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# The dynamics of direct selling for wine-growing farms

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**Abstract:** Direct selling is a marketing strategy that is developing quickly, especially in the wine-growing sector. While many studies have focused on the factors and strategies leading to the adoption of short food supply chains, this study aims to study the dynamics and sustainability over time of direct selling as adopted by wine-growing farms. The data examined relates to French farms within the Farm Accountancy Data Network (FADN) operating continuously over the period 2006 to 2012. The analysis calls on a two-step Heckman selection model that considers the duration of the direct selling adoption, conditioned by the farmers' initial decision to adopt such marketing strategy or not. The results emphasise the fact that size is a key factor driving the conversion to direct selling. This marketing channel is chosen by wine-growing farms keen to increase their acreage but to decrease their economic and financial size, as well as their use of phytosanitary products. These results reflect the emergence of a specific model of small wine-growing farms centred on the adoption of direct selling.

**Keywords:** direct selling; wine-growing; farm size; Heckman; France.

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## **Introduction**

Direct marketing strategies currently raise a great deal of interest as they closely link producers and consumers (Goodman et al., 2012). According to the definition of the French Ministry of Agriculture, they are characterised by the presence of no more than one intermediary in the supply chain between the seller and the buyer. The expansion of direct marketing goes hand in hand with a growing political interest, mainly in Europe (Kneafsey et al., 2013) and in the United States (Low and Vogel, 2011). As a result of this interest in short marketing channels, France would appear to be one of the leaders in the field of direct selling in the agricultural sector since in 2010 with almost 84,000 farmers (representing about one fifth of all farmers) selling all or part of their production via this channel (French Ministry of Agriculture, 2012a). The share of direct selling in this country accounted for almost 13% of total food sales in 2015 (French Ministry of Ecology, 2017). By comparison, the estimated value of total local food sales in the United States represented 7.8% of all food sales by U.S. farms in 2012 (Low et al., 2015).

Many segments in the agricultural sector call on direct selling. Among them, wine-growing is a perennial activity whereby grapes are preferentially converted to wine, which is a storable product. As noted by Gamble and Taddei (2007) and Olsen et al. (2016), wine-growing farms' marketing strategies have long been oriented towards production. In a context of fierce competition, differentiation through marketing strategies offers wine-growers a means of developing their entrepreneurial capacities extending beyond strictly productive activities (Thomas et al., 2013) to include management of their image and the creation of privileged relationships with consumers, as well as price adjustments in order to generate a competitive advantage (Dodd, 1999; Forbes and Kennedy, 2016).

In practice, the marketing of wines mainly relies on supermarkets and traditional retail channels (Szolnoki and Hoffmann, 2014). When it comes to direct marketing, Bruwer (2008) and Conto et al. (2015) identify the most frequently used channels as markets, wine fairs, cellars and wine clubs. Internet sales account for only a small share of direct sales because wines are complex products (Gurau and Duquesnois, 2008). Selling through producer organisations also represents an opportunity as most wine-growing farms belong to a cooperative. Cooperatives themselves can adopt direct marketing strategies, although it has been shown that their scope remains very local and of minor importance in terms of volumes sold (Hanf and Schweickert, 2014).

Existing scientific studies relating to the adoption of direct selling highlight the fact that small-scale farms which nevertheless enjoy sufficient (human) resources are more likely to adopt these marketing channels. However, while some of these studies essentially consider farm trajectories in terms of individual dynamics, they do not examine the specific dynamics of marketing strategies (Soler, 2005). One question in particular remains to be explored: the stability of adopting direct selling as a marketing channel. An analysis of the entire population of farmers shows that the largest farms use short food supply chains in addition to rather than in place of standard marketing channels (Le Velly and Dubuisson-Quellier, 2008; Fiore et al., 2016). These authors highlight that farms which sell all or part of their production via short marketing channels retain this practice over time, but is this strategy itself permanent or does it vary according to the circumstances?

Our methodology relies on databases provided by the Farm Accountancy Data Network (FADN) for the period 2006 to 2012. This survey provides a representative annual overview of medium-sized and large farms in France for different specialisations. This database is the most complete and most appropriate to take account of the structural and financial aspects of farms simultaneously. Information is processed according to the decision of farmers to adopt a strategy of direct selling or not and the proportion of sales this marketing channel concerns.

To take account of the fact that direct selling corresponds to a more or less stable or perennial business strategy, it is appropriate not only to consider the duration of this activity but also to condition its adoption by the fact that farms adopting direct selling have different individual, structural or even economic and financial characteristics from those that have never adopted this marketing strategy. The corresponding modelling takes the form of a two-step Heckman model. The first step is to identify the characteristics differentiating farmers according to their marketing channel in order to assess – in the second step – the determinants of the duration of implementation of this business strategy correctly.

In the first part of this article, we present the theoretical framework of our study before explaining the empirical strategy adopted. We then present the results of our study. Finally, we conclude by presenting certain perspectives related to this work.

## **1. Theoretical framework**

The literature on short food supply chains considers all types of produce. Some of them (e.g. fruit) are sold without transformation while others (e.g. wine, meat) are processed. Because few studies focus specifically on direct marketing in the wine-growing sector, we present these studies along with papers relating to other types of produce.

Adopting short food supply chains implies a change of paradigm relating to the implementation of a new means of marketing produce (Ilbery and Maye, 2005; Goodman et al., 2012; McNally, 2001; Capt and Wavresky, 2014). The very structure of individual farms predisposes some farmers to selling through short marketing channels, as shown by land surveys (Ministry of Agriculture, 2012b and 2012c). Moreover, the entrepreneurial posture of farmers is valued when it comes to developing new marketing channels (Langhade, 2010; McElwee, 2008; Thomas et al., 2013).

While all studies underline the importance of farm size in adopting direct selling, this dimension is approached in various ways. Several indicators of farm size are considered including physical size, the number of employees and the economic/financial dimensions. The impact of farm size on the marketing strategy can differ depending on the standpoint. To understand the exact extent to which farm size is a key determinant in the choice of marketing channel, a precise analysis of each indicator is required.

The first criterion relating to farm size is physical size, mostly measured in acreage. While considered in all existing studies, the effects of the physical dimension on the marketing strategy vary considerably. Some authors state that large farms have a higher growth potential as they appear more capable of diversifying their marketing channels (Aubert and Perrier-Cornet, 2012; Aubert and Enjolras, 2016a). These farms are more likely to expand their activity by developing a marketing strategy based on short food supply chains (Timmons and Wang, 2010). According to other authors, direct selling represents an opportunity for the smallest farms to explore alternative marketing channels when encountering difficulties in accessing traditional ones (Dufour and Lanciano, 2012; Langhade, 2010).

