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Are short food supply chains a solution for farms facing financial difficulties?

Magali Aubert *, Geoffroy Enjolras **

* UMR 1110 MOISA, INRA-Montpellier Supagro
2 place Viala, 34060 Montpellier Cedex 2, France
aubert @ supagro.inra.fr

** Univ. Grenoble Alpes, UMR 5820 CERAG, IAE
Domaine universitaire, B.P. 47, 38040 Grenoble Cedex 9, France
geoffroy.enjolras @ iae-grenoble.fr

Abstract.

This article focuses on farms facing financial difficulties and on their subsequent evolution, especially considering their marketing channel. The adoption of short food supply chains appears as a way to preserve the business by retrieving more flexibility and a greater share of added value. Using data from FADN-RICA 2005-2012 for different agricultural sectors, we perform a statistical analysis and econometric modeling. A financial score based on 5 financial key parameters measures financial difficulties and determines the contrasting profile of distressed farms. Debt servicing is a severe issue for all farms in difficulty. Farm survival translates into a reduction in their cultivated area, the number of employees but an increase in pesticide expanses to protect yields. Finally, it appears that market gardening and fruit producing farms in difficulty tend to adopt retail selling in order to restore their financial situation.

Keywords: Financial difficulties, Short food supply chains, Market gardening, Wine-growing, Fruit production, FADN-RICA, France

JEL codes: Q12, Q13, Q14

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1. Introduction

For decades, French agriculture has been experiencing a decline in the number of active farms (Butault and Delame, 2003; Giroux, 2011). Between 2000 and 2010, one fourth of farms thus disappeared, reducing their number to 490,000 in Metropolitan France. One salient fact is the almost exclusive fading of small farms, mainly in cattle breeding and wine-growing. In return, medium and large farms continued to expand their acreage, which denotes a search for a critical size.

Literature considers the question of the evolution of farms in terms of their growth as opposed to their fading or exit. The factors explaining these dynamics are numerous. They relate primarily to the farm structure (Dunne and Hughes, 1994). Large or growing farms are more likely to expand and survive (Van de Gucht *et al*, 2000). The personality of the holder is also decisive in the evolution of farms. While young ones are mostly growth-oriented, older ones are tempted to prepare their retirement by disinvesting (Gale, 1994; Rizov and Mathijs, 2003). Furthermore, the degree of personal investment of the holder in his activity is essential for the future of the company (Aubert and Perrier-Cornet, 2009). A farmer focused primarily on his farm is more attached to ensure its continuity. Finally, specialization has a significant influence in the process of growth or fading, some sectors being in more development than others (Blanchard *et al*, 2012).

The financial state of farms appears to be another key determinant in their survival because a precarious situation over several years could lead to the cessation of activity (Weiss, 1999). Each bankruptcy is the result of the conjunction of several financial parameters. Three criteria emerge particularly in the literature. The first criterion is the level of activity that determines the size and resilience of a firm to a shock (Bernanke and Gertler, 1987). The largest firms are naturally the best prepared to resist in this configuration. The second criterion is the indebtment level (Altman, 1984). Debt plays an ambiguous role insofar as it serves to expand the firm by providing the capital necessary for its development, but it can also turn against it if interest charges are too heavy. The third criterion is the level of profitability that measures the profitability from the point of view of the holder (Shepard and Collins, 1982): a low or negative profitability inevitably leads to the end of the farming activity.

Finally, several other criteria appear relevant to explain evolutions encountered in the agricultural sector. In line with financial indicators, the economic context plays a key role in cycles of farm exit, as shown in a study on a long period (Stam and Dixon, 2004). Facing these macroeconomic risks, legislation on farm bankruptcy appears as a factor of preservation (*ibid*). Moreover, the influence of agricultural policies focused on rural development is reflected in the importance of coupled or decoupled subsidies (Kazukauskas *et al*, 2013). These subsidies are particularly useful insofar as they help farms to keep updated their equipment and to pass technological mutations (Huffman and Evenson, 2001).

This review of the literature shows that the factors explaining the development or, conversely, the difficulties of companies were the subject of many studies focused on various aspects. However, financial factors appear less well studied than structural factors. The reason is often the absence of individual data regarding agricultural accounting. When these data exist, they include perennial farms; therefore faded farms cannot be studied. To deal with this difficulty, we choose to focus on farmers in financial difficulty in order to identify their main characteristics and to better understand their sources of difficulties. From a methodological point of view, we proceed to an identification of farm difficulties based on a score including 7 financial-key parameters (Colson *et al.*, 1993; Desbois, 2008). Such scoring methodology is indeed commonly used in the banking sector to offer a synthetic indicator of default risk.

Beyond this static analysis, we also seek to measure the importance of financial difficulties on the evolution of marketing channels. Faced with difficulties, a farm can try to maintain its activity by adopting short food supply chains. This marketing channel has been experiencing some success in France for several years (Ministry of Agriculture, 2012). The reasons are particularly linked to the involvement of the farmer along the distribution channel (Lanciano and Saleilles, 2010). In return, the farmer gets much more added value (Broderick *et al.*., 2011), which represents a significant asset for a farm in difficulty. Although retail saling essentially concerns large farms a solid financial situation (Aubert and Enjolras, 2013), one should verify if precarious farms rely on this distribution channel to improve their situation.

Our work relies on the databases of the Farm Accountancy Data Network (FADN-RICA) for the period 2005-2012. By construction, FADN-RICA data are representative of French professional farms of commercial size, especially in terms of productive orientation. Because of the numerous accounting and financial elements it includes (products and charges, balance

sheets and income statement), this database appears as the most complete and the most appropriate to measure the financial status of each farm and understand the dynamics of the most fragile ones. Our study is focused on permanent crops (wine-growing, fruit production) and non-permanent crops (market gardening).

This article is organized as follows. In the first part, we present more precisely the framework and the methodology of this study by identifying farms in difficulty. In the second part, we proceed to a static and dynamic analysis of the financial difficulties faced by farms. In the third part, we specifically study the link between financial difficulties and the choice of a marketing channel. In the fourth part, we conclude by presenting the perspectives related to this study.

2. Analytical framework

This section presents the framework of our study. As a first step, we present the methodology used to identify farms facing financial difficulties. In a second step, we detail the database used and more specifically the main variables.

