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THE DETERMINANTS OF THE FARMLAND MARKET

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Abstract

Land is a fixed resource and represents one of the main factors of farm production. In Italy, as in the rest of Europe, structural change is continuing, and land managed in the form of ownership is decreasing while land managed in the form of rent is increasing. The European Parliament in 2017 asked all Member States to review their land regulation to avoid the concentration of land in the hands of a few large farms and to guarantee fair access to this productive factor.

This research aims to explore the agricultural land market by identifying endogenous and exogenous factors that may influence it and the effect these may have. A literature review was conducted to develop the conceptual model. Based on this model and the available data, a probit regression analysis was performed on the FADN-Italy 2013-2020 data. To capture the dynamics within the land market and to study land regulation, a qualitative analysis of semi-structured questionnaires was conducted to experts in the Italian and French market.

The research showed that endogenous factors related to the farm structural characteristics and farmers socio-demographic characteristics, and exogenous factors related to the macroeconomic context and land regulation influenced the land market between 2013 and 2020. These factors do not act independently but influence each other.

The two empirical studies presented are complementary and have been valuable in conducting exploratory research into the complex system of the agricultural land market. Understanding the factors that influence the land market and their effects can be helpful for policymakers in implementing policies and land regulations that can improve the competitive position of farmers in the land market, either directly or indirectly.

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1.Introduction

1.1Background and motivation

Land is a durable, immobile, heterogeneous, and non-reproducible asset and is one of the main factors of production of a farm. It is a fixed resource, at least in the short term, sometimes scarce and often one of the most important limiting factors to ensure the growth and efficient expansion of the farm (Bartolini and Viaggi 2013; Schimmenti, Asciuto, and Mandanici 2013; Korthals Altes 2023).

Compared to other forms of farm growth, the purchase of land may require a major financial commitment and thus limits the investment in other productive assets. On the other hand, the full transfer of rights allows the new owner to use the land as a collateral asset in order to have greater access to credit (Johan Swinnen, Van Herck, and Vranken 2016; Bradfield et al. 2023; Binswanger, Deininger, and Feder 1995).

The increase in farm size through purchase represents a long-term investment decision that occurs less frequently than other types of investment, e.g. buildings and machinery (Elhorst 1993).

The intrinsic features of the land factor imply that the purchase takes place in a market with an extremely rigid supply that does not allow the farmer to choose the quantity of land investment (Elhorst 1993; Korthals Altes 2023). It is very likely that the investment will not be realised at the time it is planned (Elhorst 1993). Agricultural land market is characterised by few transactions taking place almost exclusively at the local level. Farmers prefer to buy land that is near to their farms. The purchase of land too far would lead to higher costs and a loss of time to conduct production activities (Cotteleer, Gardebroek, and Luijt 2008). In general, the land market is thin and local (Cotteleer, Gardebroek, and Luijt 2008; European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a) and appears to be a complex, imperfect and opaque system (Puddu

2014) subject to speculative forces, agricultural policy and land regulation (Lefebvre, Gomez y Paloma, and Viaggi 2015).

The 7th ISTAT Census indicates that between 2010 and 2020 the National Utilized Agricultural Area (UAA) remained stable, the number of farms decreased, and the average farm surface area increased (ISTAT 2022). Consequently, it appears that the structural change in the agricultural sector characterized by a reduction in the number of farms and an increase in the average farm surface area is continuing in Italy as well as in most European countries(ISTAT 2022; Eurostat 2022; Plogmann et al. 2022). In addition, the ISTAT census points out that in Italy land managed in the form of property is decreasing between 2010 and 2020. Farms cultivating exclusively owned land have significantly decreased in terms of both the absolute number of farms and the relative weight of owned land to the total. All other forms of tenure are on the rise: rent (+5.4 per cent), ownership +rent (+2.7 per cent), free use (+2.2 per cent) and ownership +free use (+4.1 per cent) (ISTAT 2022).

The low frequency with which land investment occurs, but also the absence of a structured database in Europe have certainly influenced and limited research and study of European land markets and studies on the land investment decision (De Noni et al. 2019; European Commission. Joint Research Centre. 2021b; Loughrey, Donnellan, and Hanrahan 2020).

Research on the land market mainly focused on identifying the determinants of land value in specific local agricultural land markets or on how agricultural policy payments could influence land value (Bartolini and Viaggi 2013). Ex-post studies related to the investment decision that also took into account the land production factor are scarce. To define the driver that may influence farmers' decisions, it is necessary to analyse and integrate the literature on structural change and farm size growth, agricultural land market, and decision to invest. The farm size growth represents one dimension of the structural change that has been affecting the agricultural sectors of developed economies for a long time now (Plogmann et al. 2022). Researchers sought to identify which factors could influence the structural change and increase farm size. Structural farm characteristics, farmers'

socio-demographic factors, and exogenous factors related to policy and the economic environment were identified. In particular, the literature suggests that farms that introduce new technologies are more likely not only to remain within the sector but also to increase their farm size by seeking economies of size and scale. The role of off-farm income appears controversial, especially in the case of small farms. On one side, it could help stabilise farm income and represent a form of subsidy to be invested within the farm, on the other side it could represent the first step of the farm's exit from the sector. The age of the farmer and the presence of young people in agriculture affect the introduction and management of new technologies, but also investment decisions. The purchase of land, as well as the investment in buildings, are investments linked to farm growth and could be linked to a loan of money from the bank (Elhorst 1993). Therefore, the presence of a young farmer or a successor could have a positive influence because it would increase the time horizon of the investment (Elhorst 1993; Oude Lansink, Verstegen, and Van Den Hengel 2001). Furthermore, the presence of a young farmer brings managerial skills useful for the introduction and management of innovation within the farm and ensures generational renewal of the sector. The external environment, and in particular, the economic environment may influence the investment decision. For example, as the cost of capital increases, the likelihood of the farmer making an investment decision decrease(Boehlje 1992) .

Finally, agricultural policy and land regulation programmes may influence the value of land and investment decision. The researchers hypothesised that income support subsidies may positively influence the overall investment decision of a farm because they represent a form of income that is not subject to production risk(Moro and Sckokai 2013). Furthermore, the researchers theorised that the income subsidies provided by agricultural policy could be capitalised within the land price and thus lead to an increase in land value over the years. Capitalisation of the subsidy can be affected by land regulations (J. F. M. Swinnen, Van Herck, and Vranken 2014). Stringent land regulations reduce the capitalisation of the subsidy within the land price. European countries adopt very different land regulations. For example, France is the European Country with the most stringent land and rent

regulations, while Italy is one of the countries with the most liberal regulations (European Commission. Joint Research Centre. 2021a). Land regulation is an instrument through which the State can regulate the relationship between the land purchase market and the rental market and influence the allocation of land and the efficient use of this fixed and non-reproducible factor of production (Johan Swinnen, Van Herck, and Vranken 2016). In 2017, the European Parliament asked all member states to review their land regulation with the aim of limiting the concentration of land in the hands of a few large companies and facilitating access to this factor of production(European Parliament 2017).

This dissertation represents exploratory research of the Italian land market. This research aims to identify a) those factors that influence the Italian farmer's decision to purchase land in Italy, b) the dynamics that characterise Italian land markets c) the role that state-implemented land regulation can play within the land market.

1.2 Objectives

The main objective of this PhD thesis is to identify whether and how endogenous and exogenous factors influence farmers' decision to purchase land and the agricultural land market in Italy. In particular, the dissertation has three main sub-objectives:

1) To build the conceptual basis for identifying whether and which endogenous and exogenous factors may influence the farmer's choice to expand farm size through a medium to long-term investment decision.
2) Quantitative analysis of factors affecting the investment decision of Italian farmers to purchase land between 2013 and 2020. The land market is a complex system influenced by many factors that influence each other, and the available data often conditioned the research.

3) Qualitative analysis of factors affecting land market in Italy and France. Through this analysis it will be possible to grasp the dynamics characterising local land markets and to understand if and how completely different land regulations can influence land market dynamics.

The analysis of the literature and the identification of factors influencing the choice to buy will be the basis on which for conducing two complementary research studies, one quantitative and one qualitative. These two empirical studies are complementary with each other. The model developed to reach objective 2 does not allow to capture of the dynamics and motivations that may act and characterise the land market at local and national levels. These elements can be understood through the analysis of qualitative data obtained from interviews with experts in the field. To try to understand such a complex system, it is deemed necessary to study it by integrating two different modes of research.

1.3 Novelties

This research stands out from the existing literature for having exclusively explored the land investment decision in Italy and the dynamics and relationships within the Italian land market by combining quantitative and qualitative approaches.

In the first part, through the combination of different literature streams, a conceptual model was developed to capture the basic endogenous and exogenous drivers that may influence the land investment decision. Since there is no similar research in the literature, several quantitative models were developed, thus helping to understand better how specific drivers and the interplay between some of them may influence the purchase decision. The quantitative analysis allowed the development of a robust model that identifies factors that, beyond the farm location, can influence the probability of land investment. Furthermore, unlike most empirical studies on farm size growth

and investment decision, the focus is not on one type of specialisation, but we consider all specialisations to detect possible differences.

The qualitative analysis made it possible to bring to light dynamics that can characterise land markets, to understand and contextualise the effect of drivers within the land market, and especially the relationships between the different drivers. These dynamics, which are difficult to detect through a quantitative method, made it possible to improve the understanding and contextualisation not only of the data and results obtained in the quantitative analysis but also of the data relating to national and European statistics.

Furthermore, the qualitative analysis made it possible to investigate and take stock of the effects of the different land regulations adopted by Italy and France. This comparison made it possible to highlight the positive aspects and limitations of the land regulations implemented by the two Old Member States. The study of these aspects can be useful in understanding how to implement tools such as agricultural policies and land regulation to improve both access to and use of the productive factor land and the entire national agricultural sector.

1.4 Overview

This dissertation is divided into several parts described below. In the next chapter, an analysis of the literature on structural change and farm size growth, the investment decision, and the land market is conducted. The objective of this chapter is to identify, within the theoretical and empirical literature, those endogenous and exogenous factors that may influence the purchase decision of farmers.

In Chapter 3, starting from the literature review, the basic conceptual model was developed based on which the probit regression model was developed to analyse the FADN Italy data from 2013-2020. This made it possible to delineate a regression model that can unravel, even if only partially, the investment decision and the identification of specific factors that can positively or negatively influence the probability of the investment decision.

Chapter 4 consists of a qualitative analysis of questionnaires conducted to experts in the sector in Italy and France. This analysis allows a better understanding of how the drivers identified in the literature can influence not only the agricultural sales market, but also the rental market in Italy and France. Furthermore, it allows an in-depth analysis of the effect of completely different land regulations. Interviewing experts allows us to grasp certain elements and dynamics that cannot be grasped by quantitative analysis and data collected from National and European statistics.

In Chapter 5, what emerges from the two analyses allows us to understand, discuss, and reflect on how the different factors and actors involved condition the agricultural land market. It also allows an understanding of how certain drivers interact and condition themselves.

The last chapter is dedicated to drawing conclusions based on the research results conducted in the previous chapters.

This dissertation was conducted with the awareness that the land market is a complex system, and that the available data may limit and bias the research results. All the factors described are not mutually exclusive, and often interact each other (Boehlje 1992; Goddard et al. 1993; Zimmermann, Heckelei, and Domínguez 2009). How and how much these factors affect and influence each other also depends on the context not only locally, but also nationally.

2.Literature review

2.1 Introduction and Objectives

As highlighted in the previous chapter, land represents a fixed productive factor of a farm with peculiar characteristics that differentiate it from other productive factors and contribute to characterising the agricultural land market. In the agricultural sector, more than in other sectors, land represents a critically important factor of production(Bradfield et al. 2020). In 2017, the European Parliament expressed concern about the concentration of land in the hands of a few large farms and called on Member States to review the policies and regulations governing the national land market to prevent land concentration and facilitate access to this fixed productive factor (European Parliament 2017). The purchase represents a form of investment through which the farmer can access the land factor and increase the size of their farm. There are no literature reviews on factors influencing the decision to invest in land, and no empirical studies exclusively focus on this type of investment.

The objective of the chapter is to identify the factors that directly or indirectly affect the farmers' decision to expand farm size through long-term investment.

Considering the gap in the literature on land investment, and that the purchase represents both a form of farm size growth and a form of investment that takes place within the agricultural land market, to achieve the objective, it was deemed appropriate to integrate three strands of literature: farm size growth and structural change, investment decision, and agricultural land market.

For a proper reading and understanding of this chapter, making some preliminary remarks is deemed necessary and appropriate. In the literature, farm size growth has become one of the main indicators to describe the structural change in the agricultural sector (Akimowicz et al. 2013). To identify the factors that could impact land investment decisions, it was decided to start with a review of the factors identified in the theoretical literature that may influence structural change by integrating the strands of literature related to investment decisions and the agricultural land market. Subsequently, we will

review empirical studies based on ex-post studies analysis of micro-data to identify the models implemented by researchers to study farm size growth and decision investment.

The remainder of the chapter is organized as follows: in Section 2.2, we review the theoretical research on three strands of literature; in Section 2.3, we review the empirical research on farm size growth and land investment decision; in Section 2.5, we discuss what we have learned about literature review; in Section 2.5 we draw conclusions.

2.2 Theoretical studies review

2.2.1Internal farm characteristics

Researchers seem to agree that technology adoption, mechanisation and specialisation have contributed to the development of economies of size, scale and farm size growth (Akimowicz et al. 2013; Boehlje 1992; Zimmermann, Heckelei, and Domínguez 2009). Land, machinery, buildings and (family) labour are indivisible factors of production (Plogmann et al. 2022) and linked by a proportional relationship. Technological innovation needs a minimum farm size to be considered profitable and, in the past, has been necessary and functional to replace labour. According to Boehlje (1992), the increase in non-agricultural labour costs contributed to an increase in the opportunity cost of agricultural labour and this triggered technological development. Indeed, through physical capital, and machines, it was possible to substitute labour (Boehlje 1992). In addition, technological innovation has allowed the farmer to produce on a large scale while maintaining a fixed labour input (Boehlje 1992). The more expensive and complex the innovation becomes, the more the farmer will be incentivised to produce a few types of output. Specialization allows farmers to spread fixed costs over multiple hectares dedicated to producing a few selected outputs, where farmers allocate and concentrate their managerial skills and capital (Bremmer and Oude Lansink 2002). The early adopters of technologies in the agricultural sector will benefit from a competitive advantage in the initial phase. Nevertheless, as the innovation spreads and competition intensify, the overall sector

output will increase, leading to a decrease in prices. As a result, only those who have adopted the technology will have a higher likelihood of remaining within the sector. (Zimmermann, Heckelei, and Domínguez 2009). Although small and large farms may adopt innovative technologies equally, it seems that farm growth induced by technological progress is stronger for large farms because they are more likely to have access to information, funding and managerial capacity (Goddard et al. 1993; Weiss 1999). From a theoretical perspective, it is more likely that technological innovation favours the growth of large farms and increases competition within the sector. This, in turn, puts pressure on small farms, which may either exit the sector or reduce their size (Plogmann et al. 2022).