The second indicator of farm size relates to human resources, which are major drivers in adopting short food supply chains (Aubert and Enjolras, 2016b; Bowler et al., 1996; Gasson

et al., 1988; McNally, 2001). A key factor for success of direct channels is to employ workers dedicated to this activity who possess specific marketing skills (Dufour and Lanciano, 2012; Evans and Libery, 1993). Accordingly, Aggestam et al. (2017), Barbieri et al. (2008) and Broderick et al. (2011) also highlight the importance of family labour in short food supply chains. The presence of a salaried workforce is therefore likely to contribute to the sustainable adoption of direct selling (Chiffolleau and Gauche, 2013).

The third indicator of farm size is economic size. This criterion is measured by considering either turnover (total value of sales) or standard output (production potential). The literature highlights the fact that low profitability pushes farmers to adopt direct selling in order to improve the financial situation of their business (Park et al., 2014). Farmers enjoying high profits are also encouraged to adopt direct selling in order to strengthen their situation (Aubert and Enjolras, 2016a). Finally, European subsidies linked to the CAP boost farmers' revenues while limiting risks (Enjolras et al., 2012), thereby creating an environment which is conducive to direct selling.

The fourth criterion of farm size concerns the financial dimension. From a financial point of view, changes needed to adopt short food supply chains are characterised primarily by short-term expenditure which is supposed to be amortised quickly thanks to higher selling prices and enhanced value added (Verhaegen and Van Huylenbroeck, 2001). However, the US experience shows that farms involved in direct-to-consumer sales lose money (Ahearn et al., 2013; Ahearn et al., 2018). This underlines the need for farms to have sufficient cash in order to optimise the adoption of short marketing channels. Large-scale spending may be financed using equity or by increasing debt. In this case, the farmer is encouraged to adopt direct selling on a more sustainable basis. Conversely, farms facing certain financial difficulties (primarily linked to cash and debt issues) are also pushed to adopt the practice of direct selling. This forced conversion to alternative marketing channels primarily concerns fruit production and, to a lesser extent, market gardening and wine growing (Aubert and Enjolras, 2016a). Without being able to spend more money on their farm, farmers expect to benefit from the value added generated by short food supply chains. Opportunistic behaviour may result in the intermittent adoption of direct selling.

Beyond farm size, several other factors condition the marketing strategy implemented by farmers. More precisely, these factors relate to individual characteristics of farmers and

sustainability concerns. The main individual characteristics refer to the farmers' level of education (Asfaw et al., 2010; Dörr and Grote, 2009; Kersting and Wollni, 2011; Sharma et al., 2011), their age (Dörr and Grote, 2009; Feder et al., 1985; McNamara et al., 1991; Sharma et al., 2011) and the time spent on the farm (Galt, 2008; Clay et al., 1998). The literature underlines the fact that farmers who are more likely to sell directly to consumers are younger, better educated and spend more time on their farm.

Short food supply chains are usually associated with improved sustainability for all stakeholders involved and for society in general. This is one of the reasons leading farmers to adopt this kind of marketing channel (Capt and Wavresky, 2014). Social proximity with consumers in particular is a key factor of success of direct selling strategies (Brown and Miller, 2008; Daskalopoulou and Petrou, 2002). Physical proximity is measured by the physical distance between producers and consumers (Langhade, 2010). Short food supply chains embed food systems at the local level (Penker, 2006; Praly et al., 2014), with numerous accompanying spatial and transport-related implications (Brinkley, 2017). While most studies emphasise the benefits of adopting short food supply chains for farm sustainability, Forssell and Lankoski (2015) underline the fact that the associated implications are complex and merit further study, for instance with regard to carbon impacts (Coley et al., 2009).

In addition to the proximity to consumers, reflected in reduced transportation, the quality of production is emphasised (French Ministry of Agriculture, 2012d). More specifically, there is a strong link between the adoption of direct selling and the certification of production as organic (Aubert and Enjolras, 2016b). Finally, on a financial level, farmers who demonstrate the quality of their produce gain additional profit (Uematsu and Mishra, 2011). Production using few phytosanitary products is therefore likely to encourage a certain degree of continuity in the adoption of direct selling.

## **2. Empirical strategy**

Studying the dynamics of short food supply chains requires the use of data with sufficient time depth to observe the precise change in marketing strategies implemented by farmers.

### **2.1. Database and variables**

The Farm Accountancy Data Network (FADN) is an annual survey conducted by the Department of Statistics and Prospection (SSP) of the French Ministry of Agriculture, identifying the individual, structural and financial characteristics of a panel of farms representative of the entire population of French large and medium-sized farms. More precisely, this database includes farms whose standard output (SO) is greater than 25,000 euros. This panel is stratified on the basis of farms' economic and technical orientation (ETO), their physical size and their geographical location. The FADN sampling method also involves renewing farms at a rate of about 10% per year. Consequently, the number of farms that can be followed continuously decreases as the period of the review increases.

The data allows farmers' marketing strategies to be considered by indicating if they sell all or part of their production directly to consumers. This means that there is no intermediary in the commercial relationship between the producer and the consumer. We have access to precise individual data for the period 2006 to 2012, enabling us to analyse the dynamics of marketing channels of a relevant population sample followed continuously. The dynamics of 1,770 (extrapolated) farms can therefore be studied.

### **2.2. Predominance of direct selling for some productions**

Selling through short food supply chains represents an alternative that some specialised farms are more willing to adopt than others. Regardless of the period considered, an over-representation of farms specializing in quality wine can be observed (Table 2). Furthermore, the relative share of farms that adopt direct selling remains stable over time, with an average adoption rate of 30.3%.

*Table 2. Share of farms that adopt direct selling per ETO*



### **2.3. Measuring the stability of direct selling**

Selling through short food supply chains would appear to be a stable marketing method for the specialisations considered, as its adoption remains substantially the same from one year to the next. However, this stability is to be put into perspective insofar as it is relevant only at the aggregate level and not at the individual level.

In order to examine the extent to which individual dynamics translate distinct behaviours from the overall trend, it is important to describe the set of possible states. To simplify the presentation, only 3 campaigns are included in Figure 1, referred to as T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>. Each year, a given farmer may or may not decide to sell all or part of his produce through direct selling. In T<sub>1</sub>, there are 2 possible states. In T<sub>2</sub>, for each of the 2 states observed in T<sub>1</sub>, 2 states are also possible, which leads to 4 potential trajectories.

Thus, in our example with 3 campaigns, a total of 8 states are possible (Figure 1). In our analysis, taking 7 campaigns into account, 128 possible states were thus identified. Among those 128 possible states, only 82 were observed, thereby highlighting the complexity and diversity of paths seen in practice.

#### ***Figure 1. Description of the states observed over 3 years***

Among farms observed continuously over the study period, we note a stable behaviour as nearly 34% of them never adopted direct selling and among those that adopted direct selling, 65% did so over all 7 years (Table 2). Furthermore, there are clear sectorial differences.

#### ***Table 2. Stability of direct selling over the period 2006-2012***

A more detailed study of the change in marketing channels adopted by farmers therefore shows that 25% of the total population of farmers adopted direct selling on an irregular basis, in particular with the cases presented in Table 3 being observed. For these farms, direct selling may represent only a marginal opportunity to sell their produce to consumers compared to traditional marketing channels.