2.1. State of farms facing financial difficulties

In 2011, the number of French professional farms was 308.145, but it decreased by 1.16% in 2012 to reach 304.585. This evolution varies from a production to another. For farms specializing in “market gardening”, the annual decline is equal to 0.87% while it reaches respectively 1.07%, 2.53% and 2.59% for farms specializing in “quality wine-growing”, “other wine-growing” and “fruit production”. This general trend may reflect different trajectories such as farm exit due to bankruptcy or voluntary cessation of activity or farms loosing their commercial size.

For each year, we have stratified data we could extrapolate to obtain an estimate of the professional population of farms. The difference between these estimations in 2011 and 2012 provides an estimation of the number of professional farms that have faded over this period. Cross-sectional data are thus based on an estimate of professional farms while longitudinal data are based on the farms sampled on each period. The FADN-RICA sampling method

considers a partial renewal of identified farms each year. It means that all perennial farms present over the period are not necessarily identifiable.

Considering the evolution of the estimated number of farms between 2011 and 2012, we observe that the fading rate differs according to the productive orientation and concerns mainly farms specializing in perennial crops. While farms specializing in "other wine-growing" saw their number reduced by up to 25%, those specializing in "market gardening" experienced a decrease of less than 10% (Figure 1). This result strongly motivates a study centered on the wine-growing sector.

Figure 1. Fading rate of French professional farms by ETO over the period 2011-2012

Since the number of farms specializing in “other wine-growing” does not allow to make a precise analysis in this research, we consider the whole population of wine-growing farms whether they are specializing in “quality wine-growing” or “other wine-growing”.

2.2. Definition of farms facing financial difficulties

The FADN-RICA database does not include any variable indicating the immediate future of each surveyed farm. Therefore, it is not possible to establish formally that a farm facing great financial difficulty a given year went bankrupt over the next year. However, it remains possible to define and measure the financial difficulty of each farm.

Our analysis is then based on a set of criteria identified by the literature as alerting in advance on a possible disappearance of farms (Altman, 1968; Beaver, 1966; Desbois, 2008). The five criteria specifically studied cover complementary facets of financial analysis (Table 1). They are defined by ratios of indicators of the balance sheet and the income statement so as to consider both the farm structure and activity.

Table 1. Financial difficulties criteria used in the analysis

Because a firm cannot be solely judged on one criterion in particular, we simultaneously consider seven criteria of financial difficulty by computing a risk score (Colson *et al.*, 1993; Desbois, 2008). The creation of this score requires a harmonization of the different criteria

that refer to different units. Therefore, for each indicator, the farm is so-called at risk if an indicator crosses a critical threshold. The overall score is then a linear combination of the dichotomous criteria identified previously. All criteria are equally weighted because each one identifies a specific source of difficulty.

2.3. Database

In order to assess more closely the potential difficulties of farms and calculate the ratios listed above, the accounting data of the FADN-RICA provide the required accuracy. These data are the finest possible at the individual level and the most complete and recent (2012) we can find.

It is worth noting that the FADN-RICA sample includes only professional farms, which, by definition, reach a minimum physical size equivalent to 12 hectares of wheat with a minimum workforce of 0.5 annual work units (AWU). In other words, our study is representative of French professional farms and not of all farms. In addition, the sample is based on a defined stratification (geographic location, ETO and physical dimension). For sakes of confidentiality, some individual and structural variables are presented in classes (*e.g.* the age of the holder), which allows for an indirect interpretation. Financial variables remain however unchanged and allow for a very detailed analysis.

2.4. Used variables

Table 2 details the variables used in our analysis. Following the literature exposed previously, we take into account a full set of variables.

Structural indicators, such as acreage (UAA) and labor (AWU) characterize the size of the farm. Considering a static analysis, a farm of significant size appears more able to protect itself against a failure. For that reason, an indicator of diversification is taken into account (Aubert and Perrier-Cornet, 2012). Considering a dynamic analysis, a farm whose size decreases sends a negative signal about its future. Finally, the adoption of retail selling is taken into account in order to measure the link between financial difficulties and the adoption of short food supply chains.

Individual indicators consider the fact that a young farmer is more able to contribute to the development of his farm while an older farmer can consider discontinuation of its activity. The education level is a complementary criterion for judging the level of acquired knowledge.

Financial indicators consider different aspects of farm activity. Total sales offer a standard indicator of activity and size of the business. To analyze the farm's health, additional liquidity indicators are mobilized: cash position, working capital and working capital requirement. In addition, risk management practices are studied to see if the farm protects itself using chemical inputs (fertilizers or pesticides) or crop insurance (Aubert and Enjolras, 2014; Enjolras and Sentis, 2011). A healthy farm is able to bear these costs which in return offer the guarantee of an income.

Control variables include the year and ETO that differentiates the farms specialization.

Table 2. List of variables used in the analysis

3. Analysis of financial difficulties faced by farms

In this section, we first identify farms facing financial difficulties, and we then present their financial and structural characteristics. The analysis is both cross-sectional and dynamic in order to understand how these financial difficulties evolve over time and refers to different operating rationales. Finally, we determine to what extent the financial difficulties faced by farms translate into a change in their marketing channels.

3.1. Identification and characterization of farms facing financial difficulties in 2012

We consider a farm faces financial difficulty if the aggregate score is greater than or equal to two, *i.e.* which combines at least two criteria, among the identified five characterizing a financial fragility.

3.1.1. Identification of farms facing financial difficulties

In 2012, the calculation of the score indicates that 17.91% of farms face financial difficulties (Table 3). This number recovers a high heterogeneity in productive orientation. For example,

farms specializing in "fruit production" or "market gardening" are more prone to these problems than farms specializing in wine-growing.

Table 3. Proportion of farms facing financial difficulties by ETO in 2012

These results tend to show that the fading rate of farms specializing in "quality wine-growing" and "fruit production" (Figure 1) is most likely related to the financial difficulties faced by these farms.

3.1.2. Sources of fragility of farms facing financial difficulties

The definition of the financial difficulty faced by farms is based on the five criteria presented previously (Table 4). In detail, criterion 3 (debt servicing) is found at levels that affect a significant number of professional farms, regardless of their productive orientation. For farms specializing in “market gardening” and “fruit production”, criterion 1 (indebtedness), criterion 2 (solvency) and criterion 5 (liquidity) are noteworthy indicators of fragility while they affect to a lesser extent farms specializing in “wine-growing”. The combination of these criteria describes a situation in which the farmer is unable to generate a sufficient income to offset the high cost of borrowed capital and to offer him revenue. Criterion 4 (productivity) only affects wine-growing farms because of the high level of investments required by wine production (cellars).

