barrera *et al.*, 2005; Asghari and Hadi, 2009; Sharma *et al.*, 2011). In particular, this network allows the farmer to benefit from improved access to information, training and advice (McDonald and Glynn, 1994; Traoré *et al.*, 1998). The level of education of the family is therefore assumed to exercise a positive influence on the farmer's behaviour towards the adoption of SFSCs (Perrier-Cornet and Aubert, 2009).

Hypothesis 1.2. Educated farm owners and family members are more likely to sell their production through SFSCs.

The multitude of tasks imposed by SFSCs requires a strong involvement of the farm owner (McNally, 2001; Mastronardi *et al.*, 2015). The time spent on the farm is therefore a key element facilitating the expansion of productive activities to marketing activities. Many studies also highlight the role of family work on the farm in general (Aggestam *et al.*, 2017; Berti and Mulligan, 2016; Dorocki *et al.*, 2015; Galli and Brunori, 2013; Kneafsey *et al.*, 2013). It is therefore appropriate to take the involvement of the family in the farm business into account, which we measure by the number of family members living on the farm. The literature shows that the diversification of the farm is strongly related to the involvement of family members (Clay *et al.*, 1998; Olujide and Adeogun, 2006; Barbieri *et al.*, 2008, Aubert and Enjolras, 2018). In particular, Dorocki *et al.* (2015) show that a family business has three advantages that facilitate the diversification of activities: self-sufficiency, work sharing and easier dialogue and conflict resolution. We assume that the more family members work on the farm, the more likely the farm owner is to sell through SFSCs.

Hypothesis 1.3. Involved farm holders and family members are more likely to sell their production through SFSCs.

Some studies emphasize that the family structure influences the strategy implemented by family businesses (Ramadani and Hoy, 2015). Spouses in particular play a key role in managing new ventures (Hansson *et al.*, 2013). We thus consider the marital status of the farmer and assume that farmers who are engaged or married are more likely to sell through SFSCs, since this activity requires workforce. Farm couples are therefore more likely to meet these requirements than a single farmer (Danes *et al.*, 2002). The same argument can be considered for any other member of the family working on the farm.

Hypothesis 1.4. Engaged or married farm owners are more likely to sell through SFSCs

2.2. Farm characteristics

The link between the physical dimension and the choice of a marketing channel is controversial in the literature. Some authors hold that the largest farms have the largest growth potential (McElwee and Bosworth, 2010). They therefore have a higher probability of extending the scope of their activities, in particular by developing a marketing strategy through short food supply chains. For others, SFSCs represent an opportunity for smaller farms to explore other marketing channels rather than conventional ones, which they can not necessarily access (Dupré *et al.*, 2017; McNally, 2001). SFSCs take on different forms that seem to correspond to farms of different sizes. The smallest ones are more prone to adopting direct selling on the markets or on the farm. The largest ones are more inclined to adopt collective selling points or intermediated sales (Berti and Mulligan, 2016).

The hypothesis considered as part of our study is that there is a positive relationship between the physical dimension of the farm and the fact that farmers sell through SFSCs due to incompressible costs that are relatively easier for larger farms to bear. Since the physical size of the farm refers to several realities depending on the types of production implemented, the economic size of the farm appears to be better adapted to measuring farm size. The economic size of the farm corresponds to the combination of the economic valuation per hectare of each production at the farm level.

Hypothesis 2.1. Farms with a large economic dimension are more likely to sell through SFSCs

Selling through SFSCs translates into an additional workload (McNally, 2001). Such a marketing strategy implies a specific organisation which encompasses production, processing and marketing tasks (Berti and Mulligan, 2016). A farm is more able to expand its activities when it has a large enough workforce to cope with the excess workload (McElwee and Bosworth, 2010). This workload must be considered in itself, but also in relation to other activities. Activities associated with the marketing strategy may conflict with other activities according to the period of the year considered, e.g., one worker dedicated to production may, at the same time, be assigned to marketing during the harvesting season.

Selling through SFSCs is also translated by an adaption of the farm activity organisation and a redefinition of attitudes and coordination rules (Aggestam, 2017; Berti and Mulligan, 2016). Moreover, resources available to the farms, especially the workforce, are a prerequisite for the

diversification of agricultural activities to marketing ones (Perrier-Cornet and Aubert, 2009).