#### ***Table 3. Selection of some of the 82 observed states***

The apparent stability of farms selling via short food supply chains thus conceals a certain heterogeneity of behaviours that cannot be overlooked.

It is important to notice that a bias may occur if the dynamics of farms, considered through their stability, are linked to their marketing strategy. An independence test confirms there is no relationship between these two dimensions. Results can therefore be extrapolated for the entire population of French large and medium-sized farms (Table 4).

*Table 4. Relationship between marketing channels and the population of farms studied*

#### **2.4. Econometric modelling**

In order to understand these dynamics, it is essential to measure the time frame of this marketing strategy among those farmers who adopted direct selling at least once over the period in question. The analysis is implemented in two stages: first, we identify whether or not direct selling was adopted and second, the stability of its adoption is examined among farmers who sold produce at least once via this marketing channel. Since this stability does not necessarily correspond to a successive number of years during which farms sold their production directly, the second step of the model implemented is linear and not related to duration.

Insofar as the modelling enables us to understand the determinants of the time frame during which direct selling was adopted, farms followed across the entire study period constitute the reference population to avoid conditioning this duration by the number of years during which farms were observed.

The process is based on a two-stage Heckman model (1976, 1979), which takes account of the fact that the dependent variable is only observable for a portion of the data, i.e. the time frame during which direct selling was adopted is conditioned by the fact that a farm chose to use marketing channel at least once. In order to correct this sample selection bias, the Heckman framework incorporates a regression equation [2], conditioned by a selection equation [1]. Cumulative campaigns for which the farm adopted direct selling are only meaningful for farms that have used this marketing channel at least once.

The regression equation can be formalised as follows:

$$y_{1j} = x_j \beta + \varepsilon_{1j} \quad [1]$$

where:

- $y_{1j}$  is the cumulative duration of campaigns in which the farmer adopted direct selling.
- $x_j$  are explanatory factors.
- $\beta$  are coefficients associated with each of these factors.
- $\varepsilon_{1j}$  are error terms.

The selection equation is formalised in the following way:

$$y_{2i} = w_j \gamma + \varepsilon_{2i} \quad [2]$$

and if  $y_{2i}^* > 0$ , then  $y_{2i} = 1$ , 0 otherwise

where:

- $y_{2i}$  is the likelihood that the farmer adopted direct selling at least once. This probability is conditioned by an unobservable quantitative variable, denoted  $y_{2i}^*$ .
- $w_j$  are the determinants of this unobserved variable.
- $\gamma$  are coefficients associated with each of these factors.
- $\varepsilon_{2i}$  are error terms.

Insofar as the implementation of the selection equation determines the regression equation, we have assumed that  $\text{Corr}(\varepsilon_{2i}, \varepsilon_{2j}) \neq 0$ .

All these equations can be summarised by Figure 2.

*Figure 2. Representation of the model considered*

### 3. Results

As the analysis can be broken down into two steps representing the adoption of direct selling and the duration of this adoption for wine-growing farmers, the results will be presented according to whether they refer to the first or the second step. Table 5 incorporates the definition of each of the variables included in our analysis.

*Table 5. List of variables used in the analysis*

#### **4.1. Choice of relevant farm size indicators**

As we consider several indicators and thus several dimensions of farm size at the same time, we have to examine the independence of each measure. To this end, a correlation test of variables relating to the physical dimension, employment and the economic and financial dimensions is performed (Table 6). The only indicator correlated with all the others is standard output, which is one of the economic size indicators. By construction, standard output measures farms' production potential based on the valuation of each area dedicated to a specific product. Because of the strong correlation between this variable and other physical size and economic indicators, we remove it from the econometric analysis.

*Table 6. Correlation of farm size indicators*

Consequently, we simultaneously include all the other indicators in the model in order to assess which aspects of farm size affect the marketing strategy implemented by farmers, and more precisely their probability to sell all or part of their production to consumers directly and the duration of such a marketing strategy.

#### **4.2. Characterisation of farms that adopted direct selling for at least one year**

Our statistical analysis differentiates farms that never sold via direct channels from those which did so at least once.

##### **4.2.1. Descriptive analysis**

During the period 2006-2012, we observe that indicators of farm size differ depending on whether or not they adopted direct selling at least once (Tables 7a and 7b).

*Tables 7a/7b. Characteristics of wine-growing farms according to whether or not they adopted direct selling at least once over the period 2006-2012*

First, we observe that winegrowers selling directly to consumers exhibited a higher standard output in 2006. At first glance, this result could invalidate the fact that the smallest farms are more likely to sell through short food supply chains. However, it must be considered in light of particularities specific to the wine-growing sector. A winegrower who decides to sell his produce directly to consumers needs to enlarge his productive activity by incorporating other activities (Pomarici et al., 2012). In the indirect selling market, winegrowers mainly sell their produce to wine cellars. In this case, the main productive activity of the winegrower is to produce wine. When the producer decides to sell directly to consumers, he has to bottle his own produce and open his own cellar. Hence, selling through direct channels involves a higher level of economic investment in the wine-growing sector compared to other sectors such as market gardening or fruit production, in which producers can sell their produce directly without any specific equipment.

From a financial point of view, this result goes hand in hand with the fact that winegrowers who sell directly to consumers display a higher level of indebtedness at the beginning of the period given the level of investment required in their productive and commercial activities. This situation may also explain why the level of cash flow does not differ across marketing strategies. Finally, we note that farms selling directly boast a higher average level of profit, reflecting a successful strategy.

We observe that farmers who sell their produce to consumers directly have an average of four annual work units (AWU). Conversely, those who adopt indirect selling have only two AWUs. Direct selling farms employ almost twice as many workers, regardless of their status. This result is in line with the fact that direct selling requires a larger workforce, to enlarge farm activities from production to marketing. The last indicator of farm size is acreage. Contrary to the other size indicators, farms that sell directly to consumers are significantly smaller than other farms.

It should be noted that regardless of the indicator considered, differences observed among marketing strategies are based on their 2006 values (Tables 7a-7b). When considering the changes in the indicators, there is no significant difference (Table 7b). This result implies that, on average, the development of farms is similar overtime, irrespective of the marketing strategy they adopt.

Beyond the size dimension, the results also highlight the importance of individual characteristics. The main individual characteristic which differs across marketing channels is the level of education, and more precisely the level of agricultural education. Winegrowers selling directly to consumers have, on average, a higher level of agricultural education. While more than 75% of farmers selling through direct channels have at least a secondary level of education, this figure falls to less than 65% when another marketing channel is adopted.

Another key determinant of the marketing strategy implemented by farmers is the use of phytosanitary products. The proportion of winegrowers who spend the most on phytosanitary products selling their produce directly and indirectly to consumers is 5% and 30% respectively. Among winegrowers who spend the least on phytosanitary products, these figures are about 16% and 53% respectively. These results highlight the fact that there is an interdependence between productive and commercial strategies when considering the use of phytosanitary products.