Table 4. Sources of farm fragilities in 2012

The identification of sources of farm fragilities highlights that they vary according to the productive orientation. Moreover, we observe that sources of fragility are common between farms specializing in “market gardening” and “fruit production”, while they differ for farms specializing in “wine-growing”.

3.1.3. Analysis of the financial liquidity of farms facing difficulties

One of the reasons leading directly to the fading of farms by suspension of payments and subsequent bankruptcy is the lack of liquidity. While the FADN-RICA database does not formally identify farms fading for this reason, it remains possible to characterize farms facing

great difficulty based on 3 criteria commonly used in financial analysis: working capital, working capital requirement and cash position.

Detailed analysis of these three indicators shows contrasting situations (Table 5). Farms in difficulty specializing in "market gardening" and "fruit production" have on average a negative working capital (WC) joint with a working capital requirement (WCR) also negative. This configuration is doubly risky regarding the cash position because a negative operational balance, the WCR, is supposed to cover a negative structural balance (WC). The results show however that market gardeners generate on average a positive cash flow that reflects the absence of stocks and a precise management of relations with their suppliers. However, fruit production suffers from negative cash flows, which emphasizes an insufficient capitalization (WC too low) that is not compensated by an adjustment of payment terms for providers and customers.

Table 5. Detailed analysis of the liquidity of farms facing difficulties in 2012

Wine-growing farms differ from other specializations by a WC and a WCR which are jointly positive, but the difference between these indicators results in a negative cash position. In this sector, the high value of WCR is justified by the valuation of stocks. The longitudinal analysis shows that, when they face difficulties, wine-growing farms reduce their stocks in an attempt to restore their cash level.

While it is not possible to know the potential of survival for farms belonging to the FADN-RICA database, it turns out that facing difficulties in "fruit production" and "wine-growing" leads to severe cash-flow problems that can cause the rapid disappearance of the farm.

3.1.4. Structural characterization of farms facing financial difficulties

We complement the financial analysis with a study on the individual and structural characteristics of farms facing financial difficulties (Table 6). The structural characteristics common to these farms, regardless of their productive orientation are the fact they employ relatively more labor and operate higher surfaces than identically specialized farms but without financial difficulty. For instance, we find that market gardening farms employ on average 4.8 AWU (units of work or full time equivalent) on their farms if they are in financial

difficulty while they mobilize on average 0.6 less AWU if they are safe. As a matter of fact, farms facing difficulties are found among the largest productive structures.

Farms in difficulty appear to be less diversified. Limiting the number of productions should help reducing the costs of labor as well as the time spent on each crop by limiting the number of cultural practices on different parcels on the farm.

Table 6. Structural characteristics of farms in 2012

Furthermore, a farm facing financial difficulties seems to be less encouraged to sell at the retail scale, *i.e.* within short food supply chains, except if it is specializing in "fruit production". Yet, this kind of marketing channel allows the farmer to better control its supply chain and to keep a greater share of revenue. A farm can then find additional resources to cope with its commitments. If farms facing financial difficulties do not adopt such marketing channel, it may translate the fact that they do not have enough resources, such as commercial skills.

Farms in difficulty cannot use large financial means to cover their risks. Consequently, the subscription of crop insurance is reduced (market gardening and fruit production) or stabilized (wine-growing). The same trend applies regarding the consumption of chemical inputs (pesticides and fertilizers) used to protect or develop the crop yield, which is stabilized for market gardening and is reduced for wine-growing. However, spending on chemical inputs increases significantly for fruit production, which may reflect a will to preserve at all cost their production when facing difficulties.

All these elements converge to emphasize that farms identified as in serious financial difficulty are aware of their situation. In the short term, they reduce their costs structure by acting on different expenditure items to regularize their situation, or at least stabilize it. In the long term, many efforts remain to be done to reduce their cultivated area and workforce.

3.1.5. Characterization of farmers in financial difficulty

The individual characteristics of the farm holder reveal common features which appear to be, for the most part, independent of their productive orientation (Table 7). Farmers facing

serious financial difficulties seem older, less educated, considering the level of general education, but more educated, considering the level of agricultural education. The farm holder's education seems to prevail on its experience as a factor explaining the financial difficulties encountered considering that an upper education leads to receive advanced courses in business and financial management.

Table 7. Individual characteristics of farmers in 2012

3.2. Dynamic analysis of farms facing financial difficulties over the period 2005-2012

3.2.1. Dataset

FADN-RICA data allow to perform a dynamic analysis insofar as the majority of farms is present in the database for one year to another. Sampling is based on a renewal of the population. Among the 308,145 professional farms present in 2011, 276,757 are still present in 2012. In other words, more than 10% of farms surveyed in 2011 were not in 2012. The renewal of the population does not then distinguish farms exiting from agriculture from farms not renewed because of this sampling mode.

In this section, we refer to two different populations. The subsection, which considers the evolution of the farms that are in financial difficulty, covers all identified farms. Sub-sections relating to the dynamic analysis of the farm activities refers to perennial farms on a given time step. Thus, to see to what extent farmers have changed their management behavior, we consider the evolution of their characteristics between 2011 and 2012.

3.2.2. Dynamics of farms in financial difficulty

The share of farms facing financial difficulties is little volatile over the period 2005-2012, and the trend appears stable for all specializations studied (Figure 2). Farms specializing in market gardening exhibit the highest difficulty, followed by fruit producing and wine-growing farms.

Figure 2. Estimated evolution of farms facing financial difficulties from 2005 to 2012

3.2.3. Dynamics of financial fragility

The study of farms in financial difficulty over the period 2011-2012 reveals homogeneous trajectories. The majority of farms identified as being in financial difficulty in 2011 are still facing this situation in 2012, and conversely the majority of farms that were not in difficulty in 2011 are still not in 2012 (Table 8). For the first type of farms, the value of the score characterizing the risk of financial difficulty remains broadly unchanged between 2011 and 2012. For the second ones, the score increases, whatever the production implemented, which denotes a slight worsening of their financial situation.