Hypothesis 2.2. Labour-intensive farms are more likely to sell through SFSCs

In order to take the importance of the workforce into account in marketing channels, the weight of permanent employees among the whole workforce on the farm plays a significant role (Perrier-Cornet and Aubert, 2009). Moreover, the marketing activity associated with SFSCs is more stable than the productive activity, which is rather seasonal (Galli and Brunori, 2013).

Hypothesis 2.3. Farms with a large permanent salaried workforce are more likely to sell through SFSCs.

2.3. Productive strategy

Selling through SFSCs requires the implementation of a diversification strategy, particularly in terms of production (Berti and Mulligan, 2016; Dupré *et al.*, 2017; Fitz-Koch *et al.*, 2018). Offering an extended range of produce is necessary to satisfy consumer expectations and stabilize the farm's income (Dupré *et al.*, 2017).

Hypothesis 3.1. Diversified production is more likely to be sold through SFSCs

Echoing Moustier and Nguyen (2015), we consider that the adoption of certified production reduces information asymmetries regarding produce quality (Akerlof, 1970). Producers involved in SFSCs are building trust when they adopt certifications (Giampietri *et al.*, 2018). Hence, certified farmers are more likely to sell through SFSCs than others (Kneafsey *et al.*, 2013; Demartini *et al.*, 2017). More precisely, we consider the Organic Farming certification as the relationship between this certification and the diversification of marketing channels has been proven in the French case (Aubert, 2016; Aubert and Enjolras, 2016).

Hypothesis 3.2. The Organic Farming certification is more likely to be sold through SFSCs

2.4. Control variables

Beyond the resources and skills available on farms, the environment in which farmers operate conditions the choice of marketing channel (Perrier-Cornet and Aubert, 2009). As a matter of fact, even if selling through SFSCs is implemented for all agricultural specialisations, it is more likely to be implemented for fruit, vegetables and wine-growing (Bazzani and Canavari, 2013; Galli and Brunori, 2013). The individual choice of the entrepreneur-farmer benefits from external opportunities and he adopts his behaviour within the environment he evolves in (Alsos *et al.*, 2003). Consequently, the location of the farm may also play a role in the adoption of SFSCs.

3. Methodology

According to the survey by Bayir *et al.* (2022), most studies that focus on the implementation of short food supply chains at the farm level are of a qualitative nature. While this approach

allows for an in-depth description of the process of adopting these new marketing channels, it is not suitable to study the profile of a 'typical' family business (Dana and Dana, 2005). Our methodology is therefore based on a quantitative analysis benefiting from a representative survey of French farms, which allows us to use a large and representative sample.

3.1. Database

Our study is founded on the exhaustive Agricultural Census of French farms conducted in 2010. All farms are surveyed, regardless of their productive orientation, their size and their location. The unit considered is the individual farm and the information collected relates to the farm, the farm owner and employment on the farm.

First, the census identifies the farmers' individual characteristics and all information related to their family and their employees. In particular, the information collected provides data about their age, level of education and time spent on the farm. Second, structural characteristics are mainly related to the types of production implemented and the identification of farm activities, including production and marketing channels. The main variables and a summary of the research hypotheses are presented in Table 1.

Table 1. Description of the main variables and associated hypotheses

In 2010, the Agricultural Census listed 516,152 farm holdings of which 102,040 sold all or part of their production through SFSCs, i.e., 20% of French farms. Among farmers who adopted this marketing strategy, 80% indicated the share of their sales through the different marketing channels. Nearly 40% of these farmers declared that this activity contributed to more than 75% of total sales while almost 30% estimated this contribution to be less than 10%. SFSCs can thus be considered either as an alternative or a complementary activity to selling through conventional channels (De Wolf *et al.*, 2007).

By combining the structural characteristics of the farm with the individual characteristics of the farmer and their family, we are able to provide an overview of the main particularities of farms selling through SFSCs compared to the others. Our study aims to consider both the impact of family farming and the involvement of family members as well as their combined effects.

To do so, we differentiate four types of farms as follows:

- Single farming: the farmer is not engaged or married and has no family member living on the farm.
- Family farming: the farmer is not engaged or married but is living with, at least, one family member.
- Couple farming: the farmer is engaged or married but no other family member is living on the farm.
- Enlarged family farming: the farmer is engaged or married and some family members are living on the farm.

Table 2 summarizes this categorisation.