#### **4.2.2. Econometric analysis**

The econometric model confirms that farmers who adopted direct selling at least once over the period considered display different characteristics from other farms (Table 9).

#### ***Table 9. Econometric modelling***

While the statistical analysis highlights that almost all farm size indicators serve to differentiate farmers depending on whether they ever sold through direct channels over the 2006-2012 period, the econometric analysis only underlines the importance of employment. This result confirms that farms selling directly to consumers need more employees than other farms. Hence, neither the physical size nor the economic and financial dimensions appear to be key determinants of farmers' marketing strategies.

Moreover, the econometric model demonstrates that farmers' individual characteristics do not serve to differentiate the choice made by farmers. More specifically, the initial level of education does not condition a farmer's decision to adopt direct selling. This result has to be considered while also taking account of the number of employees working on the farm. Since farmers selling through direct channels have more employees, this result might demonstrate

that the farmer's level of education is not the only determinant to consider. It may also be relevant to examine the impact of the employees' education on the adoption of a marketing strategy.

Finally, the econometric model underlines the fact that winegrowers selling through direct channels use less pesticide than farmers using conventional channels. In line with the literature, this strong result suggests that direct selling goes hand in hand with more environmentally-friendly practices. Farmers who are willing to develop proximity with consumers are those who adopt greener practices.

### **4.3. Characterisation of farms regarding the stability of their adoption of direct selling**

Understanding the duration of implementation of short food supply chains only makes sense for farmers who adopted this marketing channel at least once.

#### **4.3.1. Descriptive analysis**

Table 8a shows that direct selling is adopted on a permanent basis by farms whose size decreases. This result is salient for workforce (measured in AWU) as well as for economic and financial indicators (indebtedness, standard output, net profit and cash flow). The only exception is acreage, which increases for direct selling farms.

These results indicate that direct selling is not a long-term strategy suitable for farms keen to develop their economic capacity while remaining profitable. However, these farms increase their physical size, probably because they want to focus their development on expansion.

#### ***Table 8a. Number of years during which the farmer adopted direct selling with regards to farm characteristics***

Table 8b indicates that the number of years of direct selling is strongly correlated with the workforce employed on the farm, thus confirming the key role of this indicator in the adoption and duration of direct selling.

***Table 8b. Correlation between the number of years of direct selling and the main characteristics of wine-growing farm***

#### **4.3.2. Econometric analysis**

Once again, the econometric model only considers the duration of direct selling for farmers who adopted this marketing channel at least once. Hence, the selected econometric model takes this constraint into account by conditioning the duration equation [1] by the selection equation [2] (Table 9).

First, the results emphasise that an increase in acreage leads to a longer adoption of direct selling, probably because wine-growers involved in direct selling need to offer a sufficiently wide variety of produce to meet consumer expectations. For all the other size indicators, it is smaller values that mean that wine-growing farms adopt direct selling for a longer time. This result is valid for an increase in workforce, indebtedness, cash flow and profit. Farms whose economic and financial size decreases are therefore more likely to adopt direct selling on a sustainable basis. Consequently, farmers adjust their structure (workforce and indebtedness) when adopting direct selling, which results in lower operating and financial costs. Decreasing cash flow and profit indicate that farms with a deteriorating economic situation are more likely to adopt direct selling, which can be seen as an opportunity to increase margins.

Furthermore, the duration of direct selling does not appear to be conditioned by the initial level of these indicators. It is therefore impossible to predict the duration of a marketing channel only by considering instantaneous cross-sectional data. The marketing strategy is therefore conditioned by, and changes in accordance with, farm size. Marketing strategy is thus driven by the overall farm strategy.

In addition to farm size dynamics, the duration of direct selling is conditioned by the productive strategy. Farmers adopting more environmentally-friendly practices are more likely to adopt direct selling. Both marketing and productive strategies are co-determined in both the short and long run. By selling directly to consumers, wine-growers are better able to meet consumer requirements and expectations in terms of proximity and product quality, with small wine-growing farms best placed to achieve this.



#### **4. Conclusion**

The objective of this article was to understand the dynamics of direct selling strategies implemented by wine-growing farms, and more specifically the factors leading to a sustainable adoption of this marketing channel over time. Some two-thirds of farmers having already adopted direct selling in 2006 continued to use it systematically as a marketing channel every year until 2012. As the literature focuses on size as a critical factor leading to the adoption of direct selling, we use different measures of farm size, both technical and economic.

Our empirical strategy relies on the FADN database together with a sample of wine-growing farms surveyed continuously from 2006 to 2012. The information collected allows us to determine the trajectories followed by farms over these years by considering whether or not, and for how long, direct selling was adopted. In addition to descriptive statistics, we implement a Heckman model which considers both a selection model, explaining the choice of direct selling, and a model determining the factors that push the farmer to maintain this marketing channel, conditioned by the selection model.

The results confirm the trends observed in the literature. First, the adoption of short food supply chains goes hand in hand with a higher level of education observed in the farmer, a more intensive use of labour and a more limited use of phytosanitary products. Second, the change in farm size is a key factor when direct selling is implemented over many years. Wine-growing farms adopting these marketing channels increase their acreage over time while decreasing their use of labour, their economic and financial size and their use of phytosanitary products.

These results thus reflect the emergence of a specific model of small farms, centred around the use of short marketing channels, which manage to ensure sustainable management of their activity and the risks they face. This information could serve as a guideline for public policies aimed at encouraging the development of short marketing channels in France and Europe.

Like all research, this study displays certain limitations, thereby opening up future avenues of research. First, due to data limitations, we consider direct selling in a dichotomous way, while farmers can choose to sell all or part of their production through this marketing channel. Second, our sample was restricted to the period 2006 to 2012. More recent data would

broaden the scope of the analysis. Finally, our sample focuses only on wine-growing farms which sell processed products. In other sectors, such as fruit and meat production that correspond to non-processed products, direct selling is growing quickly and a similar analysis could be conducted.

## 5. References

Aggestam, V., Fleib, E., & Posch, A. (2017). 'Scaling-up short food supply chains? A survey study on the drivers behind the intention of food producers', *Journal of Rural Studies*, Vol. 51, pp.64-72.

Ahearn, M.C. and Sterns, J. (2013), 'Direct-to-consumer sales of farm products: producers and supplychains in the Southeast', *Journal of Agricultural and Applied Economics*, Vol. 45 No. 3, pp.497-508.

Ahearn, M.C., Liang, K. and Goetz, S. (2018), 'Farm business financial performance in local foods value chains', *Agricultural Finance Review*, Vol. 78 No. 4, pp.470-488.

Asfaw, S., Mithofer, D. and Waibel, H. (2010) 'What impact are EU supermarket standards having on developing countries export of high value horticultural products? Evidence from Kenya', *Food Agribusiness Marketing*, Vol. 22 No. 3-4, pp.262-276.