Table 8. Evolution of farms facing financial difficulties over the period 2011-2012

More precisely, we note that farms specializing in "market gardening" and "fruit production" that were not in difficulty remain more than 80% in this situation. For farms specializing in "wine-growing", they are around 90%, which denotes a high level of stability in their financial situation. At this stage, it is important to note that the definition of the population may introduce a bias since only perennial farms in the database for the period 2011-2012 are taken into account. Since we do not know the cause of the disappearance of some farms in the database (sample renewal or voluntary cessation of activity or bankruptcy), we cannot prejudge the importance of financial difficulties on their continuity.

3.2.4. Structural and individual characterization of farms facing financial difficulty

The indicators taken into account to assess the evolution of financial and structural indicators refer to values observed in 2011 and 2012, as well as the rate of growth between these two years (Table 9).

Table 9. Stability or instability of farms facing financial difficulties over the period 2011-2012

Whatever the productive orientation of farms, the evolutions remain comparable. Identified farms as in serious financial difficulty in 2011 and which remain in that situation in 2012 are farms for which current charges are declining (personnel expenses and crop insurance subscription). Farms in serious financial difficulty in 2011 and 2012 are farms which have reduced their size and their workforce since 2011, compared to farms which are no more in

difficulty in 2012. However, pesticides expenses increase at a high pace when farms face difficulties, so as to protect yields. These results reinforce the elements observed previously and confirm that farms in great difficulty are aware of their fragility and have a different behavior from that of other farms.

Finally, we find that farmers in financial difficulty sell less at the retail scale than other farms. Facing financial difficulties seems to prevent farmers to further diversify their marketing channels. However, this relation varies from a production to another. Farms specializing in "wine-growing" are more likely to sell through short food supply chains when they face difficulties while it is the opposite for farms specializing in “market gardening”. This behavior is even more important that difficulties persist over time (Table 10).

Table 10. Evolution of farms difficulties and marketing channels

The dynamics of retail selling is very contrasted according to the difficulties faced in the considered sectors. In the wine-growing sector, retail selling is adopted both by farms facing no financial difficulties in 2011 and 2012 and by farms facing difficulties over this period. Within fruit production, we observe that those that sell the most at the retail scale in 2012 are those that have been facing financial difficulties in 2011 and 2012. The effect is different for farms specializing in “market gardening”, for which farmers selling at the retail scale are those that do not suffer from financial difficulty in 2012, whatever their financial situation in 2011.

4. Financial difficulties and the choice of a marketing channel

Previous findings indicate the existence of a link between the presence of financial difficulties within the farm and the evolution of marketing channels towards retail selling. This section examines in more detail this relationship using complementary approaches.

4.1. Adoption of retail selling

The analysis of the sample reveals a diversity of marketing channels. While farms specializing in "market gardening" and " wine-growing" are relatively more numerous to sell their production at the retail scale, farms specializing in "fruit production" are relatively less

numerous (Table 11). It is worth noting that retail selling is a non-exclusive marketing channel, *i.e.* farmers may decide to sell all or part of their production using this channel.

Table 11. Retail selling differentiated by ETO in 2012

Distinguishing the productive orientations allow to consider the diversity of operational and marketing farms trajectories.

4.2. Econometric modeling

This section focuses on the determinants of retail selling. More specifically, beyond the variables already validated by the literature, it seeks to understand how this marketing channel is a strategy that financially fragile farms develop in order to cope with their difficulties.

The data at our disposal allow to appreciate the dynamics of farms. A panel-data model is implemented. The renewal of the FADN-RICA sample is independent of our research question, so that the estimation of a balanced model does not introduce any bias. The model then considers all of these farms on at least one year.

Our analysis is performed for the following productive orientations: "market gardening", "wine-growing" and "fruit production". We consider the productive orientation observed in 2012 and we consider as an additional variable a possible change in this orientation from one year to the other.

Insofar as the descriptive analysis stressed the importance of the individual, structural and financial factors, the panel data model is specifically estimated with random effects. Formally, the model can be synthesized as follows:

$$Retail\ selling_{it} = \propto + \delta * financial\ difficulties_{(i;t-1)} + \beta * level\ of\ activity_{(i;t)} + \gamma * competences_{(i)} + \xi * risk\ management_{(i;t-1)} + \theta * year_t + \varepsilon$$

Where α is the constant, β, γ, δ, θ and ζ are coefficients associated to each group of variables and ε the residuals.

Factors identified by the literature to understand retail selling are the structural, individual and financial characteristics considered previously. To obtain a synthetic representation of the relative importance of the different factors, we grouped them. Thus, the factor 'competences' refers to the level of agricultural and general education of farm holders as well as to their age. The 'level of activity' refers to the cultivated area, the employed workforce and the degree of diversification of the production. 'Risk management' includes expenditures related to pesticides and insurance policies. Finally, 'financial difficulties' is taken into account in two ways in the estimated models: the first way considers the fact to be in difficulty (score ≥ 2) while the second way considers separately each of the 5 criteria used in the composition of the score.

To avoid endogeneity problems, financial variables are lagged from one year. Similarly, size effects are neutralized for financial variables by dividing the amounts expressed in euros by the total turnover of the farm.

The results of the econometric modeling are summarized in Table 12.

Table 12. Econometric modeling explaining retail selling

The results firstly indicate that all farmers who sell at the retail scale are less educated and younger than farmers who prefer selling using traditional commercial channels (Table 12). Moreover, retail selling corresponds to farms on which farmer use less phytosanitary products. Their production is therefore more environmentally friendly and it meets the consumers' requirements.

It also appears that farms specializing in "market gardening" and "wine-growing" have subscribed more insurance policies as soon as they adopt retail selling, which takes into account the risk associated to retail selling: the farmer can indeed sell only what he is producing, so any decrease in yields leads to a direct shortfall. However, crop insurance is costly, so farms specializing in "fruit production" are more likely to get insured when they are selling wholesale.

Farms specializing in perennial crops that sell at retail are more diversified that farms that only sell through traditional channels, except for farms specializing in "market gardening" that sell at retail when they are little diversified. Similarly, while farms specializing in "market gardening" farms are relatively larger with fewer workforces, farms specializing in perennial crops are relatively smaller than farms that do not sell at retail. Only farms specializing in wine-growing employ more labor to meet the requirements associated with the various stages of the marketing process. Indeed, while the sale of market gardening production can be made without packaging, the sale of wine requires a stage of transformation and packaging. For farms specializing in fruit production, retail selling does not require more labor.