Table 2. Typology of farms according to the farmer's marital status and family involvement on the farm

3.2. Econometric model

We implement a logit model which allows us to understand which factors influence the marketing decision to sell through SFSCs. We consider the main elements identified by the literature: the farmer, their family and the farm characteristics, the productive strategy and the environment in which the producer operates. This model allows us to underline the relevance of each explanatory variable in explaining the farmer's decision regarding the marketing channels.

The model can be formalized, in a synthetic way, as follows:

$$(1)$$

A farmer i decides to sell through SFSCs () according to a continuous and unobservable variable, denoted :

$$(2)$$

where α is the constant, β the coefficients associated with the farmer and their family's characteristics, γ the coefficients associated with farm characteristics, δ the coefficient associated with the productive strategy, the coefficients associated with control variables and ϵ the error term.

4. Results

4.1. Descriptive statistics

Descriptive statistics compare the farmers and their family, farm characteristics, the productive strategy implemented and control variables depending on whether or not the farm sells through SFSCs.

Descriptive statistics underline the fact that farmers under 55, and more precisely aged between 35 and 45, whose level of education is secondary or higher and who declared themselves to be primarily farmers, are over-represented in the category of farmers who sell through SFSCs (Table 3).

Table 3. Farmer and farmer's family characteristics according to the implementation of short food supply chains

The results also highlight the influence of the farmer's family structure on the choice of marketing channels. Short food supply chains are adopted more by couples and families than by single farmers. This result goes hand-in-hand with the fact that SFSCs are generally associated with a larger number of family members working on the farm. Farm characteristics vary considerably according to the marketing channel. Medium-sized farms are over-represented among the adopters of SFSCs. Furthermore, they employ around 8 workers per hectare on average while less than 3 are employed by farmers selling through traditional channels. They also employ more workforce, which is in line with the requirements associated with the diversification of marketing channels (Table 4).

Table 4. Structural characteristics and productive strategy of farms and control

variables according to the implementation of short food supply chains

We observe an over-representation of farmers who have adopted the Organic Farming certification in the category of farmers selling through SFSCs. Moreover, farmers diversifying their commercial channels also seem to diversify their production, which is in line with customers' expectations. Hence, while farmers selling through SFSCs implement an average of 2.53 different types of production, other farmers implement 2.10 productions.

The results highlight the fact that market gardening and fruits are the two main productive orientations that are the most likely to adopt SFSCs. The associated produce does not require any transformation to be sold, contrary to cattle breeding or wine-growing. Farmers who decide to expand their productive activity are more likely to sell their production through SFSCs if no intermediate step is needed between the production and distribution steps.

We observe that farms located in Provence-Alpes-Côte d'Azur, Occitanie and Auvergne-Rhône-Alpes are more likely than others to sell through SFSCs. These regions are located in the South-Eastern part of France, which is popular with tourists. Proximity to consumers facilitates the process of selling through SFSCs.

4.2. Econometric analysis

The estimation of the econometric models provides some insights into the main factors leading to farmers adopting SFSCs (Table 5).

Table 5. Econometric models

As expected, the results confirm that farm entrepreneurs' age and education play a critical role in the adoption of SFSCs. Young farm owners are indeed more likely to sell through SFSCs (*H1.1 validated*). They appear to be more sensitive to innovation (McElwee, 2006) and they are more able to seize market opportunities offered by SFSCs (De Wolf *et al.*, 2007). Among them, farmers aged between 35 and 45 are the most inclined to sell through SFSCs. For farmers over the age of 45, we observe a steady reduction in the adoption of SFSCs. The relationship between the farmer's age and the probability of selling through SFSCs can thus be summarized by a bell curve, the highest probability being observed for farmers aged between 35 and 45. The results also demonstrate a linear progression between the level of education on the farm and the probability of selling through SFSCs (*H1.2 validated*). Hence, following the results obtained by Perrier-Cornet and Aubert (2009), the presence of a family member with a higher level of education translates into a higher probability of selling through this channel. The relationship is the opposite for farms on which family members have received only a primary education.