In this sense, the receipt of off-farm income could help small farms to survive and remain within the sector. In fact, this income could be used to subsidise farming activities at least in the short term or represent a useful form of supplementary income to manage price fluctuations and stabilise the total household income of the small farm (Goddard et al. 1993; Weiss 1999; Zimmermann, Heckelei, and Domínguez 2009). While off-farm income could help small farms survive, better off-farm remuneration could be the first step in the small farm's exit from the agricultural sector (Zimmermann, Heckelei, and Domínguez 2009). Therefore, it is still unclear how off-farm income can influence the survival and investment decision of farms.

Human capital is considered one of the main factors that can influence farm growth. This factor refers to the farmer's age, level of education, public education programmes, know-how, years of experience and managerial skills (Akimowicz et al. 2013; Boehlje 1992; Goddard et al. 1993; Zimmermann, Heckelei, and Domínguez 2009). Information management, technology assessment and adoption, and the allocation of farm resources are influenced by managerial skills and investment in human capital. Human capital also includes consultancy and advisory services that can also be purchased externally by the farmer (Boehlje 1992). According to the researchers, the improvement of human capital within the agricultural sector corresponds to better and more efficient farm management, which is why this factor is considered one of the main drivers of the expansion of farms over time (Boehlje 1992;

Goddard et al. 1993). Managerial skills also appear important in the introduction and use of new technologies, especially when these are difficult to use and expensive. It is very likely that farmers who are unable to use such technologies cost-effectively will leave the sector and favour a few large farms again (Boehlje 1992; Rodgers 1988)

The age of the farmer is one of the main socio-demographic factors analysed in studies of farm size growth and investment decisions. When the farm is run by a young farmer it is expected that the farm will grow and increase in size faster than farms run by older farmers(Bremmer and Oude Lansink 2002; Gale 1994). As the age of the farmer increases, the farm will be in the so-called stages of *maturity* and *decline* and the farmer is expected to be more reluctant to conduct forms of investment especially in the medium to long term (Bremmer and Oude Lansink 2002). In these two phases of farm life cycle, the presence of a potential successor could positively influence the expansion of the farm and prevent it from entering the *decline phase* (Huber, Flury, and Finger 2015). The decision to invest in structural assets such as land may require an important financial commitment on the part of the farm. The presence of a young farmer and/or a successor increases the time horizon of the investment and could be less risk-adverse, positively influencing the investment decision and the growth of the farm (Elhorst 1993; Huber, Flury, and Finger 2015; Oskam, Goncharova, and Verstegen 2009; Oude Lansink, Verstegen, and Van Den Hengel 2001).

The presence of young farmers within the sector means having farmers who are better trained in the use of new technologies and who are also supported by investment and modernisation programmes that inevitably lead to an increase in mechanisation and capitalisation of the sector (Akimowicz et al. 2013). Goddard et al. 1993 hypothesised that the reduction in the number of young farmers would contribute to the reduction of individual farms, and the increase of non-traditional forms of management, farm corporations, and vertically integrated food processing (Gale, 1993, (Goddard et al. 1993). According to Eurostat data, 94.8% of European farms are family farms in 2020, France and Estonia being the exceptions (Eurostat 2022). The explanation for this can be found in the sociological

model described by Boehlje (1992) who identified a social and an individual reason why the agricultural sector continues to be based on family farms. On the one side, the maintenance of family farms would guarantee society efficient production, food supply and community viability. On the individual side, it would guarantee an independent lifestyle and the possibility of controlling one's own future. In the case of multi-generational farms, it provides an opportunity for the next generation, especially in the phase of transferring ownership, the young person setting up on the farm can benefit from the help and experience of the outgoing farmer (Boehlje 1992).

2.1.2 Exogenous factors

In addition to factors related to the farm's structural and socio-demographic characteristics, there are exogenous factors related to the economic and policy environment that can influence the investment decision and farm growth (Zimmermann, Heckelei, and Domínguez 2009).

Macroeconomic factors such as the interest rate and inflation rate seem to influence investments particularly those in structural assets. As the cost of capital increases, the likelihood of the farmer conducting a form of investment decreases. Investment in land, as well as in buildings, may require an important financial commitment and the farm may require a loan from the bank (Elhorst 1993). Besides the overall economic situation, the farm's financial reputation may also be significant during negotiation with the bank. (Elhorst 1993). The inflation rate affects the economic development of the agricultural sector and the supply and demand for land (Puddu 2014; Viaggi 2009). The value of land increases more than the inflation rate, which makes land a "*safe haven*" asset, i.e. an asset through which to protect the value of capital from the rate of inflation (Schimmenti, Asciuto, and Mandanici 2013; Johan Swinnen, Van Herck, and Vranken 2016). These characteristics make the land a financial asset and store of wealth that also attracts investors from outside the agricultural sector (European Commission. Joint Research Centre. 2021a), as was the case during the 2008 financial crisis, when major investors invested in land since they considered farmland a safe investment (European

Economic and Social Committee 2015; European Parliament 2017). In this sense, policymakers via land regulation, another exogenous factor, could strengthen and protect the position of farmers. Retention of land for agricultural use, support of the rural population, reduction of land fragmentation, management and reduction of land concentration are the main objectives upon which the different Member States regulate the agricultural land sales and rental markets (European Commission. Joint Research Centre. 2021a). Each Member State of the European Union has complete jurisdiction and decision-making over agricultural land market regulation and this varies considerably between the different European countries (European Commission. Joint Research Centre. 2021a; J. F. M. Swinnen, Van Herck, and Vranken 2014). The European Union has not issued any secondary regulations that could influence land market transactions (European Commission. Joint Research Centre. 2021a), but recently, at the urging of the European Economic and Social Committee, European Parliament called on all Member States to review their land regulations so that they could avoid a concentration of land in the hands of a few large farms and ensure fair access to land (Balmann et al. 2021; European Parliament 2017). History and politics have influenced the regulation of different countries (Ciaian, Kancs, and Swinnen 2010). In general, the New EU Member States, except for Czechia and Estonia, have more stringent land regulations or a greater number of measures. More liberal regulations characterise land regulation in the Old Member States. Among the Old Member States, France is an exception because it has stringent regulations affecting both the purchase and rental markets. (Ciaian, Kancs, and Swinnen 2010; European Commission. Joint Research Centre. 2021a). According to the existing literature, stringent land regulation characterised by price and rent control avoids the capitalisation of subsidies under agricultural policies in the value of land at least in the short term (Ciaian, Kancs, and Swinnen 2010). Theoretical and empirical studies have been conducted to estimate the effect of subsidies on land prices and rents. From a theoretical point of view, the value of land should be positively affected by the decoupled payments. For example, the introduction of the Basic Payment Scheme (BSP) should have contributed to an increase in the value

of land since the payment of this subsidy was expected regardless of whether the landowner was actively or passively engaged in farming. The impact of this payment has a twofold effect on the value of the land because it guaranteed a constant income stream and increased the value of the investment option associated with the land asset (Di Corato and Brady 2019). If the land market were a perfect market, *decoupled direct payments* (DDPs), *coupled direct payments* (CDPs), and *Rural Development Programme* (RDP) and *Environment payments* could be capitalised within the land price. The capitalisation rate is higher for DDPs subsidies ranging from 0 to full capitalisation depending on the type of subsidy (European Commission. Joint Research Centre. 2021b) . The availability of data, especially in Europe, has allowed empirical research to be conducted mainly on rents rather than land value (European Commission. Joint Research Centre. 2021b). In general, what has emerged is that the capitalisation rate within the land price is lower than theoretically assumed and varies significantly across studies. Based on the FADN 1989-2016 data, it was estimated that only DDPs influence the value of land. In the short run, the capitalisation rate varies from 28.8% to 32.1%, and in the long run from 154% to 164%. However, these estimates must be taken with caution due to problems with the accuracy of the data and econometric issues (European Commission. Joint Research Centre. 2021b). The capitalisation of CAP subsidies within the land price is also conditioned by other factors such as farms credit constraints, elasticity of land supply, social capital (European Commission. Joint Research Centre. 2021b). Agricultural policy does not only affect the price of land, but also the investment decision. Subsidies were introduced with the main objective of supporting farmers' income in the event of price fluctuations due to changes in demand and/or in output prices. According to economic theory, any incentive introduced as a subsidy to the farmer increases the marginal return by increasing the price of output, either by reducing the cost of production or by increasing the return on subsidy farming activities (European Commission. Joint Research Centre. 2021b). As subsidies represent a secure form of income not subject to production risks, it is reasonable to assume that they can positively influence the investment decision, especially

in relation to imperfect capital markets, bankruptcy risk and other financial problems (Moro and Sckokai 2013; O'Toole and Hennessy 2015). The effect of the subsidy depends on how it is designed, and the economic incentive provided. It must be ensured that most of the subsidy is mainly captured by farmers. On one hand, subsidies support the development of farms and the income of farmers, and can help generate an economic surplus, at least in the long run. On other hand, care must be taken that this surplus is not concentrated mainly in the hands of parties other than the farmer himself (e.g. parties operating downstream in the value chain, non-farmers owning land, etc.) (Veysset et al. 2019).

2.3 Empirical Study review

2.3.1 Farm size growth

In the literature on structural change in agriculture, the different models implemented by researchers to study the behaviour of farms include econometric models based on regressions on numbers of explanatory variables (Zimmermann, Heckelei, and Domínguez 2009). Several of them have been implemented to study farm growth or size and often developed from Gibrat's law(Gibrat 1931; Zimmermann, Heckelei, and Domínguez 2009). This law states that a firm's growth is independent of its size and is conditioned by random factors. The basic equation of Gibrat's law is as follows:

$$\ln S_{i(t)} - ln S_{i(t-1)} = \alpha + \beta \ln S_{i(t-1)} + u_{i(t)}$$

Where $\ln S_{i(t)}$ is the firm size at time t, and $u_{i(t)}$ is the random effect (Zimmermann, Heckelei, and Domínguez 2009).

According to the social science researchers, within these random factors were systematic factors of primary importance that needed to be included and made explicit within the basic equation of the law(Zimmermann, Heckelei, and Domínguez 2009).

In the literature, four ex-post research based on micro-data analysis were identified in which the authors introduced those factors that they believed could influence farm growth.

Weiss (1999) uses Gibrat's Law as a starting point to develop his econometric model through which he highlights the importance that individual and farm-specific characteristics can have on farm survival and growth. To explain these two aspects of structural change, the author analyses a panel data consisting of more than 50, 000 farms in Upper Austria observed in three years 1980,1985 and 1990. Weiss (1999) adopts the Heckman model which suggests a two-step procedure. In the first step, the probability that the farm will survive is estimated through probit regression models. In the second step, these estimates constitute additional explanatory variables for the growth of the farm. The author develops four models: in the first he assumes that farm growth is monotonic; in the second he assumes a nonmonotonic relationship between initial farm size and farm growth; in the third and fourth model he analysed the data by separating full-time and part-time farms. The analysis of the data by separating full-time and part-time farms leads the author to reject the Gibrat's law. The research results showed that small farms grow faster towards a minimum efficient production scale than medium-sized and large farms. Furthermore, the author suggests the existence of two centres of attraction and a polarisation of growth that led to the assertion that medium-sized farms disappear in the Upper Austria. Through the implemented model, Weiss (1999) identifies socio-demographic characteristics of the farmer and his family that may influence the survival and/or growth of the farm. In particular, the presence of the young farmer influences both the survival and the growth of the farm. The farmer over 51 years of age has a negative effect on farm survival. The presence of the successor has a positive effect on full-time farm growth, while it has no effect on aggregate data and for part-time farms. Agricultural-specific schooling has a positive effect on the probability of survival and farm growth of full-time firms, while it has no effect on part-time firms. The level of general schooling has an opposite effect on the survival of full-time (+) and part-time (-) farms, while it has no effect on farm growth in either case. The marital status of the operator, and when the operator is married, has a significant effect on survival and growth when aggregate data and full-time farms are considered. The growth and survival of the business is also influenced by the number of family

members. In particular, family members between 6 and 15 years of age increases the probability of business survival. Family members represent a labour force resource and stimulate expansion (Upton and Haworth 1987; Weiss 1999). Full-time compared to part-time farms are more affected by the effect and the relationship between family size and structural and farm growth. The variable related to non-farm labour, considered only in the analysis of the aggregate data, negatively influences the probability of farm survival and growth. The author's available data conditioned the choice of explanatory variable. In fact, the researcher would have liked to introduce variables related to socio-demographic factors or farm debt, but the absence of data did not allow him to do so.

Akimowicz et al. (2013)combine three complementary econometric models to analyse whether and how farm, farmer, and territorial factors can influence farm size in terms of utilised farmland and farm size growth. The research is conducted on 5000 professional farms in terms of farm size and farm type in the Midi-Pyrénées region observed in 2000 and 2007. The authors adopt three regression models. A first model was developed to study the effect of explanatory variables on farm size. It is represented by Ordinary least squares (OLS) in which the dependent variable is numerical and is represented by the logarithm of the farm size (expressed in UAA) observed in 2000. The second model consists of a Multinomial logit developed to emphasise the effect on the dynamic of enlargement or reduction in size. Thus, the dependent variable is the change (enlargement or reduction) in farm size above the 2% threshold between 2000 and 2007. The third model is Tobit model whose dependent variable is the logarithm of the growth intensity between 2000 and 2007. The results of the research showed that small farms grow faster. The type of farm is the main farm characteristic that influences farm size, and the level of specialisation affects and influences the change in size. Cash crop farms are significantly larger than the others, while mixed crop-livestock and livestock farms have grown more in the period considered probably due to the decline of livestock farming on a regional scale. The age of the farmer and the presence of a successor are the main socio-demographic factors that have most influenced farm size growth. Furthermore, most of the small

farms that grew between 2000 and 2007 were farms run by young farmers. Due to a lack of available data, the authors cannot state whether and how much the SAFER policies stimulated this. Off-farm activities and human capital do not influence farm growth. What does emerge is that farmers with agricultural training run larger farms. Considering spatial factors, the urban area affects the dynamics of farm size and size probably due to urban policies and regulations. The department in which the farm is located also influences the dynamics of farm increase or decrease and the intensity of farm growth.

Bremmer and Oude Lansink (2002) analyse the effects of farm structure, performance, and farmer characteristics on farm renewal and farm growth. The analysis was conducted on Dutch- FADN data combined with survey data. The research focuses on data from farms specialised in horticulture and arable crops. The researchers developed two probit models with different dependent variables. In one model, the dependent variable assumed a value equal to one when both the farm area and the productive area increased by at least 5%. In the second model, the dependent variable assumed a value equal to one when the farm innovated or diversified. The authors adopt both models to analyse the data both in aggregate and by analysing them for individual specialisations, i.e. arable crops and horticultural- protected farms. Aggregate data analysis showed that the structural characteristics of the farm affect farm development much more than variables related to socio-demographic characteristics of the farmer, and farm performance. In particular, the degree of mechanisation affects both farm growth and farm renewal. Farms specialised in field production grow more than farms specialised in protected crops (mushrooms and cultivation under glass). The initial farm size does not increase the probability of the dependent variables in either model developed. Therefore, Bremmer and Oude Lansink (2002)confirm Gibrat's law. Family labour input, and solvency do affect the probability of farm growth and renewal probability when data are analysed in aggregate. These two variables lose their effect when individual specialisations are analysed. Contrary to the hypothesis and unlike the other studies identified, age, the presence of a successor, and off-farm income do not

influence farm development. Analysing the data by individual specialisation showed that the initial size influences growth positively in the case of arable crops, and negatively in horticulture protected. The level of mechanisation only positively influences farm renewal in the case of arable crops. Age affects the probability that the farm grows in the case of horticulture protected farms. Profitability at t-1 negatively influences the probability of growth in the case of protected crops, whereas profitability at t-2 has a positive influence.