Aubert, M. and Enjolras, G. (2016a) 'Analyse financière des exploitations fruitières et maraîchères françaises qui vendent au détail', *Économie Rurale*, Vol. 356, pp.99-113.

Aubert, M. and Enjolras, G. (2016b) 'Do short food supply chains go hand in hand with environment-friendly practices? An analysis of French farms', *International Journal of Agricultural Resources, Governance and Ecology*, Vol. 12 No. 2, pp.189-213.

Aubert, M. and Perrier-Cornet, P. (2012) 'La diversification des activités dans les exploitations viticoles françaises ?' *Economies & Sociétés*, Vol. 10-11, pp.1969-1996.

Barbieri, C., Mahoney, E. and Butler, L. (2008) 'Understanding the Nature and Extent of Farm and Ranch Diversification in North America', *Rural Sociology*, Vol. 73 No. 2, pp.205-229.

Bowler, I., Clark, G., Corckett, A., Ilbery, B. and Shaw A. (1996) 'The development of alternative farm enterprises: a study of family labour farms in the northern Pennines of England', *Journal of Rural Studies*, Vol. 12 No. 3, pp.285-295.

Brinkley, C. (2017) 'Visualizing the social and geographical embeddedness of local food systems', *Journal of Rural Studies*, Vol. 54, pp.314-325.

Broderick, S., Wright, V. and Kristiansen, P. (2011) 'Cross-Case Analysis of Producer-Driven Marketing Channels in Australia', *British Food Journal*, Vol. 113 No. 10, pp.1217-1228.

- Brown, C. and Miller, S. (2008) 'The impacts of local markets: A review of research on farmers' markets and community supported agriculture (CSA)', *American Journal of Agricultural Economics*, Vol. 90 No. 5, pp.1296-1302.
- Bruwer, J. (2008) 'Direct marketing channels in the French wine industry' *International Journal of Wine Business Research*, Vol. 20 No. 1, pp.38-52.
- Capt, D. and Wavresky, P. (2014) 'Determinants of direct-to-consumer sales on French farms', *Revue d'Etudes en Agriculture et Environnement*, Vol. 95 No. 1, pp.351-377.
- Chiffolleau, Y. and Gauche, A. (2013) 'Diversité des stratégies et des performances dans les circuits courts alimentaires : une analyse croisée'. Paper presented at the 5<sup>th</sup> Congress of the French Association of Sociology. 2-5 September 2013. Nantes, France.
- Clay, D., Reardon, T. and Kangasniemi, J. (1998) 'Sustainable intensification in the highland tropics: Rwandan farmers' investments in land conservation and soil fertility', *Economic Development and Cultural Change*, Vol. 46 No. 2, pp.351-377.
- Coley D., Howard M. and Winter M. (2009) 'Local food, food miles and carbon emissions: a comparison of farm shop and mass distribution approaches', *Food Policy*, Vol. 34 No. 2, pp.154-155.
- Contò, F., Fiore, M., Vrontis, D. and Silvestri, R. (2015) 'Innovative marketing behaviour determinants in wine SMEs: the case of an Italian wine region', *International Journal of Globalisation and Small Business*, Vol. 7 No. 2, pp.107-124.
- Dörr, A.C. and Grote, U. (2009) 'Impact of certification on fruit producers in the Sao Francisco Valley in Brazil', *Economics and Applied Informatics*, Vol. XV No. 2, pp.5-16.
- Dufour, A. and Lanciano, É. (2012) 'Les circuits courts de commercialisation : un retour de l'acteur paysan ?', *Revue Française de Socio-Économie*, Vol. 1 No. 9, pp.153-169.
- Evans, N.J. and Libery, B.W. (1993) 'The pluriactivity, part time farming and farm diversification debate', *Environment and Planning A*, Vol. 25, pp.945-959.
- Daskalopoulou, I. and Petrou, A. (2002) 'Utilizing a farm typology to identify potential adopters of alternative farming activities in Greek agriculture', *Journal of Rural Studies*, Vol. 18 No. 1, pp.95-103.
- Dodd, T. (1999) 'Attracting Repeat Customers to Wineries', *International Journal of Wine Marketing*, Vol. 11 No. 2, pp.18-28.
- Feder, G., Just, R.E. and Zilberman, D. (1985) 'Adoption of agricultural innovations in developing countries: A survey', *Economic Development and Cultural Change*, Vol. 33 No. 2, pp.255-298.
- Fiore, M. (2016) 'Direct selling in the wine sector: lessons from cellars in Italy's Apulia region', *British Food Journal*, Vol. 118 No. 8, pp.1946-1959.

Forbes, S.L. and Kennedy, R. (2016) 'Competitive advantage through direct marketing: A case study of a small New Zealand wine business' Proceedings of the 9<sup>th</sup> Academy of Wine Business Research Conference (p. 25).

Forsell, S. and Lankoski, L. (2015) 'The sustainability promise of alternative food networks: an examination through "alternative" characteristics', *Agriculture and Human Values*, Vol. 32 No. 1, pp. 63-75.

French Ministry of Agriculture (2012a) 'Un producteur sur cinq vend en circuit court', *Agreste Primeur*, No. 275.

French Ministry of Agriculture (2012b) 'Les circuits courts surtout présents en viticulture', *Agreste Franche Comté*, No. 171.

French Ministry of Agriculture (2012c) 'Légumes : la vente en circuit court peut encore se développer', *Agreste Limousin*, No. 77.

French Ministry of Agriculture (2012d) 'Les démarches de valorisation des produits agricoles : Diversification, circuits courts et productions sous signe de qualité', *Agreste Limousin*, No. 112.

French Ministry of Ecology (2017) 'Prospective : Économie sociale et solidaire : les circuits courts alimentaires', [https://www.entreprises.gouv.fr/files/files/directions\\_services/etudes-et-statistiques/prospective/PIPAME-circuits-courts-alimentaires.pdf](https://www.entreprises.gouv.fr/files/files/directions_services/etudes-et-statistiques/prospective/PIPAME-circuits-courts-alimentaires.pdf)

Galt, R.E. (2008) 'Toward an Integrated understanding of pesticide use Intensity in Costa Rican vegetable farming', *Human Ecology*, Vol. 36 No. 5, pp.655-667.

Gamble, P.R. and Taddei, J.-C. (2007) 'Restructuring the French wine industry: the case of the Loire', *Journal of Wine Research*, Vol. 18 No. 3, pp. 125-145.

Goodman, D.E., DuPuis, E.M. and Goodman, M.K. (2012) *Alternative food networks: knowledge, practice and politics*, Routledge, Abington.

Gasson, R., Crow, G., Errington, A., Hutson, J., Marsden, T. and Winter, D.M. (1988) 'The farm as a family business: A review', *Journal of Agricultural Economics*, Vol. 39 No. 1, pp.1-41.