Furthermore, the results indicate that SFSCs are more likely to be implemented by individuals involved primarily in farming, which is in line with McNally (2001) and Mastronardi *et al.* (2015). These farmers are indeed better able to allocate a part of their time to the marketing activity in addition to the productive one (*H1.3 validated*). Moreover, adoption of SFSCs increases when there is at least one member of the family living on the farm ('family farming' or 'enlarged family farming'), even if there is no apparent relationship between the number of family members and the marketing channel. These results are in line with the existing

literature in that they demonstrate that the general involvement of the farm entrepreneur and their family is decisive for the expansion of farm activities (Aggestam *et al.*, 2017; Dorocki *et al.*, 2015). However, we notice that ‘Couple farming’ has no specific influence on the adoption of SFSCs, which contradicts the findings of Danes *et al.* (2002). Therefore, the presence of the family on the farm is more important than the marital status of the farmer in the choice of marketing channels (*H1.4 not validated*).

The results clearly show that economic size influences the marketing strategy implemented by farmers. The relationship is not linear since medium-sized farms are more likely to sell through SFSCs compared to smaller or larger farms. Hence, the relationship between farm size and the probability of selling through SFSCs is a bell curve. This result seems to prove that a farm needs to reach a minimum physical threshold to sell through SFSCs (*H2.1 partially validated*). This result complements the existing literature, which presents mixed results relating to the role of farm size in the expansion of its activities.

Farms selling through SFSCs employ a larger workforce than other farms (*H2.2 validated*). Moreover, farms which employ at least one permanent worker are more likely to sell through these channels than other farms, which confirms that associating productive and marketing activities requires a permanent workforce (*H2.3 validated*). Expanding the farming activity to a marketing one lies on a more intensive workforce, since each worker has to be dedicated to a specific strategy at the time, which is either productive or commercial (Berti and Mulligan, 2016). This result confirms that a workforce is a prerequisite for the diversification of agricultural activities. We also notice that the presence of a permanent workforce is also essential for SFSCs (McElwee and Bosworth, 2010).

The productive strategy can be measured through the degree of diversification and the adoption of certification. The results underline the fact that farms that are more likely to sell through SFSCs are more diversified (*H3.1 validated*). Indeed, diversifying production helps meet consumers’ requirements in terms of commodity baskets, as shown by Dupré *et al.* (2017). The results also highlight the fact that organic farms are more likely to sell through SFSCs than non-certified farms (*H3.2 validated*). The Organic Farming certification acts as a guarantee for the consumer that the production meets high quality requirements regarding the use of phytosanitary products. Therefore, it shares common characteristics with SFSCs, which value the quality of production (Aubert and Enjolras, 2016).

Finally, the farmers’ choice to diversify their agricultural activity by selling through SFSCs is conditioned by the productive and geographical environment in which they operate. This point confirms that some productive orientations, such as market gardening and fruit, are more likely to sell through SFSCs than others. The results also underline the fact that the location of farms, especially in the South-Eastern part of France, influences the diversification of marketing.

4.3. Discussion

This paper has focused on the influence of the farmer and their family’s characteristics on the adoption of short food supply chains (SFSCs). The literature underlines the key role of the family in driving and accompanying change in small businesses. This is all the more true for farms, which are facing profound changes, particularly with regard to the valuation of their produce on markets that have become competitive.

Against this backdrop, the results confirm the literature by showing that the characteristics of the farm manager (age and education) and those of their family help to explain the adoption of a new marketing method that complements a strictly productive activity. The practical management of a farm is a complex issue, given the strong production constraints and the associated risks. Adding marketing activities therefore requires not only additional labour but also specific skills. The family appears to be a favourable environment for such a development due to several factors. Farmers' families very often live on the farms, creating a natural proximity. Some families have also been in the farming sector for generations, helping to drive continuous change. Far from being an obsolete concept, the promotion of family farming underpins its modernisation and the increased quality of its production.

Although our study has the advantage of drawing a typical portrait of a family farm implementing SFSCs, this quantitative approach is not without its limitations. In particular, the tangible implementation of alternative marketing methods by the family is not addressed. Moreover, the process is non-linear and long-term because of the changes it involves, which implies going beyond a cross-sectional analysis. Finally, a particular issue is becoming increasingly important for farms: succession with or without passing on to the next family generation. This process, which we were unable to address, is also a long-term one, mostly within a family framework. Young farmers benefiting from family support are thus helped to modernise their production methods and make them more sustainable.