Brenes-Muñoz, Lakner, and Brümmer (2016) attempt to identify factors that may affect farm growth in the case of organic farms as researchers had only focused on the study of farm size growth in conventional agriculture. To cover this gap in the literature, the authors develop a model to investigate farm growth in terms of UAA and agricultural revenue by analysing an unbalanced panel data consisting of 2759 observations from 453 organic farms in Bavaria and Baden-Wuttermberg observed/registered between 1993 and 2005. The model adopted is a regression analysis where the dependent variable is the first logarithm difference of the farm size, as UAA and agricultural revenue, and the explanatory variables are related to structural and socio-demographic characteristics of the farm. The results showed that farm size in terms of output is negatively influenced by the previous year's agricultural revenue and positively influenced by the previous farm size. The variable "capital", i.e. annual depreciation, and "labour" (Annual Work Unit) introduced in the model influence the dependent variable in terms of agricultural revenue, but not in terms of UAA. Part-time farming and the age of the farmer do not influence farm growth either in terms of area or in terms of revenue. However, it should be noted that the average age of the sample is 43, so average young farmers. Subsidies received for organic production influence farm growth in terms of UAA but not in terms of agricultural revenue. According to the authors, subsidies help to mitigate the effect of low and irregular yields and support the farm during the transition from conventional to organic. Livestock units influence farm growth both in terms of agricultural land and output. Specialisation in arable crops influences growth in terms of UAA, while specialisation in pig and poultry farms influences

farm growth in terms of output. Soil quality has a positive influence on agricultural revenue, but not on farm area growth. The authors conclude that large farms scale up more frequently than small farms. The greater capital at their disposal allows large farms to scale up faster than small farms and to cover any conversion costs.

2.3.2 Investment decision

In the strand of literature relating to the investment decision, only two articles were identified that conduct ex-post analyses on micro-data and in which land investment is also considered: Elhorst (1993) and Oskam, Goncharova, and Verstegen (2009). Both studies were conducted in the Netherlands based on Dutch Farm Accountacy data Network provided by the LEI Wageningen Ur and focus on one agricultural specialisation, dairy sector, and horticulture production respectively. In both studies, the authors analyse farmers' investment in at least one of the three farm assets: land, machinery, and buildings. Albeit in different ways, the authors consider both the investment decision (also defined "*participation decision"*) and the level of investment. The investment decision represents a discrete problem (Elhorst 1993) and can be described by logit or probit models. The investment level represents a continuous problem and can be modelled by a linear regression model. Elhorst (1993)analyses an unbalanced panel data from which he reconstructs a balanced panel data consisting of 4204 observations collected between 1978/79 and 1988/89 concerning the Dutch dairy sector. The author develops the final investment equation from neo-classical production theory to which he integrates elements of financial investment theory. In particular, he bases his statistical model on the infrequency purchase model developed by Blundell and Meghir (1987)by altering it using the logit regression model instead of the probit regression model. In particular, the explanatory variables of the binary variable consist of three variables describing the financial position of the firm: one variable describing the short-run profit one year delayed, another describing the percentage of the farm owned, determined from the initial capital stock held as a proportion of the total initial capital

stock, and another variable related to the nominal interest rate on mortgages deduced from the statistics of CBS (%). The explanatory variables for the level of investment consider structural characteristics of the farm, socio-demographic characteristics and external factors related to the price of inputs and outputs. Therefore, through the model developed, the author assumes that a farmer who is not in a good financial position will not consider making an investment. Despite this, the author states that it would still be reasonable to assume that the explanatory variables used to explain the level of investment could also influence the investment decision. For this reason, Elhorst (1993) considers it appropriate to conduct the discussion of the results also based on the latter option.

The results show that when investing in land, the farmer's financial position affects the distinction between zero and non-zero observations. As the age of the farmer increases, the investment decreases. The presence of the successor tends to increase the willingness to invest of the farmer probably because the horizon time of the investment increases. Thus, the presence of any successor leads to a slight increase in investment. The increase in output and input prices affect the investment in opposite ways. The former influences positively, the latter negatively. Furthermore, the increase in the price of output has a greater effect on investment than the reduction in the price of inputs. Investment is held back by the increase in the price of capital. Investment in land decreases by 0.14% when the price of capital increases by 1%. Family labour has a positive effect on investment.

Oskam, Goncharova, and Verstegen (2009) analyse an unbalanced panel data consisting of 5341 observations on 1390 Dutch glasshouse horticulture firms observed between 1975 and 1999. The authors start from the assumption that the farmer tends to maximise his profit and that those who make an investment must also consider the adjustment costs. To define the model, the authors start from Bellman's (1957) equation according to which profit is determined by the price of inputs, outputs, and capital. The variables related to the presence of the successor and the large debt tend to influence the investment participation more than the level of investment. Nevertheless, the authors decide to adopt the same explanatory variables in the two regression analyses constituting the

Heckman Selection Model. Unlike Elhorst (1993), Oskam, Goncharova, and Verstegen (2009)do not combine the two decisions within a single model but treat investment participation and investment level separately. Furthermore, they do not analyse the data by types of investments but analyse the data in an aggregate manner. The research showed that the probability of making an investment (*participation to invest*) is positively influenced by increasing output price, household welfare, revenue, farm price growth and energy price. As farm capital increases, both the probability of investment and the level of investment decrease. As the farm's debt increases, the probability of investment decreases, but the level of investment increases. The initial farm size only positively influences the level of investment. An increase in the cost of capital leads to a decrease in the probability of investment, but an increase in the level of investment. Finally, the age of the farmer negatively influences both the level and the investment decision.

Both studies report that investment in land is the least likely to occur compared to investment in buildings and machinery. Elhorst (1993)in analysing the observations of farms that did not invest, 82% concerned land, 47% buildings and only 20% machinery. In Oskam, Goncharova, and Verstegen (2009)study, 91% of the zero-observations concerned investments in land, 35.7% in buildings and 16.2% in installations and 20.4% in machinery. By extending the observation time, the probability that the farmer invests increases. According to Elhorst (1993), the probability of investing in land increases by 15% if the observation time is increased by one year, to about 50% more if it is increased by five years. According to the researchers, the low frequency of land investments is due to aspects related to the location of the land and the availability of land on the market. It is not certain that the farmer will find the amount of investment he needs on the market and consequently the time of planning and realisation of the investment may not coincide (Elhorst 1993).

The Table 1 shows for each paper analysed the models adopted and the independent variables introduced by the author to study farm growth and the investment decision.

Paper	Models implemented	Variables considered
Farm growth and structural change		
Weiss (1999)	Heckman model: two steps 1) probit model to estimate the probability that the farms survive; 2) 4 models: monotonic farm growth; non-monotonic farm growth, full time farms, part-time farms	*Farm structural characteristics:* Initial farm size; *Socio-demographics characteristics:* age, presence of successor; agricultural-specific education, level of "general" education; number of family members, farmer's marital status, off-farm (part-time farming), gender
Akimowicz et al. (2013)	3 different model: -OLS where dependent variable is logarithm of farm size; -Multinomial logit model where the dependent variable is the increase the decrease of UAA; -Tobit model where the dependent variable is logarithm of the growth intensity.	*Farm characteristics:* farm size, farm type; level of specialisation; legal status, *Socio-demographic characteristic:* age, presence of successor, off-farm and human capital, gender of the farmer, off -farm job, level of agricultural education, level of general education *Local characteristic:* Department, type of area(urban, per-urban, rural, deep rural)
Bremmer et al. (2002)	2 probit model with dependent variable assumes value equal 1 - farm innovated or diversified - farm increased both farm area and productive area	*Farm characteristics:* initial farm size, degree of mechanization; Specialization, solvency, profitability; *Socio-demographic characteristics*: family labour input, age, presence of successor, education, off- farm income.

Brenes-Muñoz et al. (2016)	Two regression analyses in which the dependent variable is respectively the difference of the first logarithm of the UAA and agricultural revenue	*Farm characteristics:* initial farm size, agricultural revenues (t-1), capital (as annual depreciation), labour (as annual work unit); specialisation(mixed farm, arable crops, pig and poultry farms), soil quality *Socio-demographic characteristics:* Age, part-time farming; Policy environment: subsidies for organic production
Investment decision		
Elhorst (1993)	Statistical model based on infrequency purchase model developed by Blundell and Meghir (1987) by altering it using logit regression model instead of the probit regression model	*Financial variables: short*-run profit one year delayed, % of farm owned and nominal interest rate ; Socio-demographic characteristics: age, presence of successor, family labour input; External factor: output and input prices
Oskam et al.(2009)	Heckman selection model	*Farm structural characteristics*: firm size, Financial and economic characteristics: Capital, wealth, Debts, labour cost, revenue,Socio-demographic: characteristics: Age, presence of successor, new entry external factor: output price, energy price, price of capital

Table 1 Summary of findings from the literature review

2.4 Discussion and conclusions

The literature analysis suggests that there are factors endogenous and exogenous to the farm that influence farm growth and investment decision. From the theoretical literature, these factors are not independent, but often interact each other (Boehlje 1992; Goddard et al. 1993; Zimmermann, Heckelei, and Domínguez 2009).

Analysing and comparing the theoretical and empirical literature, it is evident that among the explanatory variables of the empirical models implemented to analyse farm growth, variables related

to the external environment are not considered. The studies mostly seem to focus on the effect that structural and socio-demographic characteristics can have on farm growth. There are no variables related to subsidies linked to agricultural policy and land regulation. Even in the study by Brenes-Muñoz, Lakner, and Brümmer (2016) focusing on organic farm growth, only subsidies related to organic farming are considered. There are no variables related to other types of subsidies, just as there are no variables related to the macroeconomic environment. In the two studies focused on the investment decision, variables related to subsidies and funding are not considered, but there are elements related to the financial position of the farm and the external environment.

All empirical research identified in the farm size growth strand is conducted by analysing data from farms located in limited territories. This may be because land supply is in any case determined by local characteristics. In the study of Akimowicz et al. (2013)although it focuses on a circumscribed area, it nevertheless includes a categorical variable related to the location of the farm. The empirical studies identified in the investment strand focus on a single type of specialisation and analyse data on a single member country, the Netherlands. In studies that do not focus on a specific agricultural specialisation, a categorical variable linked to this farm characteristic is always present within the model. The study conducted by Bremmer and Oude Lansink (2002) shows how variables related to structural and socio-demographic characteristics can affect the specialisation differently and how the effect of certain variables can be lost when data are treated in aggregate. Except for Oskam, Goncharova, and Verstegen (2009), research is conducted on balanced panel data of farms observed for a minimum of 7 years and a maximum of 24 years. The increase in farm size and/or investment in productive assets in general does not occur frequently and for this reason more years of observation are necessary to detect differences.

Apart from the problem of data availability and retrieval, it is evident from empirical studies how complex it is to include variables related to factors such as land regulation in econometric models.

According to the theoretical literature, this factor inevitably influences market dynamics and land prices.

3. Factors affecting farmers' choices: a quantitative analysis

3.1 Introduction and objective

As extensively emphasized in the previous chapter, the purchase of land is one of the ways through which a farmer can access one of the main factors of production and represents a form of investment in a capital asset characterized by a certain degree of irreversibility (Elhorst 1993; Oskam, Goncharova, and Verstegen 2009). The local land market can be thin, making it difficult for farmers to find desired amounts of land (Cotteleer, Gardebroek, and Luijt 2008; Elhorst 1993). Land purchases are less frequent than other types of investments, meaning that farms must be observed over a period to be detected. However, the lack of a structured database has hindered research on the land market and investments made by farmers in general (De Noni et al. 2019; Elhorst 1993). No literature studies have exclusively focused on the decision to invest in land and identifying the factors that can influence access to this production factor through purchase.

The objectives of this chapter are to conduct a quantitative analysis by examining Italian FADN data to identify the factors that may have influenced the investment decision in land by Italian farmers between 2013 and 2020. A conceptual model was first designed based on the literature review conducted in Chapter 2. Subsequently, five empirical models were developed to explore and analyse the decision to invest in land, representing it as a discrete problem (Elhorst 1993).

The remainder of the chapter is organized as follows: in Section 3.2, we develop the conceptual model based on the literature review conducted in Chapter 2; in Section 3.3, we describe the data analysed; in Section 3.4, we define the empirical model developed based on the literature review and available data and describe the variables taken into account; in Section 3.5, we present our main results; in Section 3.6, we discuss the main findings, and in Section 3.7, we provide final remarks.

3.2 Conceptual Model

Based on the review of theoretical and empirical literature conducted in Chapter 2, the conceptual model represented in Fig. 1 was designed.

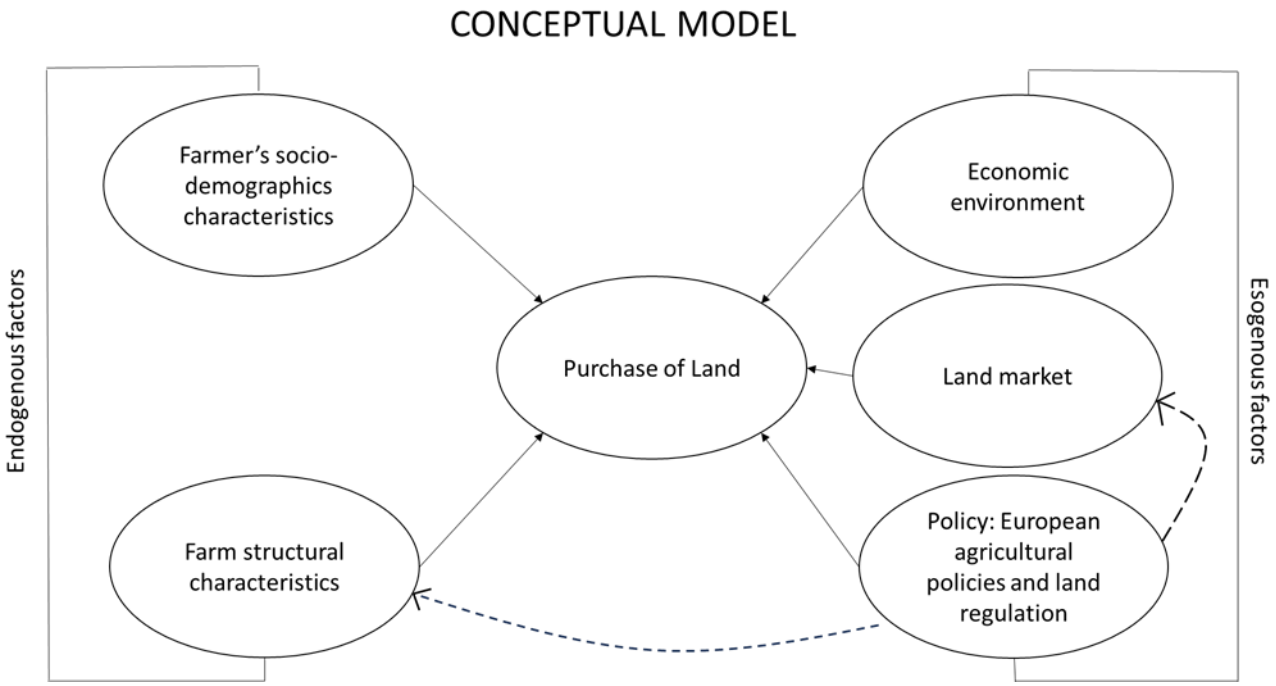

Figure 1 Conceptual Model, own elaboration.