The incentive to sell at retail when the farm is experiencing difficulties is particularly strong for farms specializing in “fruit production”, each source of financial difficulty leads to increase the probability to sell at the retail scale, except criterion 2 (solvency) that has the opposite influence. The aggregated financial difficulty indicator has also a positive impact on the probability to sell at the retail scale. A quite similar situation is observed for farms specializing in “market gardening” which share in common with "fruit production" the influence of criterion 1 (indebtment), criterion 3 (debt servicing) and criterion 4 (productivity). However, criterion 5 (liquidity) has a negative influence on retail selling. In this sector, the aggregated financial difficulty has no influence, which confirms the need to consider the combination of sources of difficulty.

For market gardening and fruit producing farms, debt appears as a major issue: a high leverage leads to pay a high amount of interest rates. However, at the same time, production is not enough important compared to invested capital. In this context, retail selling appears as a reliable way to provide cash to the farm, thus enabling it to pay back its loans and to continue its activity. The situation is much different considering “wine-growing”. In this sector, the occurrence of financial difficulties does not motivate either an evolution of the marketing channels. The existence of stocks provides farms a sort of security valve, which acts as a disincentive to change marketing channels.

5. Conclusion

We have proposed in this article a study of French farms facing financial difficulties. This work falls into the literature about financial difficulties that has been developed over several decades, and it complements the literature in agricultural economics related to short food supply chains. Using the accounting FADN-RICA database, we could identify farms facing difficulties and understand the causes thereof. We studied several different aspects of financial difficulty and built an overall score indicating a degree of distress. This construction shows that the cause of difficulty common to all sectors is debt servicing. For farms specializing in market gardening and fruit production, the two sectors mostly affected by financial difficulties, indebtedness and liquidity are also key factors explaining difficulties. Productivity is only a salient issue in the wine-growing sector.

The static and dynamic analyses paint a portrait of farms facing financial difficulties through their structural and financial characteristics. They are characterized by a large size, older and less educated holders. When confronted to this precarious situation, farmers naturally adapt their size, workforce and some expenses such as crop insurance. However, they increase their use of phytosanitary products to protect their yield. The adoption of retail selling is also a solution to deal with difficulties, especially in market gardening and fruit production, by providing cash directly to farms. Despite these measures, the majority of farms facing difficulties in 2011 remain in this situation in 2012, thus reflecting the existence of a vicious circle of misfortune as any restructuring process could not restore a healthy financial situation.

The extent of this result is probably underestimated insofar as the sample obtained using FADN-RICA data presents a bias of omission. Indeed, it is not possible with this database to know the reason of a farm disappearing of the sample (cessation of activity, bankruptcy or simple renewal of the sample). This limitation is common to all databases related to the agricultural sector, which significantly limits studies about the fading of farms. Indeed, except for the agricultural census performed every 10 years, surveys are based on sampling methods defined only according to the geographic location, the productive orientation and the physical size of farms.

This work offers many perspectives, such as the inclusion of more years in the analysis. Despite the limitations exposed previously, it appears interesting to study over several years the destiny of farms, in order to understand if the vicious circle highlighted before continues. This work could help to identify successful strategies for supporting farms in difficulty. Opposite of this approach, a more in-depth understanding of the mechanisms leading to financial difficulties would provide additional information to understand the sources of the farms failure. This analysis could promote precise implications in terms of public policies in order to help farmers adapt rather than decline.

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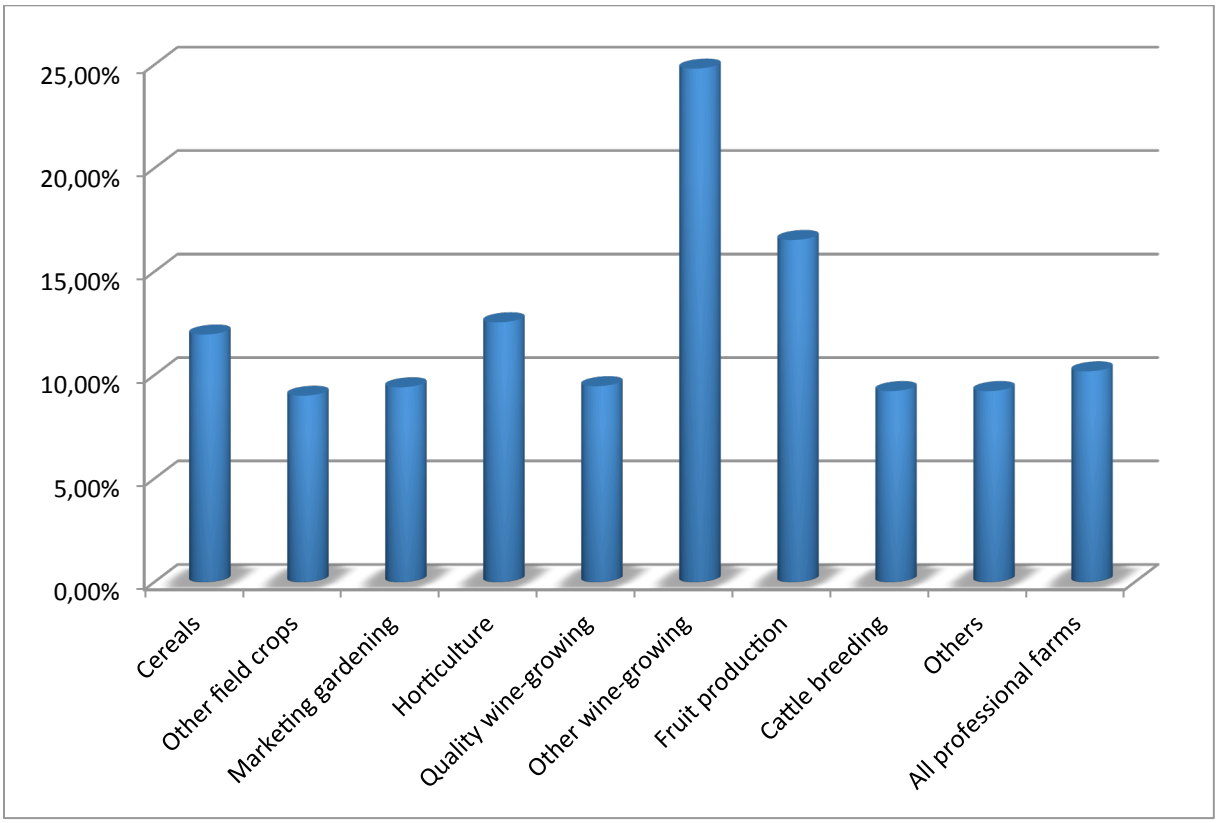
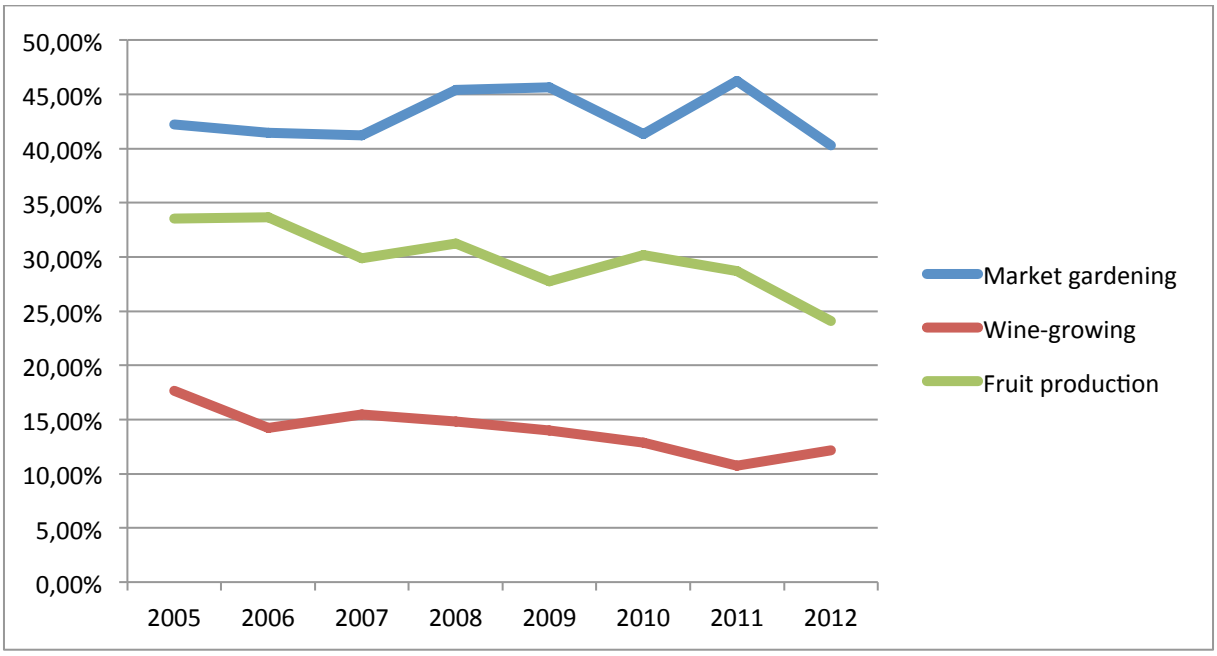
Figure 1. Fading rate of French professional farms by ETO over the period 2011-2012