5. Conclusion

A growing number of research articles focus on the adoption of short food supply chains (SFSCs). This kind of marketing channel is indeed increasingly popular among farm entrepreneurs. In addition to strictly productive activities, farmers have to actively manage the marketing of their products, which requires an adaptation of their practices. Our approach to understanding this dynamic is original, focusing on the influence of the farmer and their family's characteristics. We focus on the French context and consider the 2010 exhaustive census of French farms, which surveys all farms. This representative sample makes it possible to define the typical portrait of a family farm adopting SFSCs.

The results show that family plays a key role in the adoption of short food supply chains. Age and education, as well as the involvement and the marital status of family members, strongly influence the marketing decision. By contrast, the number of family members does not matter. The model also proves that SFSCs are adapted for medium-sized farms and for farms benefitting from a larger, permanent workforce. Diversifying production and adopting Organic Farming certification are measures in favour of SFSCs while some types of production, such as fruit and market gardening, and certain regions are better suited to these alternative channels.

Given that productive and marketing strategies are interdependent, future research should analyse the influence of family structure on the choice of productive practices and hence offer them opportunities to promote their production much more. Since the family and its structure influence the marketing strategy implemented by farm entrepreneurs in the long term, it would be useful to consider a dynamic analysis over several years. Furthermore, it would be interesting to study the life cycle of farms more precisely in order to explore the issue of their transfer and succession, and the resulting influence on the innovative practices of farms.

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Table 1. Description of the main variables and associated hypotheses

Variables	Definition	Expected influence on SFSCs	Research hypotheses
Farmer and his family characteristics			
Age	Age of the farm owner: 1 if the farmer is under 35; 2 if he is between 35-45; 3 if he is between 45-55; 4 if the farmer is over 55	-	H 1.1

Education	The highest level of agricultural and general education observed for any family member: 1 if no education; 2 if primary; 3 if secondary; 4 if higher	+	H 1.2
Main activity declared	The main activity declared by the farmer: 1 if the producer declares to be primarily a farmer; 0 otherwise	+	H 1.3
Presence of family members	The presence of other family members living on the farm: 1 if the farmer lives with other family members; 0 if the farmer lives alone	+	H 1.3
Marital status	The farmer's marital status, associated with the presence of any other family members: 1 single farmer; 2 couple farming; 3 family farming; 4 enlarged family farming	+	H 1.4
Farm characteristics			
Economic size	The farm is qualified as: 1 small; 2 medium; 3 large	+	H 2.1
Workforce	Number of workers on the farm	+	H 2.2
Permanent workforce	The presence of permanent workforce on farm: 1 if there is, at least, one permanent person; 0 otherwise	+	H 2.3
Productive strategy			
Diversification	The number of productions implemented on the farm	+	H 3.1
Certification	The production complies with the Organic Farming certification: 1 if yes and 0 otherwise	+	H 3.2
Control variables			

Productive orientation	The main productive specialisation of the farm		
Location	The region in which the farmer is located		

Table 2. Typology of farms according to the farmer's marital status and the involvement of their family on the farm

		There is, at least, one member of the family living on the farm	
		No	Yes
The farmer is engaged or married	No	Single farming	Family farming
	Yes	Couple farming	Enlarged family farming

Table 3. Farmer and farmer's family characteristics according to the implementation of short food supply chains

		Short food supply chains			Equality of means test / Chi2 test
		No	Yes	Total	
Age	Under 35	8.23	10.69	8.57	***
	35-45	20.56	23.51	20.97	
	45-55	32.15	33.66	32.36	
	Over 55	39.05	32.15	38.10	
Level of education	No education	5.11	3.74	4.92	***
	Primary	45.53	37.39	44.41	
	Secondary	38.84	45.21	39.72	
	Higher	10.52	13.66	10.95	
Main activity declared	Farmer	31.35	20.80	29.90	***
	Other	68.65	79.20	70.10	
Marital status and family members who live on the farm	Single farming	59.51	49.17	58.09	***
	Couple farming	32.99	42.33	34.28	
	Family farming	5.98	6.47	6.05	

	Enlarged family farming	1.51	2.02	1.58	
Total percentage	100.00	100.00	100.00		
Number of family members on the farm	0.72	0.79	0.73		***

Source: Own contribution based on the 2010 Exhaustive Census of French farms.

Keys: The null hypothesis considers equality of means or independence between the two populations. Means are significantly different at the 10% (*), 5% (**) and 1% (***) thresholds. The two populations are independent at the 10% (*), 5% (**) and 1% (***) thresholds.