In our conceptual model we hypothesise that the decision to expand farm size through purchase is directly influenced by endogenous factors such as structural farm characteristics and the socio-demographic characteristics of the farmer and his family. In addition to endogenous factors, we assume that exogenous factors related to the macroeconomic environment, the local land market, and European agricultural policies and land regulation influence investment participation. Furthermore, we assume that agricultural policies and land regulation may influence both local land market and farm structural characteristics. In fact, subsidy provided by agricultural policies and capital account linked to the first and second pillar can over the years incentivise farms to invest and diversify their activities. Subsidies provided by Pillar I represent a form of income that is not subject to production risks but is directly linked to farm area (Moro and Sckokai 2013). The measures linked to RDP do not directly finance investment in land. However, they could indirectly influence the agricultural land

market by financing other productive farm assets that can lead to innovation /renewal of other farm assets or business diversification that could stimulate economies of scale and/or increased income to be reinvested in the farm. Land regulation and institutions implemented by each Member State can influence the capitalisation of subsidies within the land price, the farmland market and the relationship between agricultural sales and rental markets (Ciaian et al. 2012; Johan Swinnen, Van Herck, and Vranken 2016).

3.3 Data

The research was conducted on Italian FADN data of Italian farms observed between 2013 and 2020. The data represent an unbalanced panel data consisting of 84610 observations representing 24212 farms. On average, the same farm remains in the sample for about 3 to 4 years.

For each farm, there is information on the structural characteristics of the farm, data on the farm's balance sheet, and data on the socio-demographic characteristics of the farms.

3.3.1 Descriptive analysis

Of the 24212 farms in the sample, 919 made at least one investment in land during the period in question, of these 176 farms made more than one investment (Table 2).

	Full Sample	**Buyer**	**%**
Number of observations	84610	1095	1,29
Number of farms	24212	919	3,79

Table 2Descriptive analysis: Dimension of unbalanced panel data

The data include non-specialised and specialised farms in cereals, arable crops, horticulture, fruit crops, olive growing, viticulture, dairy cattle, herbivores and granivores.

The 90, 55% of the sample is characterised by specialised farms, and the remaining 9.45% by non-specialised farms, of which 9.4% are mixed crop and livestock farms. The 32,9% of the sample are annual production, 29,9% are permanent crops and 27,8% livestock farms (Table 3).

Specialization	N. Observations	% Total observation	N. farms
No specialisation:	**7997**	**9,45**	**3364**
Unclassifiable farms	*11*	*0,013*	*11*
Mixed crops and livestock farming	*7986*	*9,4*	*3354*
Annual Crops	**27796**	**32,9**	**10612**
Cereals	8812	10,4	3188
Arable Crops	10292	12,2	4329
Horticulture	8692	10,3	3095
Permanent Crops	**25305**	**29,9**	**7781**
Fruit Crops	10721	12,7	3308
Olive growing	4034	4,8	1363
Viticulture	10550	12,5	3110
Livestock farms	**23512**	**27,8**	**7304**
Dairy cattle	7339	8,7	2239
Herbivores	12108	14,3	3780
Granivores	4065	4,8	1285
TOT	**84610**		**29061**

Table 3Specialisation of farms

In terms of UAA, specialised livestock farms are the largest in terms of average UAA, followed by annual crops and permanent crops. Among all specialisations, farms specialised in viticulture have the smallest average farm size followed by those specialised in fruit crops and horticulture. Important is the difference in farm size between horticultural farms and those specialising in other annual crops. Farms specialising in permanent crops have lower “RENT/UAA” ratios than farms specialising in annual crops and livestock (Table 4).

Specialisation	Min			Mean			Median			sd			Max		
	UAA	RENT/ UAA	GSP/ha	UAA	RENT/ UAA	GSP/ha	UAA	RENT/ UAA	GSP/ha	UAA	RENT/ UAA	GSP/ha	UAA	RENT/ UAA	GSP/ha
No Specialised	0,01	0	-8579	32,33	0,38	5158	15,77	0,21	1862	51,39	0,41	33029,55	920,1	1	1607980
Annual crops	0,06	0	-12782	36,17	0,41	16155	18	0,28	1935	60,23	0,42	64942	1754	1	2258118
Cereals	0,06	0	-348,7	51,51	0,4	1451,8	30	0,26	1289	67,6	0,41	2515	1279	1	192963,5
Arable crops	0,29	0	0	39,3	0,44	3727,3	21,35	0,41	1483,5	64,7	0,42	8101,25	1754	1	189833,8
Horticulture	0,07	0	-12782	16,9	0,38	45777	4,5	0,15	14060	37,29	0,42	110111,9	1101,75	1	2258118
Permanent crops	0,2	0	-20524	14,73	0,27	7777	7,81	0	5098	34,21	0,39	18451,5	526,87	1	331152
Fruit crops	0,2	0	-42,11	14,03	0,26	8370,81	7,53	0	5961,17	24,5	0,38	8069,8	413	1	101916,9
Olive crops	0,85	0	-601,6	18,86	0,25	2966,8	10,55	0	2170,5	28,43	0,39	2885,61	394	1	39744,7
Viticulture	0,3	0	-20524	13,85	0,28	9013	7,14	0	5612	24,25	0,39	12797,7	526,87	1	331152
Livestock sector	0,05	0	-13621	51,74	0,46	11515	28	0,44	2123	73,45	0,41	115461,7	1687,54	1	8190889
Dairy cattle	0,2	0	-63,33	49,13	0,48	7358,45	27	0,49	5005	65,66	0,4	8614,96	770	1	130405,41
Herbivores	0,1	0	-7903,8	61,15	0,47	3882	36,26	0,44	1116	83,43	0,41	26471,8	1687	1	1226304,3
Granivores	0,05	0	-13621	28,43	0,44	41752	13,19	0,37	4843	43,27	0,42	271631,7	514,55	1	8190889

Table 4 Descriptive analysis of farm size

39.45% of the land purchases were conducted by farms specialising in permanent crops, followed by farms specialising in annual crops and livestock. In particular, 18% of the recorded transactions were conducted by farms specialising in fruit crops, 16.45% by vineyards, and 12% by farms specialising in arable crops (Table 5).

Specialisation	**N. observations**	**% Total observation**	**N. farms**
No specialisation	91	8,31	82
Crops	**312**	**28,50**	**268**
Cereals	102	9,32	93
Arable Crops	133	12,15	112
Horticulture	77	7,03	63
Permanent crops	**432**	**39,45**	**366**
Fruit Crops	202	18,45	169
Olive growing	47	4,29	43
Viticulture	183	16,71	154
Livestock	**260**	**23,75**	**228**
Dairy cattle	102	9,32	87
Herbivores	102	9,32	94
Granivores	56	5,11	47
Tot	**1095**		**944**

Table 5 Our processing of data relating exclusively to buyers

3.4 Empirical Model

3.4.1 Overview

The empirical model implemented to conduct the quantitative analysis was developed based on the literature and data available to us. The characteristics of our database do not allow us to conduct a dynamic analysis, which would be appropriate since investments in capital stock are not annual investments (Lefebvre, Gomez y Paloma, and Viaggi 2015) and generally do not occur at the same time as they are planned (Elhorst 1993).

Since the investment decision represents a discrete problem(Elhorst 1993), to estimate the probability of participation decision we adopted probit regression model.

Probit regression models, whose name refers to the contraction of probability units, are a specific regression analysis that, like a logistic model, provides a conditional probability that an observation belongs to a particular category (i.e., yes/no) (DePamphilis 2011; Fávero and Belfiore 2019). They can be used as an alternative to binary logistic regression models, particularly in cases where the probability curve for the given events aligns more closely with the cumulative density function of the standard normal distribution. In most cases, the classification results are similar for both models, despite differences in the underlying distributions (Fávero and Belfiore 2019).

The probit regression model is expressed as follows:

$$p_{i=}\Phi(Z_i) = \Phi(\alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki})$$

Where:

- Φ represents the cumulative distribution function of the standard normal distribution,
- Z is the linear combination of independent variable (X) with coefficients (β1, β2, ..., βk)
- α, β1, β2, ..., βk are the coefficients that are estimated from the data,
- X_1, X_2, ..., X_k are the predictor variables(Fávero and Belfiore 2019).

In probit regression analysis, the coefficients represent the change in the cumulative probability of the outcome variable being 1 for a one-unit change in the predictor variable, assuming all other variables are held constant.

The probit equation used to develop our empirical models is described as:

$$y_i^* = \beta_0 + \sum_{k=1}^{K} \beta_{ki} x_{ki} + \varepsilon_i$$

Where:

- y_i^* is the binary dependent variable that assumes a value equal to 1 in the year in which the purchase occurs, 0 otherwise.
- ε_i = composite error term.
- *"i"* represents the number of observations,
- The term x_{ki} is the observed factor of explanatory variables that described factors linked to farm characteristics, farmer socio-demographic characteristics and exogenous variables.

The effect of x_i on y_i^* is represented by β_{ki}, β_0 and ε_i are respectively the intercept and the errors for *i*.

The equation is estimated using the 'glm' function in Rstudio of the 'stats' package (R Core Team 2022).

The independent variables (x_i), identified based on the literature and available data, are described below, and shown in Table 5.

3.4.2 Definition of explanatory variables

The explanatory variables (Table 6) introduced in the probit model will be defined below.

3.4.2.1 Farm structural characteristics

Utilized agricultural area

Chapter 2 showed that it is unclear what effect the initial size of the farm may have on the growth of farm size and on the investment decision. To try to understand whether and what effect farm size may have on the investment decision, it was decided to introduce as an explanatory variable the "UAA sq" which represents the squared value of the total initial UAA of the farm regardless of whether it is owned, leased, or free use. Assuming that farm size can also be a measure of the farm's ability to generate income (Oude Lansink, Verstegen, and Van Den Hengel 2001), we expect this variable to have a positive effect on the investment decision.

Gross Saleable Production per hectares

This variable was introduced as an explanatory variable representing the agricultural productivity of the farm. Through this variable, the aim is to understand whether the revenue per hectare derived exclusively from the farm's agricultural activity affects the growth of the farm size through purchase. It was determined through the ratio of gross saleable production, from which income subsidies derived from the first pillar and CMO were subtracted, to the utilised agricultural area. According to the literature, the farmer is encouraged to buy land when productivity is high (Ciaian, Kancs, and Swinnen 2010). Therefore, it is assumed that as productivity per hectare increases, the likelihood of the farmer investing in land increases.

Production Specialisation

When not focusing on a single specialization (e.g., the dairy sector), the researchers introduced a categorical variable related to farm specialisation (e.g Akimowicz et al. 2013) in order to understand whether the type of farm could influence the farm growth or investment decision. This is probably related to the fact that the type of assets needed by a farm varies according to their specialisation (Lefebvre, Gomez y Paloma, and Viaggi 2015). The data at our disposal include specialised and non-specialised farms. Specialised farms fall into 9 categories: Cereal crops, arable crops, horticulture, fruit crops, olive crops, viticulture, dairy cattle, herbivores and granivores. Therefore, the explanatory variable was introduced into the model to account for the nine specialisation categories. "*No*

specialisation" is used as the reference category since specialisation is one of the main drivers of the search for economies of scale and farm growth. So, specialised farms are expected to be more likely to increase their farm size than non-specialised farms.

*Utilised agricultural area *Specialisation*

Since the necessary assets of a farm and the 'optimal size' vary depending on the type of farm and the level of technological progress (Lefebvre, Gomez y Paloma, and Viaggi 2015; Plogmann et al. 2022), it was decided to combine the two preceding variables “UAAsq” and “Specialisation” to test whether the effect of farm size can vary depending on the type of farm as already shown in (Bremmer and Oude Lansink 2002).

Rent/Utilised agricultural area

According to 7th Agricultural Census, the percentage of land managed under lease has increased in Italy. On the one hand, renting allows the farm more flexibility and the possibility to invest its liquidity in other productive assets (Johan Swinnen, Van Herck, and Vranken 2016). On the other hand, land managed as property allows the farmer to use it as collateral capital and thus to have greater access to credit (Johan Swinnen, Van Herck, and Vranken 2016). It was decided to introduce into the empirical model the ratio of the land managed under rent to the total utilised agricultural area of the farm as a measure of the amount of collateral available (Benjamin and Phimister 2002; Lefebvre, Gomez y Paloma, and Viaggi 2015). It is expected that as this ratio increases, the probability of the farm acquiring land increases so that the amount of this collateral asset increases.

Machinery Plant Value

Machinery and plant represent another form of collateral capital for a farm. It is assumed that high values of this variable correspond to a farm's recent investment in such productive assets that vary proportionally to the farm area (Plogmann et al. 2022). Furthermore, there is a correlation between the intention to purchase land and investment in other farm assets (Lefebvre, Gomez y Paloma, and

Viaggi 2015).Therefore, it is hypothesised that the farm is inclined to purchase with the aim of maximising the productive capacity of the asset in which it has recently invested. For this variable, the values correspond to the total historical purchase cost net of depreciation and VAT(CREA, n.d.)

Common Agricultural Policy

Theoretically, the Common Agricultural Policy has been identified as an exogenous factor that can influence the land price, but also the decision and level of investment. Subsidies received and capital financing are not the same for every farm and for this reason it can be considered as an endogenous variable linked to structural characteristics of the farm. It was decided to introduce two continuous variables. One, the ratio of subsidies per hectare related to the first pillar of the Common Agricultural Policy. The second, the value of the capital subsidies received by the farm between 2013 and 2020 and connected to the measures of the second pillar of the Common Agricultural Policy.

Pre-purchase

Investment in land is a planned, long-term investment with a certain degree of irreversibility (Elhorst 1993; Oskam, Goncharova, and Verstegen 2009; Oude Lansink, Verstegen, and Van Den Hengel 2001). The land market is thin and local, and it is difficult for the farmer to find the amount of land he needs on the market (Cotteleer, Gardebroek, and Luijt 2008; Elhorst 1993). Therefore, it may happen that the farmer must make more than one purchase to reach the desired level of investment. The dummy variable *'Pre_Prc'* introduced in the model assumes a value equal to one when the purchasing farm has already made a purchase previously.