Gurau, C. and Duquesnois, F. (2008) 'Direct marketing channels in the French wine industry', *International Journal of Wine Business Research*, Vol. 20 No. 1, pp.38-52.

Heckman, J. (1976) 'The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models', *Annals of Economic and Social Measurement*, Vol. 5 No. 4, pp.475-492.

Heckman, J. (1979) 'Sample selection bias as a specification error', *Econometrica*, Vol. 47 No. 1, pp.153-161.

Ilbery, B. and Maye, D. (2005) 'Alternative (shorter) food supply chains and specialist livestock products on the Scottish-English borders', *Environment and Planning A*, Vol. 37 No. 5, pp.823-844.

Kersting, S. and Wollni, M. (2011) 'Public-private partnerships and GLOBALGAP standard adoption: evidence from small-scale fruit and vegetable farmers in Thailand' Paper presented at the EAAE 2011 Congress. 30 August – 2 September 2011. Zurich, Switzerland.

Kneafsey, M., Venn, L., Schmutz, U., Balázs, B., Trenchard, L., Eyden-Wood, T., Bos, E., Sutton, G. and Blackett, M. (2013) 'Short Food Supply Chains and Local Food Systems in the EU. A State of Play of their Socio-Economic Characteristics', JRC Report 25911.

Langhade, E. (2010) 'Circuits courts : une relation de proximité', *Dossier de la chambre d'agriculture*, No. 991.

Le Velly, R. and Dubuisson-Quellier S. (2008) 'Les circuits courts entre alternative et hybridation', in Maréchal, G. (Ed.), *Les circuits courts alimentaires. Bien manger dans les territoires*, Educagri, Paris, pp.105-112.

Low, S. and Vogel, S. (2011) 'Direct and Intermediated Marketing of Local Foods in the United States', Economic Research Report No. 128. <http://www.ers.usda.gov/publications/err-economic-research-report/err128.aspx>

Low, S., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S., Vogel, S. and Jablonski, B.B.R. (2015) 'Trends in U.S. Local and Regional Food Systems', AP-068. U.S. Department of Agriculture, Economics Research Service.

McElwee, G. (2008) 'A taxonomy of entrepreneurial farmers', *International Journal of Entrepreneurship and Small Business*, Vol. 6 No. 3, pp.465-478.

McNamara, K.T., Wetzstein, M.E., and Douce, G.K. (1991) 'Factors affecting peanut producer adoption of integrated pest management', *Applied Economic Perspectives and Policy*, Vol. 13 No. 1, pp.129-139.

McNally, S. (2001) 'Farm diversification in England and Wales: What can we learn from the farm business survey?', *Journal of Rural Studies*, Vol. 17 No. 2, pp.247- 257.

Olsen, J., Wagner, P. and Thack, L. (2016) *Wine marketing & sales: Success strategies for a saturated market*, Board and Bench Publishing.

Park, T., Mishra, A.K. and Wozniak, S.J. (2014) 'Do farm operators benefit from direct to consumer marketing strategies?', *Agricultural Economics*, Vol. 45 No. 2, pp.213-224.

Penker, M. (2006) 'Mapping and measuring the ecological embeddedness of food supply chains', *Geoforum*, Vol. 37 No. 3: pp. 368-379.

Pomarici, E., Boccia, F., and Catapano, D. (2012) 'The wine distribution systems over the world: an explorative survey', *New Medit*, Vol. 11 No. 4, pp.23-32.

Praly, C., Chazoule, C., Delfosse, C., and Mundler, P. (2014) 'Les circuits de proximité, cadre d'analyse de la relocalisation des circuits alimentaires', *Géographie, économie, société*, Vol. 16 No. 4, pp.455-478.

Sharma, A., Bailey, A., and Fraser, I. (2011) 'Technology adoption and pest control: strategies among UK cereal farmers: Evidence from parametric and nonparametric count data models', *Journal of Agricultural Economics*, Vol. 62 No. 1, pp.73-92.

Soler, L.G. (2005) 'Retailer strategies in the food marketing chain: Introduction to the special issue', *Journal of Agricultural and Food Organisation*, Vol. 3 No. 1, pp.1-5.

Szolnoki, G. and Hoffmann, D. (2014) 'Consumer segmentation based on usage of sales channels in the German wine market', *International Journal of Wine Business Research*, Vol. 26 No. 1, pp.27-44.

Thomas, L.C., Painbéni, S. and Barton, H. (2013) 'Entrepreneurial marketing within the French wine industry', *International Journal of Entrepreneurial Behavior & Research*, Vol. 19 No. 2, pp.238-260.

Timmons, D. and Wang, Q. (2010) 'Direct Food Sales in the United States: Evidence from State and County-Level Data', *Journal of Sustainable Agriculture*, Vol. 34 No. 2, pp.229-240.

Uematsu, H. and Mishra, A.K. (2011) 'Use of Direct Marketing Strategies by Farmers and Their Impact on Farm Business Income', *Agricultural and Resource Economics Review*, Vol. 40, pp.1-19.

Verhaegen, I. and Van Huylenbroek, G. (2001) 'Costs and Benefits for Farmers Participating in Innovative Marketing Channels for Quality Food Products', *Journal of Rural Studies*, Vol. 17 No. 4, pp.443-456.

**Table 1. Share of farms that adopt direct selling per ETO**

	2006	2007	2008	2009	2010	2011	2012	2006-2012
<b>Cereals</b>	6.3%	7.0%	5.7%	5.4%	6.2%	6.2%	6.5%	6.1%
<b>Market gardening</b>	52.4%	56.3%	52.0%	52.2%	53.9%	54.3%	55.1%	53.7%
<b>Quality wine-growing</b>	52.5%	53.6%	54.1%	51.9%	52.4%	51.9%	53.9%	52.8%
<b>Other wine-growing</b>	19.7%	21.1%	16.3%	13.8%	9.5%	12.9%	8.1%	16.4%
<b>Fruit production</b>	26.7%	30.7%	29.8%	30.4%	31.3%	30.1%	33.8%	30.3%
<b>Cattle</b>	10.3%	10.0%	8.7%	8.5%	9.2%	10.1%	10.3%	9.0%
<b>Other production</b>	14.9%	18.1%	15.4%	16.6%	15.1%	16.3%	18.4%	16.3%

**Table 2. Stability of direct selling over the period 2006-2012**

	Wine-growing			All farms		
	No.	Distribution for all farms	Distribution for direct selling farms	No.	Distribution for all farms	Distribution for direct selling farms
<b>0</b>	5,698	32.46%	/	9,405	33.91%	/
<b>1</b>	468	2.66%	3.94%	824	2.97%	4.50%
<b>2</b>	110	0.62%	0.92%	417	1.50%	2.27%
<b>3</b>	380	2.16%	3.20%	1,076	3.88%	5.87%
<b>4</b>	456	2.60%	3.85%	791	2.85%	4.32%
<b>5</b>	876	4.99%	7.39%	1,490	5.37%	8.13%
<b>6</b>	942	5.37%	7.95%	1,807	6.52%	9.86%
<b>7</b>	8,626	49.13%	72.74%	11,925	43.00%	65.06%
<b>Total</b>	17,556	100%	100%	27,736	100%	100%

**Table 3. Selection of some of the 82 observed states**

Direct selling						
2006	2007	2008	2009	2010	2011	2012
0	1	0	0	1	0	1
1	1	0	0	0	0	1
1	0	1	0	1	0	1

Key: 0 denotes a farm that did not adopt direct selling and 1 a farm that adopted direct selling during the year in question.