Source: Agreste - FADN-RICA 2011-2012

Figure 2. Estimated evolution of farms facing financial difficulties from 2005 to 2012



Source: Agreste - FADN-RICA 2005-2012

Table 1. Financial difficulties criteria used in the analysis

Criteria	Method of calculation	Risk threshold	Interpretation
1. Indebtedness (financial leverage)	Total debts / Total assets	> 70%	Measure of dependence towards creditors
2. Solvency (credit worthiness)	Total short term debts / Total current assets	> 70%	Ability of the farm to repay its debts
3. Debt servicing (interest rate)	Total interests / Total borrowings	> 6%*	Credit terms granted to farms
4. Productivity	Total fixed assets / Turnover	< 0.33*	Ability of the farm to sell its products regarding invested capital
5. Liquidity	Working Capital / Turnover	< 0	Safety margin ensured by the farm to pay for its current expenditures

Note: thresholds without an asterisk denote a level of proven risk (over-indebtedness, inability to repay the debt, negative profitability) and are used in practice in the banking sector. Values marked with an asterisk are estimated empirically on FADN-RICA data considering the 10% of farms beyond the considered threshold (high interest rates, low productivity).

Table 2. List of variables used in the analysis

Variable		Unit	Definition
Year		-	Year
ETO		-	Economic and technical orientation (classes)
Acreage		Hectare	Cultivated area of the farm (classes)
AWU		-	Annual work unit
Diversification		-	Number of different crops on the farm
Retail selling		Yes/No	Adoption of retail selling
Age		Year	Age of the farm holder (classes)
General education	**None**	Yes/No	No general education
	Primary	Yes/No	Education at the primary level
	Secondary	Yes/No	Education at the secondary level
	Upper	Yes/No	Upper education
Agricultural education	**None**	Yes/No	No agricultural education
	Primary	Yes/No	Education at the primary level
	Secondary	Yes/No	Education at the secondary level
	Upper	Yes/No	Upper education
Turnover		€	Total turnover of the farm
Working Capital		€	Working capital at the end of the year
Working Capital Requirement		€	Working capital requirement at the end of the year
Cash Position		€	Cash-flows available at the end of the year
Crop insurance		Yes/No	Subscription of crop insurance policies
Fertilizers		€	Amount of spending on fertilizers
Pesticides		€	Amount of spending on pesticides

Table 3. Proportion of farms facing financial difficulties by ETO in 2012

	Proportion of farms facing financial difficulties
Fruit production	24.06%
Market gardening	40.29%
Wine-growing	12.17%
All farms	17.91%

Source: Agreste - FADN-RICA 2012

Table 4. Sources of farm fragilities in 2012

	Market gardening	**Wine-growing**	**Fruit production**
Criterion 1 - Indebtedness	32.64%	6.66%	20.40%
Criterion 2 - Solvency	48.33%	9.24%	27.79%
Criterion 3 - Debt servicing	32.39%	27.93%	24.55%
Criterion 4 - Productivity	4.75%	14.20%	6.57%
Criterion 5 - Liquidity	26.03%	3.07%	12.81%

Key: Among farms specializing in market gardening, 32.64% have an indebtment which exceeds the selected threshold.