Diversification activities

In the literature reviewed, researchers have not considered the role that farm-related activities can have on farm growth and the investment decision. The related activities that can be stimulated by RDP measures allow for a diversification of the farm activity and represent a different form of income for the agricultural firm. Based on the database, three dummy variables were introduced for three

agricultural related activities: agrotourism, energy production and contracting. It is assumed that conducting agricultural related activities increases the probability that the purchase will occur.

Family work units

Family labour can be considered a fixed input of production within the farm (Elhorst 1993) and Elhorst's research showed that as family labour input increases, investment increases. Weiss (1999) and Oude Lansink, Verstegen, and Van Den Hengel (2001) showed that the number of family members affects farm growth and the investment decision. The variable FWU/TWU was introduced into the model as an index of how much the business depends on family labour. It is hypothesised that family farms have a greater interest in investing in the farm and farm growth and thus as this ratio increases, the probability that the farm invests in land increases.

3.4.2.2 Farmer's sociodemographic characteristics

Age of farmer and successor

Theoretically and empirically, it has been shown how the age of the farmer and the presence of the successor can affect the growth of the farm and the investment decision. The presence of a young farmer and a possible successor increases the horizon of investment time and represents a form of human capital capable of introducing and managing innovative and technological developments(Akimowicz et al. 2013; Goddard et al. 1993). Since there may be several farmers and potential successors with different ages on the same farm, it was decided to divide the farmers into five age classes to which five dummy variables correspond. Regarding the successor, 4 dummy variables were created to consider the presence and age of the potential successor. A successor was the one who was classified within the dataset as the 'son' or 'grandson' of the farmer.

Off-farm income

In the literature, it is unclear whether the earning of an off-farm income can be a prelude to leaving the sector or represents a form of income that allows the farm to survive and not leave the sector

(Lefebvre, Gomez y Paloma, and Viaggi 2015; Plogmann et al. 2022). Based on the available data, a dummy variable was created which takes the value of 1 if the farmer or a member of his or her family, who is employed part-time or full-time on the farm, earns an off-farm income >2000 euros.

3.4.3 Exogenous factors

As mentioned before, land is considered an asset that can be used as collateral and a safe investment option. The model introduced two external factors to consider: *inflation rate* and *interest rate*. It is assumed that when inflation rates rise, the likelihood of purchasing land also increases. However, buying land may require a significant investment that the farm may need to finance through a bank loan. As interest rates go up, the probability of making such an investment decrease. The inflation rate values are obtained from the ISTAT website every December of the reference year, while the interest rate is determined by the average annual yield of Italian BTPs, which can be found on the website of the Italian Treasury Ministry.

Variables	*Specification*	*Type of variable*	*Expected effect*
Farm structural characteristics			
UAASQ	UAA square	Continuous	+
Production specialisation	Agricultural specialisations considered are: Non-specialised farms, cereals, arable crops, horticulture, fruit crops, olive growing, viticulture, dairy cattle, herbivores, granivores.	Categorical; Non-specialised farms as reference	+
GSP/ha	Gross saleable production per hectare; the ratio between Gross saleable production (minus Income subsidies and COM subsidies and UAA)	Continuous	+
UAASQ *Production Specialisation		Continuous*categorical; Non-specialised farms as reference	+
GSP/ha*Specialisation		Continuous*categorical; Non-Specialised farms as reference	+
Pre_pruchase	Purchases made between 2010-2020	Dummy	+
RENT/UAA	The ratio of the rented UAA to the UAA	Continuous	+/-
Machinery_ Plant value	Value of Machinery+ equipment + plant; It represents a proxy variable for level of innovation on farms	Continuous	+
Income subsidies/ha	Aid per hectare provided by First Pillar and COM	Continuous	+
Capital Account	Public capital aid (Second Pillar)	Continuous	+
Energy Production	Farm produces renewable energy	Dummy	+
Subcontracting activities	Farm carries subcontracting activities	Dummy	+
Agrotourism	Farm carries out agrotourism activities	Dummy	+
FWU/TWU	The ratio of family work units to total work units on the farm	Continuous	+

Farmer sociodemographic characteristics			
SUCC_117	There is a potential successor aged between 1 and 17 on the farm	Dummy	+
SUCC_1829	There is a potential successor aged between 18 and 29 on the farm	Dummy	+
SUCC_3039	There is a potential successor aged between 30and 39 on the farm	Dummy	+
SUCC_4050	There is a potential successor aged between 40 and 50 on the farm	Dummy	+
FARMER_1829	The farm manager is between 18 and 29 years old	Dummy	+
FARMER_3039	The farm manager is between 30 and 39 years old	Dummy	+
FARMER_4049	The farm manager is between 40 and 49 years old	Dummy	+
FARMER_5059	The farm manager is between 50 and 59 years old	Dummy	-
FARMER_OVER60	The farm manager is aged 60 old or older	Dummy	-
EXTRA_INCOME	Farmer with non-agricultural income >2,000 euro; Children/grandchildren, father-in-law, parent, wife employed part-time or regularly with non-agricultural income >2000 euro	Dummy	+
Exogenous variables			
INTEREST RATE	Interest rate recorded for each year on the Ministry of the Treasury website	Continuous	-
INFLATION_ RATE	Inflation rate taken for each year from the ISTAT website	Continuous	+

Table 6 Definition of the variables and expected effects.

3.4.3Descriptive analysis of explanatory variables

Table 7 shows the descriptive analysis of the variables introduced into the model. The average initial area of the sample is 33, 72 ha, which increases by about 5 ha if only buyers are considered. The value related to gross marketable production per hectare (GDP/ha) exhibits significant variations

among the sample farms. Nevertheless, these differences decrease considerably when only the agricultural farms that invest in land during the reference period are considered. Furthermore, the average value of the variable “GSP/ha” is lower for the buyers, whereas the median value for buyers is higher than the value within the entire sample. The average value of machinery and equipment of the farms that invested in land is more than twice as high as the sample average. There are also important differences in the median value, and the standard dispersion of values around the mean is important. For the ratio of rented area to total farm area and of family labour units to total farm hours, there are no important differences between the farms that purchase and the entire sample. It should be noted that the purchasing farms have on average lower FWU/TWU than the sample farms. The sample farms received, on average, a higher subsidy/hectare and capital financing than the buying farms. Analysing the value of the median and standard deviation of the variable for subsidies/ha related to the first pillar, the sample farms received a higher subsidy and a greater dispersion of values around the mean. For the years under consideration, there are no important differences in the variables related to the exogenous context.

Variable	Min	Mean	Median	sd	Max
Farm structural characteristics					
UAAsq	0	4467.1	227.9	32704.46	3076516.0
UAAsq_BUYER	0,1	5286	381,8	35908,68	8217645
UAA	0,01	33,72	15,1	57,7	1754
UAA_BUYER	0,23	37,73	19,54	62,17	909,75
GSP/ha	-20524	11320	2790	72377.99	8190889
GSP/ha_BUYER	-602.3	8877.3	3983.9	16035.17	231679
Specialisation	1	5,33	5	2.78	10
Specialisation_Buyer	1	5,36	5	2.63	10
Machinery	-1628809	34683	6310	114923.9	5450764
Machinery_BUYER	0	79280	30239	210057,8	4900435
Rent/UAA	0	0,38	0,19	0,41	1
Rent/UAA_BUYER	0	0,3446	0,1954	0,3785	1
FWU/TWU	0	0,837	1	0,25	1
FWU/TWU_Buyer	0,017	0,75	0,92	0,29	1
Income Subsidies/ha	0	260,1	373,8	1071,23	121033,9
Income Subsidies/ha_Buyer	0	386,4	273,6	510,5	6408
Capital Account	0	583,9	0	6.866.118	639170
Capital Account_Buyer	0	2008	0	15679	435000
Energy production	0	0,3679	0	0.18816	1
Energy production_ Buyer	0	0.075	0	0,264	1
Subcontracting activities	0	0,03543	0	0.1848	1
Subcontracting activities_buyer	0	0,64	0	0,246	1
Agroturism	0	0,04306	0	0.20298	1
Agroturism_ buyer	0	0,5	0	0,218	1
Pre_Purchase	0	0,0026	0	0,051	1
Pre_Purchase_Buyer	0	0,2	0	0,4	1

Table 7 Descriptive analysis of the variables

Variable	*Min*	*Mean*	*Median*	*sd*	*Max*
Farmer sociodemographic characteristics					
18≤FARMER≤29_ Buyer	0	0,35	0	0,18	1
18≤FARMER≤29_ Buyer	0	0,046	0	0,21	1
30≤FARMER≤39	0	0,11	0	0,31	1
30≤FARMER≤39_Buyer	0	0,13	0	0,34	1
40≤FARMER≤49	0	0,229	0	0,42	1
40≤FARMER≤49_ Buyer	0	0,28	0	0,45	1
50≤FARMER≤59	0	0,28	0	0,44	1
50≤FARMER≤59_ Buyer	0	0,3	0	0,46	1
FARMER>60	0	0,36	0	0,48	1
FARMER>60_Buyer	0	0,24	0	0,43	1
1≤SUCCESSOR≤17	0	0,002	0	0,05	1
1≤SUCCESSOR≤17_ Buyer	0	0,004	0	0,067	1
18≤SUCCESSOR≤29	0	0,05	0	0,22	1
18≤SUCCESSOR≤29_ Buyer	0	0,084	0	0,27	1
30≤SUCCESSOR≤39	0	0,049	0	0,21	1
30≤SUCCESSOR≤39_Buyer	0	0,061	0	0,23	1
40≤SUCCESSOR≤49	0	0,039	0	0,17	1
40≤SUCCESSOR≤49_ Buyer	0	0,035	0	0,18	1
OFF_FARM INCOME	0	0,16	0	0,36	1
OFF_FARM INCOME_Buyer	0	0,24	0	0,43	1
Exogenous factors					
Inflation rate	-0.20	0,45	0,5	0,42	1,1
Interest rate	1,14	1,86	1,81	0,77	3,6

Table 7 Descriptive analysis of the variables

3.4.2 Empirical models

Since to the best of our knowledge there is no research of this type in the literature, it was decided to implement five probit regression models to understand better which and how different factors may influence the land investment decision between 2013 and 2020.

1) Model 1: the model considers all the variables described above and summarised in Table 5 except for the variable “GSP/ha”. Thus, the model only considers the “UAASQ” as the farm size variable, and this variable does not interact with specialisation.
2) Model 2: Same as previous model, but the variable “UAASQ” interacts with specialisation (“UAASQ* Specialisation”).

3) Model 3: Same as model 1 but also consider the productivity per ha variable (“GSP/ha”).
4) Model4: same as model 1 but makes the specialisation interact exclusively with the variable relating to productivity per hectare (“GSP/ha*Specialisation”).
5) Model 5: same the model 3 but the “GSP/ha” and “UAASQ” variables interact with the specialisation variable within the model.

In models 2, 4, 5, it was decided to include the interaction between the variables "UAA" and "GSP/ha" and specialisation, to test whether these variables might have a different effect depending on the specialisation of the farm. The interaction of these variables could help to better understand and add information on the probability of the purchase decision.

3.5 Results

3.5.1 Correlation analysis

To verify that there is no relationship between the independent variables and the dependent variable, a Pearson correlation analysis was conducted. The results (Table 8) show that the correlation indices between the independent variables are far from the threshold values. Thus, it can be ruled out that there is multicollinearity between the variables considered in the empirical model developed.

	GSP/ha	UAASQ	Specialisation	RENT/UAA	Machinery+ Plant Value	Subsidies/ha	Capital Account	Energy Production	Subcontracting activities	Agrotourism	Pre_Purchase	FWU/TWU
Farm structural characteristics												
GSP/ha	1	-0,0162	0,0237	-0,0135	0,0110	0,0985	0,0140	0,0013	-0,0148	-0,0062	-0,0014	-0,1054
UAASQ	-0,0162	1	0,0227	0,0485	0,2059	-0,0001	0,0200	0,0432	0,0274	0,0266	0,0065	-0,1403
Specialisation	0,0237	0,0227	1	0,0291	0,0367	-0,0041	0,0266	0,0548	-0,0695	0,0028	-0,0028	-0,0283
RENT/UAA	-0,0135	0,0485	0,0291	1	0,0449	0,0168	0,0254	0,0474	0,0652	-0,0068	-0,0045	0,0226
Machinery+ Plant Value	0,0110	0,2059	0,0367	0,0449	1	0,0436	0,1206	0,2812	0,0832	0,0366	0,0410	-0,1835
Subsidies/ha	0,0985	-0,0001	-0,0041	0,0168	0,0436	1	0,0293	0,0152	-0,0040	-0,0151	-0,0001	-0,0551
Capital Account	0,0140	0,0200	0,0266	0,0254	0,1206	0,0293	1	0,0577	0,0085	0,0174	0,0302	-0,0641
Energy Production	0,0013	0,0432	0,0548	0,0474	0,2812	0,0152	0,0577	1	0,0604	0,0712	0,0179	-0,0758
Subcontracting activities	-0,0148	0,0274	-0,0695	0,0652	0,0832	-0,0040	0,0085	0,0604	1	-0,0038	0,0099	-0,0010
Agrotourism	-0,0062	0,0266	0,0028	-0,0068	0,0366	-0,0151	0,0174	0,0712	-0,0038	1	0,0026	-0,0603
Pre_Purchase	-0,0014	0,0065	-0,0028	-0,0045	0,0410	-0,0001	0,0302	0,0179	0,0099	0,0026	1	-0,0244
FWU/TWU	-0,1054	-0,1403	-0,0283	0,0226	-0,1835	-0,0551	-0,0641	-0,0758	-0,0010	-0,0603	-0,0244	1
Farm socio-demographic characteristics												
18<FARMER<29	-0,0101	0,0075	0,0102	0,0986	0,0254	0,0080	0,0383	-0,0034	0,0025	-0,0052	0,0051	0,0116
30<FARMER<39	-0,0073	0,0029	0,0424	0,1310	0,0297	-0,0027	0,0209	0,0049	0,0091	0,0265	0,0039	-0,0075
40<FARMER<49	0,0042	0,0079	0,0487	0,1074	0,0368	-0,0010	0,0152	0,0279	0,0278	0,0162	0,0089	-0,0404
50<FARMER<59	0,0083	0,0079	0,0187	-0,0014	0,0244	-0,0010	-0,0076	0,0263	0,0211	-0,0030	0,0065	-0,0085
FARMER>60	-0,0009	-0,0054	-0,0884	-0,2039	-0,0568	0,0059	-0,0290	-0,0347	-0,0400	-0,0261	-0,0167	0,0386
1<SUCCESSOR<17	-0,0021	-0,0010	0,0202	-0,0020	0,0108	-0,0029	-0,0001	0,0135	0,0091	0,0041	0,0019	0,0082
18<SUCCESSOR<29	0,0027	0,0095	0,0571	-0,0098	0,0509	0,0026	0,0145	0,0463	0,0164	0,0344	0,0139	0,0231
30<SUCCESSOR<39	0,0061	0,0281	0,0428	-0,0253	0,0390	0,0000	0,0093	0,0154	0,0146	0,0364	0,0040	0,0232
40<SUCCESSOR<49	0,0077	0,0057	0,0163	-0,0501	0,0064	0,0268	-0,0026	0,0061	0,0122	0,0054	0,0070	0,0254
OFF_FARM INCOME	-0,0183	-0,0034	-0,0153	-0,0731	0,0045	-0,0176	-0,0027	0,0014	0,0020	0,0366	0,0192	-0,0162
Exogenous factors												
INFLATION RATE	0,0031	0,0052	0,0006	-0,0026	-0,0013	-0,0267	-0,0083	-0,0006	-0,0010	-0,0027	-0,0032	0,0062