Table 4. Structural characteristics and productive strategy of farms and control variables according to the implementation of short food supply chains

		Short food supply chains			Equality of means test / Chi2 test
		No	Yes	Total	
Farm characteristics					
Economic size	Small	36.58	35.66	36.45	***
	Medium	29.77	36.16	30.65	
	Large	33.65	28.18	32.90	
Permanent workforce	No	86.94	82.49	86.33	***
	Yes	13.06	17.51	13.67	
Workforce per hectare	2.53	7.75	3.23		***
Productive strategy					
Diversification	2.10	2.53	2.16		***
Organic farming	No	96.88	93.40	96.40	***
	Yes	3.12	6.60	3.60	
Control variables					
Productive orientation	Field crops	26.27	12.92	24.43	***
	Market gardening	2.12	8.27	2.96	
	Wine growing	16.05	2.85	14.24	
	Fruit production	2.97	8.91	3.76	
	Cattle breeding	36.37	33.59	35.99	
	Granivores	5.70	8.49	6.08	
	Other specialisations	10.52	24.95	12.51	
Location	Grand Est	10.41	7.65	10.03	***

	Nouvelle Aquitaine	17.26	14.98	16.95	
	Auvergne Rhône Alpes	11.98	18.16	12.83	
	Normandie	7.59	4.83	7.21	
	Bourgogne-Franche-Comté	6.29	5.18	6.13	
	Bretagne	7.34	4.93	7.01	
	Centre Val de Loire	5.30	3.89	5.10	
	Provence-Alpes-Côte d'Azur	4.29	10.51	5.14	
	Ile de France	0.99	1.19	1.02	
	Occitanie	15.74	17.79	16.02	
	Hauts de France	5.59	5.36	5.56	
	Pays de la Loire	7.22	5.54	6.99	

Source: Own contribution based on the 2010 Exhaustive Census of French farms.

Keys: The null hypothesis considers equality of means or independence between the two populations. Means are significantly different at the 10% (*), 5% (**) and 1% (***) thresholds. The two populations are independent at the 10% (*), 5% (**) and 1% (***) thresholds.

Table 5. Econometric model

	Coefficient	Odds Ratio
Farmer and farmer's family characteristics		
<i>Farmer's age (ref: Under 35)</i>		
35-45	0.0654***	1.07
45-55	-0.0310***	0.97
Over 55	-0.1986***	0.82
<i>Maximum level of education (ref: No education)</i>		
Primary	-0.1986***	0.82
Secondary	0.1289***	1.14
Higher	0.3607***	1.43
Main activity of the farmer	0.3376***	1.40
Number of family members	-0.0143	/
<i>Family type (ref: Single farming)</i>		
Family farming	0.0498***	1.05
Couple farming	0.0306	
Enlarged family farming	0.2561***	1.29
Farm characteristics		
Permanent workers	0.5150***	1.67
Workforce per hectare	0.7811***	/
<i>Economic size (ref: Small)</i>		
Medium	0.1154***	1.12

Large	-0.5930***	0.55
Productive strategy		
Diversification	0.3230***	/
Organic Farming certification	0.2953***	1.34
Control variables		
<i>Productive Orientation (ref: Field crops)</i>		
Fruit production	0.8963***	2.45
Market gardening	0.9575***	2.61
Wine-growing	-1.9569***	0.14
Cattle breeding	-0.1666***	0.85
Granivores	0.3630***	1.44
Other specialisations	0.4595***	1.58
<i>Location (ref: Grand Est)</i>		
Auvergne-Rhône-Alpes	0.2379***	1.27
Bourgogne-Franche-Comté	-0.1247***	0.88
Bretagne	-0.5768***	0.56
Centre-Val de Loire	-0.0987***	0.91
Provence-Alpes-Côte d'Azur	0.8437***	2.32
Hauts de France	0.0951***	1.10
Ile de France	0.4646***	1.59
Normandie	-0.4301***	0.65
Nouvelle Aquitaine	-0.2524***	0.78
Occitanie	0.1181***	1.13
Pays de la Loire	-0.3163***	0.73
Concordance rate		76.6%
Number of observations		4 917 947

Source: Own contribution, based on the 2010 Exhaustive Survey of French farms.

Keys: Estimates significant at the 10% (*), 5% (**), and 1% (***) thresholds