Source: Agreste - FADN-RICA 2012

Table 5. Detailed analysis of the liquidity of farms facing difficulties in 2012

	Farms without financial difficulties		Farms with financial difficulties	
	Average	**Std deviation**	**Average**	**Std deviation**
Market gardening				
Net working capital	76044	128661	-843	58912
Working capital requirement	36031	82183	-1367	52506
Cash position	40012	83992	523	31959
Δ Net working capital	3330	39112	-7612	34942
Δ Working capital requirement	8681	42666	-9547	42521
Δ Cash position	5350	43995	-1935	39978
Wine-growing				
Net working capital	312120	448484	88244	192466
Working capital requirement	296598	439764	97007	204559
Cash position	15522	58692	-8763	139997
Δ Net working capital	-1023	72029	-15147	105546
Δ Working capital requirement	550	83125	-9822	138053
Δ Cash position	1573	41741	5325	105751
Fruit production				
Net working capital	111546	171986	-25196	113456
Working capital requirement	82460	153230	-19053	102608
Cash position	29086	48608	-6143	40315
Δ Net working capital	11938	56756	645	60814
Δ Working capital requirement	16413	60937	-726	62056
Δ Cash position	4475	33765	-1371	27561

Source: Agreste - FADN-RICA 2012

Table 6. Structural characteristics of farms in 2012

	Market gardening		Wine-growing		Fruit production	
	Financial difficulties		Financial difficulties		Financial difficulties	
	No	Yes	No	Yes	No	Yes
Retail selling						
Yes	54.29%	33.75%	50.12%	46.01%	33.13%	35.82%
Being insured						
Yes	30.98%	23.40%	57.13%	59.44%	50.66%	41.16%
Fertilizer expenses (in €)						
	11542	9447	4127	2923	6155	8914
Pesticides expenses (in €)						
	6492	6497	8951	8173	11037	13853
Diversification (number of cultivated crops)						
	1.32	1.25	1.54	1.37	2.10	1.74
Acreage						
< 5 ha	51.69%	11.77%	22.70%	27.33%	8.32%	2.46%
5-10 ha	11.30%	6.40%	20.09%	12.44%	23.43%	20.69%
10-15 ha	3.74%	1.36%	15.70%	10.95%	11.66%	18.83%
15-20 ha	2.77%	1.57%	11.59%	8.17%	17.08%	18.87%
20-25 ha	3.09%	0.61%	9.93%	7.15%	8.30%	18.13%
25-30 ha	4.03%	29.07%	0.40%	5.93%	2.63%	
30-35 ha	0.53%	0.71%	4.15%	4.37%	4.87%	4.23%
35-40 ha	2.99%	0.77%	4.33%	0.35%	8.00%	5.68%
> 40 ha	19.86%	47.73%	11.12%	23.31%	15.72%	11.10%
Average AWU						
	4.20	4.82	2.76	2.72	3.89	5.46

Source: Agreste - FADN-RICA 2012

Table 7. Individual characteristics of farmers in 2012

	Market gardening		Wine-growing		Fruit production	
	Financial difficulties		Financial difficulties		Financial difficulties	
	No	Yes	No	Yes	No	Yes
Age of the farm holder						
Less than 40 years	20.88%	8.93%	16.07%	21.21%	13.16%	16.99%
41-50 years	38.83%	29.73%	32.06%	24.35%	39.21%	24.96%
51-60 years	37.32%	47.87%	38.02%	39.48%	37.65%	38.82%
More than 61 years	2.98%	13.47%	13.85%	14.96%	9.99%	19.23%
Level of general education						
None	19.66%	21.54%	19.08%	19.75%	19.63%	14.90%
Primary	77.21%	73.95%	76.82%	72.92%	73.83%	84.34%
Secondary and upper	3.13%	4.51%	4.10%	7.33%	6.54%	0.76%
Level of agricultural education						
None	29.06%	28.48%	25.22%	30.50%	27.40%	27.32%
Primary	68.00%	62.69%	66.67%	58.13%	62.63%	68.40%
Secondary and upper	2.94%	8.83%	8.11%	11.38%	9.97%	4.28%

Source: Agreste - FADN-RICA 2012

Table 8. Evolution of farms facing financial difficulties over the period 2011-2012

			Financial difficulties in 2012					
			Market gardening		Wine-growing		Fruit production	
			No	Yes	No	Yes	No	Yes
Financial difficulties in 2011	**No**	**Number**	1 915	323	35 903	1 781	4 769	281
		Distribution	73.66%	18.38%	89.29%	31.97%	83.20%	15.49%
		Score 2012	0.62	2.34	0.58	2.35	0.45	2.39
		Score 2011	0.50	0.46	0.33	0.77	0.35	0.79
	Yes	**Number**	685	1 432	4 304	3 789	963	1 535
		Distribution	26.34%	81.62%	10.71%	68.03%	16.80%	84.51%
		Score 2012	0.57	3.21	0.64	2.76	0.78	2.92
		Score 2011	2.47	2.92	2.68	2.71	2.55	2.88
	Evolution of farm situations		23.14%		13.29%		16.49%	

Source: Agreste - FADN-RICA 2011-2012

Table 9. Stability or instability of farms facing financial difficulties over the period 2011-2012

	Market gardening		Wine-growing		Fruit production	
	Financial difficulties in 2012					
	No	Yes	No	Yes	No	Yes
Farms without financial difficulties in 2011						
Δ Acreage	0.03	0.08	0.05	0.08	0.04	0.04
Spending on fertilizers (t)	11713.50	12066.70	4111.40	2079.21	6199.67	7643.26
Spending on pesticides (t)	7438.82	5957.96	8924.30	6476.78	11281.90	17199.80
Spending on fertilizers (t-1)	11302.38	12440.23	3510.07	2320.88	5602.74	7870.71
Spending on pesticides (t-1)	7228.92	4831.40	7889.48	5545.26	10949.63	15354.63
Δ Spending on fertilizers	50.21	-16.54	155.79	-8.61	107.10	-4.26
Δ Spending on pesticides	32.51	37.56	27.19	55.94	18.02	19.13
Total AWU	4.29	3.59	2.81	2.19	3.97	4.49
Δ AWU	-0.35	-3.38	0.14	-7.35	-2.71	-3.32
Diversification	1.39	1.12	1.52	1.29	2.16	1.53
Δ Diversification	-0.49	0.00	2.21	-0.89	4.78	-15.55
Retail selling (t)	0.57	0.32	0.52	0.42	0.34	0.26
Retail selling (t-1)	0.58	0.18	0.52	0.42	0.32	0.27
Being insured (t)	0.30	0.22	0.57	0.63	0.50	0.45
Being insured (t-1)	0.36	0.69	0.59	0.55	0.56	0.41
Farms with financial difficulties in 2011						
Δ Acreage	0.27	0.11	0.70	0.25	0.49	0.28
Spending on fertilizers (t)	11066.00	8857.07	4266.37	3320.98	5938.15	9147.64
Spending on pesticides (t)	3847.75	6618.52	9181.22	8970.51	9826.09	13240.00
Spending on fertilizers (t-1)	11721.09	9003.04	2280.04	3378.22	4623.60	8870.73
Spending on pesticides (t-1)	3010.59	5657.92	5863.95	7721.35	9838.54	12854.26
Δ Spending on fertilizers	-4.02	5.63	341.54	234.48	35.29	63.43
Δ Spending on pesticides	-20.71	59.17	11.55	29.43	-14.36	7.07
Total AWU	3.95	5.10	2.38	2.98	3.48	5.64
Δ AWU	1.67	0.78	2.52	-3.18	-5.55	-4.03
Diversification	1.13	1.28	1.71	1.41	1.81	1.78
Δ Diversification	0.00	-0.72	-0.75	-0.21	-0.09	-3.22
Retail selling (t)	0.47	0.34	0.35	0.48	0.28	0.38
Retail selling (t-1)	0.44	0.24	0.30	0.42	0.33	0.29
Being insured (t)	0.33	0.24	0.54	0.58	0.55	0.40
Being insured (t-1)	0.05	0.33	0.62	0.72	0.68	0.57