INTEREST RATE	0,0104	0,0059	0,0012	-0,0321	-0,0009	-0,0113	0,0173	-0,0200	-0,0126	-0,0156	-0,0160	-0,0041

	18< FARMER <29	**30< FARMER <39**	**40< FARMER <49**	**50< FARMER <59**	**FARMER >60**	**1< SUCCESSOR <17**	**18< SUCCESSOR <29**	**30< SUCCESSOR <39**	**40< SUCCESSOR <49**	**OFF_FARM INCOME**	**INFLATION RATE**	**INTEREST RATE**
Farm structural characteristics												
GSP/ha	-0,0101	-0,0073	0,0042	0,0083	-0,0009	-0,0021	0,0027	0,0061	0,0077	-0,0183	0,0031	0,0104
UAASQ	0,0075	0,0029	0,0079	0,0079	-0,0054	-0,0010	0,0095	0,0281	0,0057	-0,0034	0,0052	0,0059
Specialisation	0,0102	0,0424	0,0487	0,0187	-0,0884	0,0202	0,0571	0,0428	0,0163	-0,0153	0,0006	0,0012
RENT/UAA	0,0986	0,1310	0,1074	-0,0014	-0,2039	-0,0020	-0,0098	-0,0253	-0,0501	-0,0731	-0,0026	-0,0321
Machinery+ Plant Value	0,0254	0,0297	0,0368	0,0244	-0,0568	0,0108	0,0509	0,0390	0,0064	0,0045	-0,0013	-0,0009
Subsidies/ha	0,0080	-0,0027	-0,0010	-0,0010	0,0059	-0,0029	0,0026	0,0000	0,0268	-0,0176	-0,0267	-0,0113
Capital Account	0,0383	0,0209	0,0152	-0,0076	-0,0290	-0,0001	0,0145	0,0093	-0,0026	-0,0027	-0,0083	0,0173
Energy Production	-0,0034	0,0049	0,0279	0,0263	-0,0347	0,0135	0,0463	0,0154	0,0061	0,0014	-0,0006	-0,0200
Subcontracting activities	0,0025	0,0091	0,0278	0,0211	-0,0400	0,0091	0,0164	0,0146	0,0122	0,0020	-0,0010	-0,0126
Agrotourism	-0,0052	0,0265	0,0162	-0,0030	-0,0261	0,0041	0,0344	0,0364	0,0054	0,0366	-0,0027	-0,0156
Pre_Purchase	0,0051	0,0039	0,0089	0,0065	-0,0167	0,0019	0,0139	0,0040	0,0070	0,0192	-0,0032	-0,0160
FWU/TWU	0,0116	-0,0075	-0,0404	-0,0085	0,0386	0,0082	0,0231	0,0232	0,0254	-0,0162	0,0062	-0,0041
Farm socio-demographic characteristics												
18<FARMER<29	1	-0,0599	-0,0997	-0,1071	-0,1361	-0,0097	-0,0353	-0,0387	-0,0339	-0,0047	-0,0045	0,0003
30<FARMER<39	-0,0599	1	-0,1786	-0,2113	-0,2480	-0,0134	-0,0776	-0,0759	-0,0614	0,0010	-0,0087	0,0056
40<FARMER<49	-0,0997	-0,1786	1	-0,3199	-0,3964	0,0326	-0,0447	-0,1141	-0,0949	0,0269	0,0023	0,0174
50<FARMER<59	-0,1071	-0,2113	-0,3199	1	-0,4502	0,0113	0,1566	-0,0005	-0,0966	0,0457	0,0055	-0,0155
FARMER>60	-0,1361	-0,2480	-0,3964	-0,4502	1	-0,0283	-0,0467	0,1589	0,2181	-0,0673	0,0007	-0,0026
1<SUCCESSOR<17	-0,0097	-0,0134	0,0326	0,0113	-0,0283	1	0,0713	-0,0084	-0,0056	0,0316	0,0096	-0,0045
18<SUCCESSOR<29	-0,0353	-0,0776	-0,0447	0,1566	-0,0467	0,0713	1	0,0647	-0,0185	0,0769	0,0031	-0,0112
30<SUCCESSOR<39	-0,0387	-0,0759	-0,1141	-0,0005	0,1589	-0,0084	0,0647	1	0,0676	0,0612	0,0054	0,0039
40<SUCCESSOR<49	-0,0339	-0,0614	-0,0949	-0,0966	0,2181	-0,0056	-0,0185	0,0676	1	0,0564	-0,0027	0,0054

OFF_FARM INCOME	-0,0047	0,0010	0,0269	0,0457	-0,0673	0,0316	0,0769	0,0612	0,0564	1	-0,0047	-0,0138
Exogenous factors												
INFLATION RATE	-0,0045	-0,0087	0,0023	0,0055	0,0007	0,0096	0,0031	0,0054	-0,0027	-0,0047	1	0,3261
INTEREST RATE	0,0003	0,0056	0,0174	-0,0155	-0,0026	-0,0045	-0,0112	0,0039	0,0054	-0,0138	0,3261	1

Table 8 Correlation analysis

3.5.2 Probit regression models

The five implemented models (Table 9,10,11,12,13) explain between 19 % and 20 % of the land investment decision of the observed farms between 2013 and 2020. The addition of the new variable "GSP/ha" and the interaction of the variable "Specialisation" with "UAAsq" and "GSP/ ha" did not lead to an improvement of the model. As the intercept value also shows, there are other factors that were not considered that influenced the purchase decision. In addition to the value of Pseudo R2 not varying, the sign of the independent variables also never changes in the different models implemented. This indicates a good level of robustness of the model.

From the analysis and comparison of the five implemented probit regression models, it is evident that the variables that influenced the land investment decision between 2013 and 2020 of the analysed sample are: "UAASQ", "RENT/UAA", "FWU/TWU", "Mechanization and plant value", "Energy production", "Subcontracting activities", the two dummy variables related to the presence of a successor aged between 18 and 29 and between 30 and 39, "Off farm income", and the two exogenous variables respectively inflation rate and interest rate. These variables are statistically significant in all implementing models despite introducing a new variable and the interaction between variables that differentiate model 1 from the other four models.

Contrary to the hypothesis that as the farm area increases, the farmer seems less inclined to invest in land purchase. Although this variable appears less statically significant compared to other variables considered within the model, its effect appears to be constant in all models implemented. The effect does not change even when in model 3 with the introduction of the variable relating to the productivity per hectare of the farm, nor when farm size is made to interact with the variable relating to specialisation. In this regard, it is evident from model 2 and model 5 that when the farm specialises in permanent crops such as fruit crops and viticulture, and in the production of horticulture, and herbivore livestock, the initial farm size positively influences the land purchase decision. Thus, it is

evident from the five models that UAA negatively influences the probability of purchase, but its effect may change depending on specialisation.

Unlike farm size, the negative effect of farm productivity per hectare ("GSP/ha") found in model 3 is not constant when this variable is related to farm specialisation. It is evident from models 4 and 5 that once farm productivity is related to specialisation, productivity per hectare completely loses statistical significance, and the p-value from 0.08 increases to 0.94. In model 4, it emerges that productivity per hectare increases the probability of acquiring land for farms specializing in horticulture and fruit crops. This effect is only confirmed for farms specialised in fruit crops in model 5. For this specialisation in models 4 and 5, the effect appears statistically significant ($p<0.001$).

Concerning the categorical variable regarding specialisation alone, in model 1, the purchase probability decreases if the farm specialises in horticultural production. In contrast, it increases if the farm specialises in fruit crops and viticulture. The negative effect of specialisation in horticulture also remains significant in model 2. Specialisation in fruit crops and dairy cattle positively influences purchase in model 3 and model 4.

Contrary to the hypothesis, the farm is not inclined to purchase as the ratio of rented area to UAA (RENT/UAA) and the ratio of FWU to TWU (FWU/TWU) increase. In all models analysed, these variables are statistically significant ($p<0.001$) and negatively influence the probability of buying land. Consistent with this hypothesis, the variable relating to the value of machinery and plant positively affect the probability of purchase. Of the three agricultural-related activities considered, subcontracting activity and energy production, although with different pvalue, are statistically significant in all models and positively influence the probability that the farmer invests in the farmland. All five models show that conducting agro-tourism activities does not influence the farmer's decision to invest in land. Sub-contracting activity and value in machinery and plant are the two variables related to farm structural characteristics that are most statistically significant ($p<0.001$) and positively influence the decision to purchase land.

In all five models, the two variables related to agricultural policies, i.e., “subsidies/ha” and “capital account”, appear not to directly influence the investment decision probability.

Concerning the sociodemographic variables, the presence of the successor aged between 18 and 29 and between 30 and 39 positively influences the purchase decision in all models implemented. About the age of the farmer/holder, when the farmer is older than 60, it is statistically significant ($p<0.01$) and negatively influences the probability of the purchase decision. When the “GSP/ha” interaction with specialisation is introduced into the model, the p-value increases, and the variable is no longer statistically positive. As was hypothesised, the variable on the perception of off-farm income is among the most statistically significant variables ($p<0.001$) and positively influences the purchase decision.

Consistent with the hypothesis, the variables relating to the external macroeconomic environment, i.e., the inflation and interest rates, influence the investment decision in opposite direction. As the inflation rate increases, the investment decision increases. The farmer's probability of investing in land decreases as the interest rate increases.

Variable	estimate	std.error	statistic	p.value	
(Intercept)	-1,92567	0,112387	-17,1343	8,23E-66	
Farm structural characteristics					
UAASq	-1,3E-06	7,05E-07	-1,77799	0,075405	.
No specialisation					
Cereals	0,054358	0,06196	0,877298	0,380325	
Arable Crops	0,057745	0,058378	0,989156	0,322587	
Horticulture	-0,13106	0,065964	-1,9868	0,046944	*
Fruit Crops	0,129448	0,055672	2,32521	0,020061	*
Olive growing	-0,0112	0,074676	-0,15002	0,880748	
Viticulture	0,125004	0,055914	2,235661	0,025374	*
Dairy cattle	0,040365	0,06245	0,646352	0,518052	
Herbivores	-0,04917	0,059647	-0,8243	0,409772	
Granivores	0,013844	0,074291	0,186344	0,852175	
RENT/UAA	-0,12714	0,033761	-3,76572	0,000166	***
Machinery_ Plant Value	3,18E-07	7,05E-08	4,506087	6,6E-06	***
Subsidies EU/UAA`	1,85E-06	1,05E-05	0,176858	0,85962	
Capital Account	1,78E-06	1,11E-06	1,611725	0,107022	
Energy production	0,141684	0,059716	2,372631	0,017662	*
Subcontracting activities	0,208418	0,058186	3,581939	0,000341	***
Agrotourism	-0,03521	0,061329	-0,57409	0,565906	
Pre_PURCHASE	7,472233	24,48822	0,305136	0,760263	
FWU/TWU	-0,33178	0,04938	-6,71898	1,83E-11	***
Farm socio-demographic characteristics					
FARMER_1829	0,13863	0,104094	1,331777	0,182933	
FARMER_3039	0,126264	0,091731	1,376457	0,16868	
FARMER_4049	0,077937	0,089045	0,875257	0,381434	
FARMER_5059	0,001555	0,08859	0,017556	0,985993	
FARMER_OVER60	-0,15267	0,088818	-1,71892	0,085628	.
SUCC_117	0,087875	0,206111	0,426347	0,669855	
SUCC_1829	0,142924	0,052556	2,719477	0,006539	**
SUCC_3039	0,142039	0,057798	2,457492	0,013991	*
SUCC_4049	0,066787	0,077862	0,857765	0,391022	
OFF_FARM INCOME	0,116392	0,032426	3,589448	0,000331	***
Exogenous factors					
Inflation rate	0,10295	0,03179	3,238434	0,001202	**
Interest rate	-0,12198	0,020101	-6,06835	1,29E-09	***
*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*					
N.observation			84610		
N.farms			24212		

Table 9 Model 1

Variable	estimate	std.error	statistic	p.value	
(Intercept)	-1,88091	0,115061	-16,3471	4,56E-60	***
Farm structural characteristics					
UAASq	-1,8E-05	1E-05	-1,75434	0,079373	.
No specialisation			*ref.*		
Cereals	0,018587	0,065346	0,284445	0,776069	
Arable Crops	0,038099	0,061379	0,620729	0,534778	
Horticulture	-0,1746	0,068446	-2,55087	0,010745	*
Fruit Crops	0,083061	0,058422	1,42173	0,155105	
Olive growing	-0,01792	0,079635	-0,22506	0,821934	
Viticulture	0,082343	0,058484	1,40794	0,159149	
Dairy cattle	0,016847	0,066319	0,254023	0,799478	
Herbivores	-0,09338	0,06217	-1,50196	0,133106	
Granivores	0,009817	0,078421	0,125181	0,90038	
UAAsq*No specialisation			*ref.*		
UAAsq*Cereals	1,61E-05	1,02E-05	1,58281	0,113465	
UAA sq*Arable Crops	1,19E-05	1,04E-05	1,138416	0,254947	
UAA sq*Horticulture	1,78E-05	1,02E-05	1,752388	0,079707	.
UAA sq*Fruit Crops	2,19E-05	1,05E-05	2,081029	0,037431	*
UAA sq*Olive growing	-2,8E-05	4,32E-05	-0,64565	0,518505	
UAA sq*Viticulture	2E-05	1,04E-05	1,915204	0,055467	.
UAA sq*Dairy cattle	1,35E-05	1,04E-05	1,301656	0,193034	
UAA sq*Herbivores	1,69E-05	1E-05	1,686272	0,091743	.
UAA sq*Granivores	-1,4E-06	1,6E-05	-0,08449	0,932668	
RENT/UAA	-0,12436	0,033841	-3,6748	0,000238	***
Machinery_ Plant Value	3,58E-07	7,32E-08	4,8896	1,01E-06	***
Subsidies EU/UAA`	1,18E-06	1,09E-05	0,10889	0,913289	
Capital Account	1,7E-06	1,11E-06	1,528883	0,126293	
Energy production	0,150791	0,059866	2,518804	0,011775	*
Subcontracting activities	0,214397	0,058379	3,672514	0,00024	***
Agrotourism	-0,03794	0,061512	-0,61672	0,537422	
Pre_PURCHASE	12,81425	40,68329	0,314976	0,75278	
FWU/TWU	-0,34725	0,050301	-6,90338	5,08E-12	***
Farm socio-demographic characteristics					
FARMER_1829	0,14187	0,105068	1,35027	0,176929	
FARMER_3039	0,126354	0,092589	1,364675	0,172355	
FARMER_4049	0,082906	0,090062	0,920541	0,35729	
FARMER_5059	0,003924	0,08959	0,043796	0,965067	
FARMER_OVER60	-0,14908	0,089847	-1,65929	0,097058	.
SUCC_117	0,088278	0,206171	0,428178	0,668521	
SUCC_1829	0,142698	0,052623	2,71168	0,006694	**
SUCC_3039	0,142839	0,057955	2,464632	0,013715	*
SUCC_4049	0,071311	0,077918	0,915202	0,360085	
OFF_FARM INCOME	0,116346	0,032492	3,580729	0,000343	***
Exogenous factors					
Inflation rate	0,104131	0,031839	3,27055	0,001073	**
Interest rate	-0,12278	0,020143	-6,09545	1,09E-09	***