**Table 4. Relation between marketing channels and the population of farms considered**

	Farms followed continuously	All large and medium-sized farms	Test for equality of means
<b>Share of farms that adopted direct selling</b>	18.56%	18.99%	***

Key: \*, \*\* and \*\*\* denote a significance of tests at the respective thresholds of 10%, 5% and 1%.

**Table 5. List of variables used in the analysis**

Variable	Unit	Definition	
<b>Variables of interest</b>			
<b>Direct selling</b>	Yes/No	Adoption of direct selling for at least one year over the period 2006-2012	
<b>Duration of direct selling</b>	Year	Number of years during which the farmer adopted direct selling for all or part of his production	
<b>Variables considered in 2006</b>			
<b>ETO</b>	Class	Economic and technical orientation of farms	
<b>Acreage</b>	Hectare	Cultivated area of the farm (in classes)	
<b>AWU</b>	-	Annual work unit	
<b>General education</b>	<b>None</b>	Yes/No	No general education
	<b>Primary</b>	Yes/No	Primary general education
	<b>Secondary</b>	Yes/No	Secondary general education
	<b>Higher</b>	Yes/No	Higher general education
<b>Agricultural education</b>	<b>None</b>	Yes/No	No agricultural education
	<b>Primary</b>	Yes/No	Primary agricultural education
	<b>Secondary</b>	Yes/No	Secondary agricultural education
	<b>Higher</b>	Yes/No	Higher agricultural education
<b>SO</b>	€	Standard output at year-end	
<b>Indebtedness</b>	%	Debt-to-equity ratio at year-end	
<b>Net profit</b>	€	Net profit (or loss) at year-end	
<b>Cash level</b>	€	Cash level at year-end	
<b>Variables considered in dynamic terms over the period 2006-2012</b>			
<b>Crop insurance</b>	Year	Number of years during which the farmer purchased a crop insurance policy.	
<b>Phytosanitary products</b>	Class	Typology of farmers according to whether or not they display stable behaviour over the period 2006-2012. Farmers are differentiated by considering those making the most intensive use of phytosanitary products (more than 10% of total sales) and those making the least intensive use (less than 5% of total sales).	
<b>Acreage</b>	Class	Change in cultivated area (increase or stabilisation vs decrease)	
<b>AWU</b>	Class	Change in average working units (increase or stabilisation vs decrease)	
<b>SO</b>	Class	Change in standard output (increase or stabilisation vs decrease)	
<b>Indebtedness</b>	Class	Change in indebtedness (increase or stabilisation vs decrease)	
<b>Net profit</b>	Class	Change in net profit (increase or stabilisation vs decrease)	
<b>Cash flow</b>	Class	Change in cash flow (increase or stabilisation vs decrease)	



**Table 6. Correlation of farm size indicators**

	AWU in 2006	Acreage in 2006	Indebtedness in 2006	Standard output in 2006	Net profit in 2006	Cash flow in 2006
AWU in 2006	1.0000					
Acreage in 2006	0.2634***	1.0000				
Indebtedness in 2006	0.2439***	0.1276**	1.0000			
Standard output in 2006	0.5210***	0.3297***	0.1301**	1.0000		
Net profit in 2006	0.3893***	-0.0520	-0.1467**	0.5398***	1.0000	
Cash flow in 2006	-0.2351***	-0.0873	-0.2802***	-0.0098	0.1755***	1.0000

Key: \*, \*\* and \*\*\* denote a correlation between the variables at the respective thresholds of 10%, 5% or 1%.

**Table 7a. Characteristics of wine-growing farms according to whether they adopted direct selling at least once over the period 2006-2012**

			Average	Test
AWU in 2006	Direct selling	Never	2.0307	***
		At least one year	3.8218	
Acreage in 2006	Direct selling	Never	22.60	***
		At least one year	19.80	
Cash flow in 2006	Direct selling	Never	6932.95	ns
		At least one year	5447.14	
Indebtedness in 2006	Direct selling	Never	30.5678	***
		At least one year	36.8479	
Standard output in 2006	Direct selling	Never	182676.3	***
		At least one year	250933.0	
Net profit in 2006	Direct selling	Never	35650.18	***
		At least one year	71992.21	

Key: \*, \*\* and \*\*\* denote a significance of equality of means tests at the respective thresholds of 10%, 5% and 1%. - ns indicates that there is no link.

**Table 7b. Characteristics of wine-growing farms according to whether they adopted direct selling at least once over the period 2006-2012**

		Direct selling		
		Never	At least one year	Test
Level of agricultural education	None	4.82%	6.43%	***
	Primary	29.29%	18.03%	
	Secondary	63.71%	64.82%	
	Higher	2.17%	10.72%	
Level of general education	None	5.38%	3.43%	ns
	Primary	17.79%	16.75%	
	Secondary	74.04%	75.06%	
	Higher	2.79%	4.76%	
Use of phytosanitary products	The least intensive	16.08%	52.93%	***
	Intermediate users	55.07%	42.63%	
	The most intensive	28.85%	4.45%	
Change in acreage	Decrease	18.86%	18.36%	ns
	Stability or increase	81.14%	81.64%	
Change in AWU	Decrease	49.50%	48.11%	ns
	Stability or increase	50.50%	51.89%	
Change in cash flow	Decrease	50.29%	52.21%	ns
	Stability or increase	49.71%	47.79%	
Change in indebtedness	Decrease	57.35%	50.70%	ns
	Stability or increase	42.65%	49.30%	
Change in standard output	Decrease	42.97%	34.79%	ns
	Stability or increase	57.03%	65.21%	
Change in net profit	Decrease	45.84%	51.87%	ns
	Stability or increase	54.16%	48.13%	
All farms		100.00%	100.00%	

Key: \*, \*\* and \*\*\* denote a relationship between the variables at the respective thresholds of 10%, 5% or 1%. - ns indicates that there is no link.