Source: Agreste - FADN-RICA 2011-2012

Table 10. Evolution of farms difficulties and marketing channels

		Direct selling in 2012		% of farms selling through short food supply chains
		No	Yes	
Market gardening	**No difficulty in 2011 and No difficulty in 2012**	828	1 087	56.77%
	No difficulty in 2011 and Difficulty in 2012	220	103	31.91%
	Difficulty in 2011 and No difficulty in 2012	361	324	47.35%
	Difficulty in 2011 and Difficulty in 2012	943	489	34.16%
Wine-growing	**No difficulty in 2011 and No difficulty in 2012**	17 264	18 639	51.91%
	No difficulty in 2011 and Difficulty in 2012	1 030	750	42.15%
	Difficulty in 2011 and No difficulty in 2012	2 789	1 515	35.20%
	Difficulty in 2011 and Difficulty in 2012	1 977	1 812	47.82%
Fruit production	**No difficulty in 2011 and No difficulty in 2012**	3 137	1 632	34.23%
	No difficulty in 2011 and Difficulty in 2012	208	73	25.93%
	Difficulty in 2011 and No difficulty in 2012	696	267	27.69%
	Difficulty in 2011 and Difficulty in 2012	957	578	37.64%

Source: Agreste - FADN-RICA 2011-2012

Table 11. Retail selling differentiated by ETO in 2012

	Distribution of farms that sell at the retail scale
Cereals	4.17%
Other field crops	12.91%
Market gardening	46.01%
Horticulture	61.29%
Wine-growing	49.62%
Fruit production	33.78%
Cattle breeding	6.67%
Others	18.49%
All farms	18.61%

Source: Agreste - FADN-RICA 2012

Table 12. Econometric modeling explaining retail selling

	Market gardening		Wine-growing		Fruit production	
C1-Indebtedment (t-1)		0.3615***		-0.0601		0.8895***
C2-Solvency (t-1)		0.1109		0.0772		-0.3607***
C3-Debt servicing (t-1)		0.1852***		0.0165		0.3169***
C4-Productivity (t-1)		0.7461**		0.0043		0.8193***
C5-Liquidity (t-1)		-0.2739***		-0.0955		0.3975***
Facing difficulties (t-1)	0.1075		-0.1620***		0.6015***	
Diversification	-0.1888*	-0.1621*	0.8667***	0.8770***	1.5482***	1.4699***
Δ Diversification	0.0007	0.0004	-0.0088***	-0.0090***	-0.0095***	-0.0080***
Acreage	0.0545**	0.0477**	-0.3882***	-0.4131***	-0.3582***	-0.3223***
Δ Acreage	0.1424	0.1270	-0.3254***	-0.3625***	-0.8958***	-0.9597***
AWU	-0.1443***	-0.1441***	1.0054***	0.9712***	0.0123	-0.0045
Δ AWU	0.0038***	0.0035***	-0.0094***	-0.0092***	0.0012	0.0009
Level of general education (ref: no)						
Primary	0.2214	0.2452	0.8153***	1.0874***	-0.5770***	-0.4689***
Secondary or upper	-0.5616	-0.5600	-0.0719	-0.0628	4.9720***	5.4508***
Level of agricultural education (ref: no)						
Primary	-3.1765***	-3.0130***	-0.5825***	-0.7607***	-0.8607***	-0.9550***
Secondary or upper	-3.7833***	-3.6359***	0.0679	-0.0304	5.8946***	8.1739***
Age of the farm holder (ref: 40 years old)						
41-50 years	-1.1904***	-1.1383***	-0.0903**	-0.0896**	-0.3666***	-0.5219***
51-60 years	-0.5975***	-0.5248***	-0.4419***	-0.4288***	0.0954	0.3015**
> 60 years	-2.0927***	-1.9613***	-1.5744***	-1.5566***	-0.2483	0.3628*
Chemical inputs (t-1)	-2.3978***	-2.5006***	-6.8805***	-7.7391***	-1.5613***	-0.2283
Being insured (t-1)	0.4826***	0.4928***	0.1988***	0.2164***	-0.8116***	-0.6749***
Change of ETO	1.1183***	1.1133***	-0.2196***	-0.2322***	-0.9009***	-0.8631***
Year (ref: 2006)						
2007	-0.3367***	-0.3552***	0.4703***	0.4504***	0.4125***	0.4271***
2008	0.1400*	0.1303	0.1994***	0.1911***	0.9983***	1.1150***
2009	-0.3128***	-0.4047***	0.5794***	0.5809***	0.3698***	0.3790***
2010	-0.1724*	-0.2153**	0.6811***	0.6798***	0.6804***	0.6563***
2011	-0.8688***	-0.8749***	0.4037***	0.4111***	0.0105	-0.1051
2012	-0.5023***	-0.5085***	0.3751***	0.3693***	0.3182***	0.2428**
Intercept	3.6722***	3.3634***	-2.3876***	-1.9960***	-3.8862***	-5.3628***

Source: Agreste - FADN-RICA 2005-2012