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

N.observations	84610
N.farms	24212
Pseudo R^2	0,1992
AIC	9447.6

Table 10 Model 2

Variable	estimate	std.error	statistic	p.value	
(Intercept)	-1,91702	0,112411	-17,0537	3,28E-65	***
Farm structural characteristics					
GSV/ha	-9,7E-07	5,68E-07	-1,71207	0,086884	.
UAASq	-1,3E-06	7,22E-07	-1,83391	0,066668	.
No specialisation					
Cereals	0,051677	0,061986	0,833676	0,404464	
Arable Crops	0,056402	0,058391	0,965943	0,334073	
Horticulture	-0,10109	0,067831	-1,49035	0,136132	
Fruit Crops	0,131252	0,055698	2,356491	0,018448	*
Olive growing	-0,01896	0,074824	-0,25336	0,79999	
Viticulture	0,129338	0,055988	2,31009	0,020883	
Dairy cattle	0,041857	0,062463	0,670109	0,502788	*
Herbivores	-0,04946	0,059644	-0,8292	0,406989	
Granivores	0,033316	0,074835	0,445197	0,656177	
RENT/UAA	-0,12859	0,033803	-3,80414	0,000142	***
Machinery_ Plant Value	3,19E-07	7,05E-08	4,529135	5,92E-06	***
Subsidies EU/UAA`	9,05E-06	1,17E-05	0,771785	0,440242	
Capital Account	1,82E-06	1,11E-06	1,640464	0,100909	
Energy production	0,139704	0,059746	2,338305	0,019371	*
Subcontracting activities	0,206541	0,058204	3,548569	0,000387	***
Agrotourism	-0,03354	0,061313	-0,54703	0,584355	
Pre_PURCHASE	7,469538	24,4921	0,304977	0,760383	
FWU/TWU	-0,3429	0,049737	-6,89441	5,41E-12	
Farm socio-demographic characteristics					
FARMER_1829	0,139839	0,104004	1,344552	0,17877	
FARMER_3039	0,129159	0,091656	1,409173	0,158784	
FARMER_4049	0,081029	0,088956	0,910888	0,362355	
FARMER_5059	0,005121	0,0885	0,057867	0,953855	
FARMER_OVER60	-0,15002	0,088718	-1,69096	0,090845	.
SUCC_117	0,089497	0,206046	0,434354	0,664032	
SUCC_1829	0,145096	0,052559	2,760614	0,005769	**
SUCC_3039	0,144463	0,057846	2,49738	0,012511	*
SUCC_4049	0,069596	0,07789	0,893516	0,371581	
OFF_FARM INCOME	0,115473	0,03244	3,559534	0,000372	***
Exogenous factors					
Inflation rate	0,103755	0,031804	3,2623	0,001105	**
Interest rate	-0,12181	0,020108	-6,05779	1,38E-09	***

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

N.observations	84610
N.farms	24212
Pseudo R^2	0,1978
AIC	9447,7

Table 11Model 3

Variable	Estimate	Std.error	Statistic	p.value	
(Intercept)	-1,93757	0,112901	-17,1616	5,14E-66	***
Farm structural characteristics					
GSP/ha	-9,3E-08	1,32E-06	-0,07008	0,94413	
UAASq	-1,2E-06	6,93E-07	-1,67302	0,094324	.
No specialisation			*ref.*		
Cereals	0,077133	0,093555	0,824465	0,409676	
Arable Crops	0,06668	0,061809	1,078811	0,280672	
Horticulture	-0,03159	0,073867	-0,42764	0,668916	
Fruit Crops	0,01679	0,064654	0,259684	0,795107	
Olive growing	0,073733	0,099269	0,742762	0,457626	
Viticulture	0,114987	0,060271	1,907816	0,056415	
Dairy cattle	0,013583	0,071299	0,190507	0,848912	.
Herbivores	-0,04452	0,060474	-0,73623	0,461589	
Granivores	0,031989	0,077177	0,414489	0,678516	
GSP/ha*No specialisation			*ref*		
GSP/ha*Cereals	-1,9E-05	5,05E-05	-0,36884	0,712247	
GSP/ha*Arable Crops	-3E-06	5,3E-06	-0,55633	0,577988	
GSP/ha*Horticulture	-3,3E-06	1,98E-06	-1,67167	0,094589	.
GSP/ha*Fruit Crops	1,15E-05	3,34E-06	3,435379	0,000592	***
GSP/ha*Olive growing	-3,4E-05	2,58E-05	-1,31433	0,188735	
GSP/ha*Viticulture	1,23E-06	2,47E-06	0,498742	0,617961	
GSP/ha*Dairy cattle	3,43E-06	4,26E-06	0,80511	0,420756	
GSP/ha*Herbivores	-1,6E-06	2,6E-06	-0,63077	0,528192	
GSP/ha*Granivores	-5,1E-07	1,57E-06	-0,32125	0,748018	
RENT/UAA	-0,12733	0,033957	-3,74983	0,000177	***
Machinary_ Plant Value	2,97E-07	7,16E-08	4,151101	3,31E-05	***
Subsidies UE/UAA`	1,56E-05	1,94E-05	0,804777	0,420948	
Capital Account	1,82E-06	1,11E-06	1,640138	0,100976	
Energy production	0,143797	0,059709	2,40831	0,016027	*
Subcontracting activities	0,21025	0,05826	3,608833	0,000308	***
Agrotourism	-0,04446	0,061696	-0,72061	0,471152	
Pre_PURCHASE	7,462453	24,43647	0,305382	0,760075	
FWU/TWU	-0,32697	0,050515	-6,47274	9,62E-11	***
Farm socio-demographic characteristics					
FARMER_1829	0,143998	0,104069	1,383688	0,166454	
FARMER_3039	0,129115	0,091762	1,40706	0,15941	
FARMER_4049	0,082551	0,089012	0,927419	0,353709	
FARMER_5059	0,007759	0,088508	0,087659	0,930147	
FARMER_OVER60	-0,1447	0,088733	-1,6307	0,102953	
SUCC_117	0,081131	0,206262	0,393339	0,694069	
SUCC_1829	0,13136	0,052855	2,485274	0,012945	*
SUCC_3039	0,13269	0,058116	2,283205	0,022418	*
SUCC_4049	0,068059	0,078033	0,872182	0,383109	
OFF_FARM INCOME	0,113977	0,032589	3,497462	0,00047	***
Exogenous factors					

Inflation rate	0,103381	0,031843	3,246584	0,001168	**
Interest rate	-0,12166	0,020153	-6,03671	1,57E-09	***

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

N.observations	84610
N.farms	24212
Pseudo R^2	0,1998
AIC	9443,2

Table 12 Model 4

Variable	Estimate	Std.error	Statistic	p.value	
(Intercept)	-1,89082	0,11581	-16,327	6,34E-60	***
Farm structural characteristics					
GSP/ha	-2,4E-07	1,53E-06	-0,15506	0,876775	
UAASq	-1,8E-05	1E-05	-1,74692	0,080652	.
No specialisation			*ref.		
Cereals	0,04312	0,09642	0,447212	0,654722	
Arable Crops	0,050205	0,065294	0,768904	0,44195	
Horticulture	-0,07647	0,076548	-0,99897	0,317809	
Fruit Crops	-0,03602	0,067485	-0,53368	0,593565	
Olive growing	0,084893	0,105819	0,802252	0,422407	
Viticulture	0,072643	0,062882	1,155223	0,247999	
Dairy cattle	-0,00689	0,076123	-0,09056	0,927845	
Herbivores	-0,08927	0,063196	-1,41265	0,157759	
Granivores	0,03085	0,081759	0,377325	0,705932	
UAAsq*No specialisation			*ref.		
UAAsq*Cereals	1,61E-05	1,02E-05	1,585604	0,112829	
UAA sq*Arable Crops	1,18E-05	1,05E-05	1,125278	0,260471	
UAA sq*Horticulture	1,73E-05	1,03E-05	1,684561	0,092073	.
UAA sq*Fruit Crops	2,29E-05	1,05E-05	2,182207	0,029094	*
UAA sq*Olive growing	-3,6E-05	4,6E-05	-0,78211	0,434152	
UAA sq*Viticulture	2E-05	1,05E-05	1,912819	0,055771	.
UAA sq*Dairy cattle	1,39E-05	1,04E-05	1,333909	0,182234	
UAA sq*Herbivores	1,69E-05	1E-05	1,685678	0,091858	.
UAA sq*Granivores	-2E-06	1,61E-05	-0,12347	0,901737	
GSP/ha*No specialisation			*ref.		
GSP/ha*Cereals	-2E-05	5,17E-05	-0,39212	0,694968	
GSP/ha*Arable Crops	-3,8E-06	5,54E-06	-0,68046	0,496213	
GSP/ha*Horticulture	-3,1E-06	2,12E-06	-1,4751	0,140185	
GSP/ha*Fruit Crops	1,2E-05	3,43E-06	3,489493	0,000484	***
GSP/ha*Olive growing	-3,9E-05	2,63E-05	-1,48405	0,137795	
GSP/ha*Viticulture	1,24E-06	2,59E-06	0,477378	0,633093	
GSP/ha*Dairy cattle	2,83E-06	4,44E-06	0,638024	0,523458	
GSP/ha*Herbivores	-1,5E-06	2,74E-06	-0,55912	0,57608	
GSP/ha*Granivores	-4,6E-07	1,76E-06	-0,26069	0,794333	
RENT/UAA	-0,12451	0,034035	-3,6584	0,000254	***
Machinary_ Plant Value	3,37E-07	7,42E-08	4,542935	5,55E-06	***
Subsidies UE/UAA`	1,53E-05	1,96E-05	0,779886	0,435458	
Capital Account	1,72E-06	1,12E-06	1,542527	0,122946	
Energy production	0,152522	0,059845	2,548611	0,010815	*
Subcontracting activities	0,215642	0,058465	3,688421	0,000226	***
Agrotourism	-0,04732	0,061879	-0,76465	0,444482	
Pre_PURCHASE	13,89675	39,58514	0,35106	0,725544	
FWU/TWU	-0,3453	0,051666	-6,68325	2,34E-11	***
Farm socio-demographic characteristics					
FARMER_1829	0,148118	0,105065	1,409778	0,158605	

FARMER_3039	0,130296	0,092642	1,406439	0,159594	
FARMER_4049	0,088637	0,090055	0,984249	0,324993	
FARMER_5059	0,011378	0,089536	0,127079	0,898878	
FARMER_OVER60	-0,14037	0,089796	-1,56326	0,117992	
SUCC_117	0,081554	0,206341	0,395236	0,692668	
SUCC_1829	0,131209	0,052926	2,479095	0,013172	*
SUCC_3039	0,133913	0,058274	2,297984	0,021563	*
SUCC_4049	0,073252	0,078094	0,937996	0,348247	
OFF_FARM INCOME	0,113255	0,032659	3,46779	0,000525	***
Exogenous factors					
Inflation rate	0,104439	0,031892	3,274789	0,001057	**
Interest rate	-0,1222	0,020197	-6,05067	1,44E-09	***
*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*					
N.observations			84610		
N.farms			24212		
Pseudo R^2			0,201		
AIC			9439.5		

Table 13 Model 5

3.6 Discussion

Out of the total observations, only 1.29% invested in land between 2013 and 2020. The high number of zero-observations can be attributed to the specific characteristics of the land factor and the land market, as it is unlikely that farms invest in capital goods every year (Elhorst 1993; Oskam, Goncharova, and Verstegen 2009; Nilsen and Schiantarelli 2003).

About 90% of the sample is characterised by specialised and heterogeneous farms in terms of structural and socio-demographic characteristics. This heterogeneity is due to intrinsic characteristics of the Italian agricultural sector, the fact that the research was not conducted in a specific local area but instead based on FADN data collected across the entire national territory. The high number of zero-observations and the complexity of ignoring the heterogeneity effect are some of the reasons why quantitative research using micro-data in the investment decision-making process is challenging (Elhorst 1993).

The average surface area of the farms in the sample is about 30 ha, above the 11 ha, average UAA recorded in the last ISTAT 2010-2020 census (ISTAT 2022). On the one hand, the FADN data maintain a certain degree of representativeness of the agricultural sector and represent a useful resource in terms of the amount of data collected in Europe, on the other hand, small farms are still not well represented within the FADN data (Ciaian, Kancs, and Swinnen 2010; Centre for European Policy Studies 2008).

It is unclear from the literature review what effect UAA may have on the investment decision and farm size growth. The models do not allow to clarify, but to better understand the role of this variable. It clarifies that UAA influences the investment decision negatively but has a different effect depending on farm specialisation. This had already partly emerged in the study conducted by Bremmer and Oude Lansink (2002), which found that UAA had a positive influence on the size growth of arable crops farms and a negative influence on the growth of farms specialized in protected horticulture. In our research, the positive effect of the variable "UAA SQ" in the case of farms specialising in fruit crops, viticulture and horticulture can be linked to the fact that for these specialisations the mean and median value of the farm's UAA is lower than for other crops. This could confirm the hypothesis that when a farm is very large it does not tend to invest in the land input. (Lefebvre, Gomez y Paloma, and Viaggi 2015).

Contrary to what was hypothesised based on the theoretical literature on farm size growth, the results showed that specialisation was not a factor that influenced the growth through purchase of the farms in the sample. Furthermore, in the case of farms specialised in horticulture, the influence of specialisation on the probability that farms increase their size through purchase is negative. The scarcity of the literature does not allow us to compare this result with that of other studies. In the empirical studies on the decision to invest in land, the analyses were conducted on specific agricultural sectors, not allowing a comparison between several specialisations. From research

conducted by Akimowicz et al. (2013), it emerged that specialization influences farm size, changes in farm size, and growth intensity in the Midi-Pyrenees region between 2000 and 2007.

Unlike the “UAA SQ”, productivity per hectare (“GSP/ha”) becomes statistically insignificant when interacting with the categorical variable relating to specialisation. This variable is only significant for farms developed in fruit crops. Therefore, it is reasonable to think that the strong interaction between GSP/ha and specialization in fruit crops influences the purchasing decision rather than the gross saleable production itself.