**Table 8a. Number of years in which the farmer adopted direct selling with regards to the farm characteristics**

		Average	Test
Level of agricultural education	None	4.42	<i>ref</i>
	Primary	4.39	ns
	Secondary	4.57	ns
	Higher	5.20	ns
Level of agricultural education	None	4.96	<i>ref</i>
	Primary	4.77	ns
	Secondary	4.51	ns
	Higher	4.97	ns
More or less intensive use of phytosanitary products	The least intensive users	6.49	<i>ref</i>
	Intermediate users	3.82	***
	The most intensive users	3.79	***
Change in AWU	Decrease	6.54	***
	Stability or increase	3.89	
Change in acreage	Decrease	4.41	***
	Stability or increase	6.16	
Change in indebtedness	Decrease	6.15	***
	Stability or increase	4.00	
Change in standard output	Decrease	6.41	***
	Stability or increase	4.15	
Change in net profit	Decrease	6.29	***
	Stability or increase	3.92	
Change in cash level	Decrease	6.30	***
	Stability or increase	3.91	

Key: \*, \*\* and \*\*\* denote a significance of equality of means tests at the respective thresholds of 10%, 5% and 1%. - ns indicates that there is no significant difference in the duration of short circuits between the populations considered.

**Table 8b. Correlation between the number of years of direct selling and the main wine-growing farms characteristics**

	Number of years of direct selling
AWU in 2006	0.1305*
Acreage in 2006	-0.0857
Number of years during which the farm was insured	0.0028
Indebtedness in 2006	0.0844
Standard output in 2006	-0.0424
Net profit in 2006	0.0015
Cash flow in 2006	-0.0729

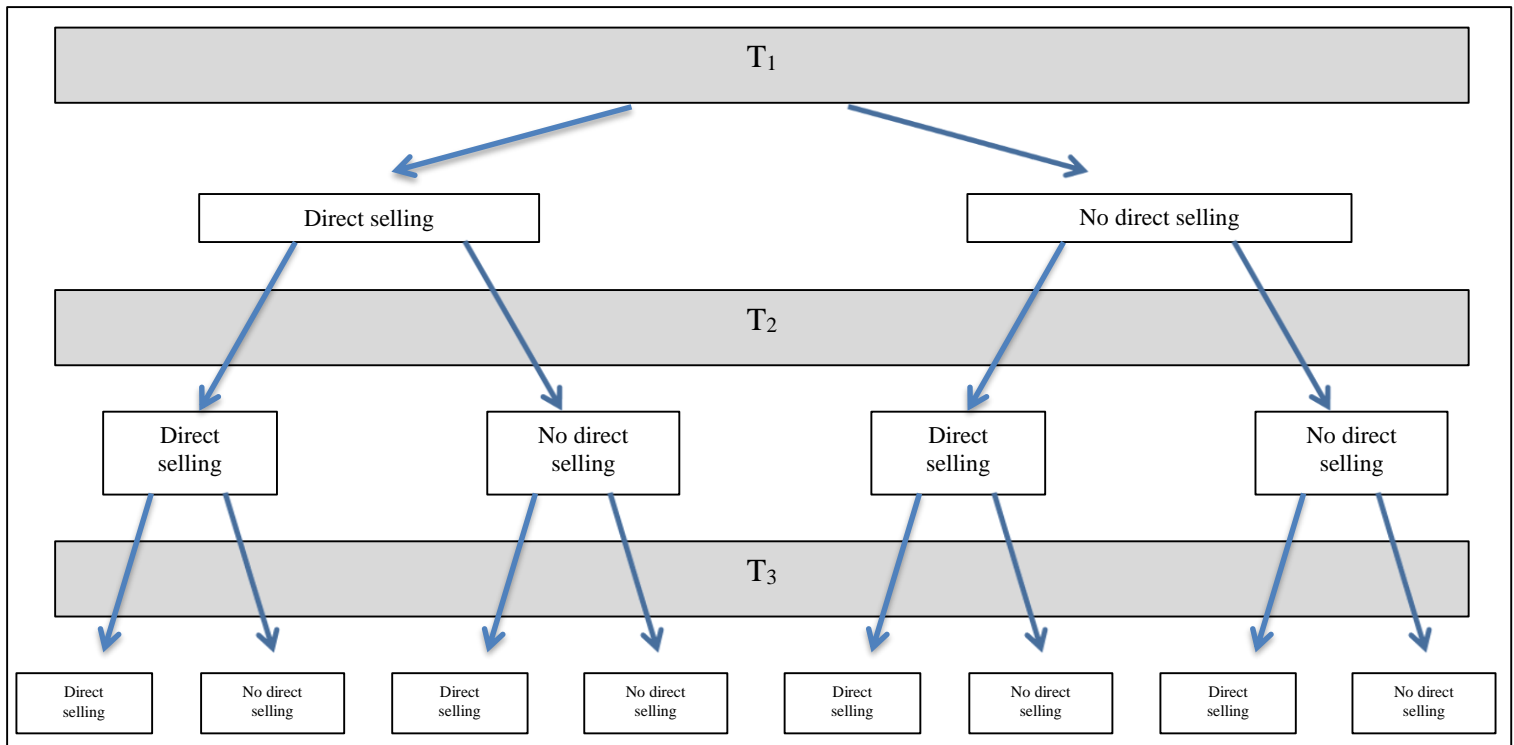
Key: \*, \*\* and \*\*\* denote a significant correlation at the respective thresholds of 10%, 5% and 1%.

**Table 9. Econometric modelling**

	<b>Determinants of the duration of direct selling</b>	<b>Determinants of direct selling</b>
<b>Farm size indicators</b>		
<i>Employment</i>		
<b>AWU in 2006</b>	-0.0068	0.3005***
<b>Change in AWU</b>	-1.1691***	0.1799
<i>Physical size</i>		
<b>Acreage in 2006</b>	0.0011	-0.0049
<b>Change in acreage</b>	0.7590*	0.0815
<i>Economic and financial size</i>		
<b>Indebtedness in 2006</b>	-0.0016	-0.0001
<b>Change in indebtedness</b>	-0.5059*	-0.1945
<b>Net profit in 2006</b>	-0.0002**	0.0002
<b>Change in net profit</b>	-0.8809***	0.0187
<b>Cash flow in 2006</b>	0.0002	0.0002
<b>Change in cash flow</b>	-0.6684**	-0.0546
<b>Control variables</b>		
<b>Number of years during which the farm was insured</b>	0.2162***	
<i>Level of agricultural education (ref: none)</i>		
<b>Primary</b>	-0.7769	-0.2513
<b>Secondary</b>	-0.7003*	-0.0977
<b>Higher</b>	-0.2736	0.7267
<i>Level of general education (ref: none)</i>		
<b>Primary</b>	0.4865	0.5515
<b>Secondary</b>	0.6494	0.4645
<b>Higher</b>	0.8826	0.5386
<i>More or less intensive use of phytosanitary products (ref: least intensive farms in 2006 and 2012)</i>		
<b>Intermediate use</b>	-1.2457***	-0.7491***
<b>The most intensive in 2006 and 2012</b>	-1.3391**	-1.233***
<b>Intercept</b>	7.3766***	-0.1209

Key: \*, \*\* and \*\*\* denote a significance of parameters at the respective thresholds of 10%, 5% and 1%.

*Figure 1. Description of the states observed over 3 years*



*Figure 2. Representation of the model considered*