Although theoretically it would be desirable for a farm to have a balance between owned and rented land, as the ratio of rented to total area (RENT/UAA) increases, the likelihood of farms increasing their share of owned land decreases. This result could be a confirmation of the findings of the last census of the Italian agricultural sector according to which the amount of land managed under lease has increased and this form of management is also becoming established in Italy (ISTAT 2022). The descriptive analysis of the data in Table 3 shows that the farms in the sample specialised in permanent crops have far lower “RENT/UAA” ratios than those specialised in annual crops and livestock farming. Understanding whether isolating this variable would have a different effect depending on the specialisations would be interesting. It could also be related to the result regarding the effect of “GSP/ha”, which has a positive effect for those specialised in fruit crops. Permanent crops require a higher investment cost and return on investment time than annual crops. It might explain why farmers specializing in permanent crops might have an incentive to buy land because it grants them a property right that cannot be guaranteed by the rental contract, especially given the Italian regulations in this regard.

The results regarding the value of capital of machinery and plant confirm what the Bremmer and Oude Lansink (2002)and Lefebvre, Gomez y Paloma, and Viaggi (2015) research had already found. The former had shown how the degree of mechanisation influenced farm growth for arable crops and horticulture in the Netherlands. Lefebvre, Gomez y Paloma, and Viaggi(2015)'s study of farmers'

investment intentions in six European countries had shown that farmers are most likely to invest in one asset class after they have already invested in another. The correlation between the intention to invest in two types of assets was also shown between land and the purchase of machinery and machinery replacement.

In the literature to our knowledge, no research has introduced variables related to agricultural policies and activities into the models to explain farm growth or the investment decision and level. The results on subsidies and funding related to European Agricultural Policies do not confirm the hypothesis that agricultural policies can directly influence the decision to invest in land. Rather, subsidies could be seen as a useful tool for the farmer to manage periods of market fluctuations rather than as a form of income to make a long-term investment that could be considered irreversible. The RDP measures do not directly finance land purchases, but they encompass financing for investments in tangible farm assets, innovation, and farm diversification. The correlation analysis allows us to exclude the presence of a relationship between “Capital account” and the value of machinery and, and of these two variables with the dummy variable relating to subcontracting and energy production. The results for the latter two variables and the forms of income derived from off-farm income lead to the assertion that the investment in a capital good is supported by forms of income derived from a diversification of the activities conducted by the farmer. Thus, off-farm income does not lead to an exit of the farm from the sector but helps the farm to survive and increase its size.

The results confirm the findings of previous research regarding the positive effect of the presence of a successor, but not that of the young farmer on the farm. In fact, contrary to what has been hypothesised, the presence of a young person on the farm identified as a 'holder' does not influence the decision to invest in land. The results confirm the negative effect exerted by the presence of a farmer over 60.

The results regarding the exogenous variables introduced confirm what was hypothesised. The macroeconomic context influences the investment decision. The inflation rate was not included in

the empirical literature analysed in Chapter 2, while the results regarding the cost of capital confirm what has already emerged in the study of Elhorst (1993) and Oskam, Goncharova, and Verstegen (2009).

The model explains 19% of the land investment decision, indicating that factors not considered influence the decision to purchase land. The relative Pseudo R^2 value is lower than that of other studies on structural change but more in line with studies on investment decision. The available data and their quality have influenced the choice of explanatory variables and the type of analysis. It was not possible to conduct the analysis on balanced panel data and include explanatory variables related to the financial position of the farm and its local area. Investments in capital goods could represent a significant investment that may even require a bank loan. These are rational decisions that the farmer makes after analysis of the internal and external business contest. Investment in land rarely occurs at the same time as it is planned because it is not certain that the farmer will find the supply on the local market will meet his needs (Elhorst 1993). Therefore, to study and understand this type of investment it would be appropriate to conduct the analysis on farms observed over a long period of time. Furthermore, the land market is thin and local, and the absence of precise geolocation data for farms prevented the consideration of other external factors. Farmers tend to buy land near their activity to reduce and avoid downtime. Cotteleer, Gardebroek, and Luijt(2008)estimated that 90% of farmers in the Netherlands buy land that is at most 6.7 km away from their farm. During the testing and implementation of the model, we attempted to include the regional variable as a categorical variable. However, this variable reduced the statistical significance of other categorical variables related to farm structure. The regional variable already contains information related to other variables such as specialisation, UAA, and RENT/UAA. This is because the Italian territory is highly heterogeneous regarding territorial structure, production, and farm management. For this reason, it was preferred not to include it.

About exogenous factors related to the farm environment, such as land regulation, are complex to include in an empirical model and can influence investment decisions.

In addition to data availability, the lack of literature has influenced the design of the theoretical framework for developing the conceptual model and the interpretation and discussion of results.

3.7 Conclusions

This research represents a first attempt at an ex-post study using microdata to identify the factors that have influenced the land investment decision in Italy by introducing variables related to agriculture policies and the macroeconomic environment. The quantitative research on Italian FADN data from 2013 to 2020 showed that more than specialisation and subsidies provided by agricultural policies, income-generating activities from other on-farm and off-farm activities positively influence land investment. Results related to the ratio of leased land to total farm area (RENT/UAA) and capital in machinery and plant suggest that rather than land capital, the capital invested in other farm assets increases the likelihood of investment. Furthermore, farms with a high ratio of leased land to total farm area are not inclined to increase their land capital. The more a business relies on family labour, the less likely it is to purchase land. The presence and age of the successor have been confirmed as important characteristics for growth through acquisition. The five implemented models explain approximately 20% of the land investment decisions of the analysed farms. Therefore, other factors that need to be considered and included that can influence farmers' decisions.

European Economic and Social Committee and the European Parliament have expressed concern about the concentration of land in the hands of large farms(European Economic and Social Committee 2015; European Parliament 2017). Understanding what factors may affect the purchase decision helps to identify and characterise farms that expand their farm size through purchase. The identification of endogenous and exogenous drivers that might influence the likelihood of investment in fixed productive assets such as land could be useful for policymakers to implement policies and regulations to promote the survival and growth of farms, as well as to facilitate land investment by reducing

barriers to land acquisition. If on the one hand, buying land takes away liquidity from the farm that could be invested in other fixed productive assets and in this regard, renting could provide access to land and at the same time allow the farm more flexibility. On the other hand, the purchase entails a transfer of rights to the new buyer who could use the land as a form of collateral capital especially in countries like Italy characterised by a liberal land regulation and where the tenant is no more protected than the owner (European Commission. Joint Research Centre. 2021a).

Quantitative research did not show a direct influence of the subsidies provided by the policy on the decision to invest in land, but policies and regulations could affect those factors that directly affect the decision to invest in land. Thus, agricultural policies can indirectly influence the agricultural land market by acting directly on its main drivers.

4. Factors affecting farmland markets: an analysis bases on expert interviews

4.1 Introduction and objective

In recent years, there has been growing interest among policymakers, stakeholders, and academics in studying the effect that policy subsidies and land regulation can have on agricultural land sales and rental markets(European Commission. Joint Research Centre. 2021a; 2021b). In particular, research has often focused on understanding whether and to what extent European policy subsidies could be capitalised within the land value and rent and whether there were factors that could influence the capitalization rate. These include the land regulation. According to the researchers, the tighter the land regulation adopted and implemented by the Member State, the lower and slower the capitalisation process of the subsidy within the land value and rent (Ciaian et al. 2021).

Land regulation represents a tool through which a state can regulate access to and use of land and the relationship between the purchase and rental market of agricultural land (Johan Swinnen, Van Herck, and Vranken 2016). Each Member Countries implement it independently and even following even secondary regulations/directives from the European Union (European Commission. Joint Research Centre. 2021a). The New Member States have adopted stricter regulations governing the agricultural land sales market and/or agricultural rental market than the Old Member States. An exception to this is France, which, among the Old Member States, has the most stringent regulation to control both the land sales and rental markets. Italy is one of the countries with the most liberal regulations(European Commission. Joint Research Centre. 2021a).

In recent years, European institutions have grown increasingly concerned about the concentration of land in the hands of a few large companies. The European Parliament in 2017 called on each Member State to review its land regulation and to ensure that it is implemented in such a way as to prevent the concentration of land in the hands of a few large companies and to facilitate access to land (European Parliament 2017; European Economic and Social Committee 2015).

Through the qualitative analysis, the aim is to understand if and how a)the different drivers selected through the literature can influence the agricultural land sales and rental market, b)the different drivers influence each other, c) the Common Agricultural Policy has influenced the agricultural land sales and rental market d) different land regulations affect agricultural land market trying to grasp the effects of this driver on national land markets.

To achieve these objectives, a qualitative analysis of questionnaires to land market experts in Italy and France was conducted. The choice of comparing Italy with France is dictated by the fact that heterogeneous farms characterise the national agricultural sector regarding production types and farm structures. They are two Old Member States that in 2003 adopted the historical model for the transition to decoupled aids(European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a) but differ strongly in terms of land regulation.

The remainder of this chapter is organized as follows: in the next section, Section 4.2, background on the evolution of the Common Agricultural Policy and land regulation in Europe will be described through a literature review. Subsequently, in section 4.3, an analysis of the agricultural sector of the two case studies, Italy and France, will be made. Section 4.4 will present the methodology used and, thus, the structure of the semi-structured questionnaire adopted to conduct the interviews with experts in the sector in Italy and France. The results will then be presented in Section 4.6 and discussed in Section 4.7. In Section 4.8, the conclusions of the qualitative research conducted will be drawn.

This research is innovative because it aims to identify the dynamics that may exist in both local and national land markets. Unlike previous studies, it does not just describe and compare the land regulation measures implemented by different states. Instead, it seeks to understand and explain how these measures have affected agricultural land sales and rental markets.

4.2 Background

The 2003 CAP reform was a turning point and a significant change. Subsidies coupled to production were drastically reduced to make way for decoupled payments. This type of entitle introduced in

2003, but started in 2005, was linked to the ownership of land considered eligible. Decoupled payments were introduced as the Single Payment Scheme or Single Area Payment Scheme. Unlike the former, the New EU Member states could only adopt the latter (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a; European Commission. Joint Research Centre. 2021b).

Each Old Member State could choose between three different models for introducing SPS payments:

- Historical model: the title differed per farm and the amount was calculated based on the previous production period taken as a reference (2000-2002).
- Regional model (or flat rate): the subsidy per hectare were calculated based on the average of the historical reference amounts of the entire region concerned. Therefore, the payment entitlement per hectare was the same for all farms within the same region.
- Hybrid model: a hybrid model between the regional and the historical model, and like the latter the payment was different per farm.

Coupled payments, although significantly reduced, remained active for certain productions to maintain the level of production within specific areas (Centre for European Policy Studies 2008; European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a; European Commission. Joint Research Centre. 2021b).

In 2013, changes were introduced to reduce the difference between the farms and between Member States and to support small and medium-sized companies more. The EU asked Member States that had adopted the historical or static hybrid model to move towards the flate rate (or regional model) through either full convergence or partial convergence of securities to reduce the heterogeneity of DDP subsidies within a region or Member State. To support small and medium-sized farms and reduce the total payments to large farms, redistributive and degressivity/ capping payments were introduced, respectively increasing the payment for the first 30ha over the others and reducing the total payment for large farms (European Commission. Joint Research Centre. Institute for Prospective

Technological Studies. 2016a; European Commission. Joint Research Centre. 2021b; Centre for European Policy Studies 2008).

Furthermore, to link the payment to agricultural practices beneficial to climate and environment, the so-called CAP-greening was introduced (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a; European Commission. Joint Research Centre. 2021b). So, the new payment scheme introduced by the new reform included an income support component divided into basic and young farmer payments and a public good provision component (i.e. greening) (Ciliberti and Frascarelli 2015). Each Member State could introduce optional payments such as payment for areas with natural constraints, coupled support and small farmers scheme and redistributive payments.

Since the 2007 reform, the EU, through its Rural Development Programmes (RDP), has introduced new forms of subsidies developed and designed to support and promote the development of rural areas by providing tools to help the farmer meet economic, environmental, and social challenges. These aids support the farmer in tangible and intangible investments useful to improve the production process and product quality with the aim of improving the economic position of the farmer (European Commission. Joint Research Centre. 2021b; European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016).

Subsidies under agricultural policies are provided to increase the farmer's income and represent a form of income for the farm that is not affected by production risks (Ciaian et al. 2021; Moro and Sckokai 2013). By increasing the return on farming or reducing production costs, subsidies increase the marginal return of the farmer's activity. According to economic theory, this could increase demand for inputs and to a greater extent for scarce inputs such as land (European Commission. Joint Research Centre. 2021b).

For this reason, researchers over the years have sought to understand whether both theoretically and empirically the different forms of subsidy could be capitalised within the price of land as a scarce

factor of production, not easily reproducible and characterised by low elasticity of supply. Theoretically, all subsidies provided can be capitalised within the value of land when the land market is well functioning. However, there are differences depending on the subsidy (DDP, CDP, RDP) and how the same subsidy has been implemented by the Member State (SPS, SPAS, historical model, regional model and hybrid model) (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016b; Ciaian et al. 2021; European Commission. Joint Research Centre. 2021b).

The literature shows that DDP payments are more capitalised within land value than payments made through CDP and RDP (e.g. Agri-environment mesures). This is because the latter's payment is linked to the production of certain crops (CDP) or the voluntary adoption of specific cultivation practices. The benefit from CDP and RDP subsidies is shared by multiple actors within the market, such as landowners, consumers, and production input suppliers (Floyd 1965; Gardner 1983; Alston and James 2002; European Commission. Joint Research Centre. 2021b).

Empirical studies have been conducted predominantly on the rental market for several reasons: a) more than 50 % of the European land is managed in the form of rents, b) rents are less affected by the farmer's future expectations, c) rents are market-driven (Whitaker, 2006) and are more available data than agricultural sales market data (European Commission. Joint Research Centre. 2021b). Furthermore, if the lease is short-term, it is not affected by other non-agricultural factors, better reflecting the value of the agricultural activity conducted on the land (Whitaker, 2006; J. Swinnen et al. 2013; Borchers, Ifft, and Kuethe 2014; Delbecq, Kuethe, and Borchers 2014; European Commission. Joint Research Centre. 2021b; Czyżewski, Kułyk, and Kryszak, 2019).

Generally, the capitalisation rate varies widely among the different empirical studies and is lower than theoretically assumed (European Commission. Joint Research Centre. 2021b). Few empirical studies have been conducted on the capitalisation of the 2013 reform subsidies. In a recent empirical study by *Joint Research Centre* in 2021, the authors studied the capitalisation of subsidies within the

rent and land value by analysing European FADN data from 1989 to 2016 (European Commission. Joint Research Centre. 2021b). According to this study, DDP subsidies are capitalised within the rent with a capitalisation rate of 23.8%. Specifically with the 2013 reform, the capitalisation rate decreased to 21.9%. Although the 2013 reform had a positive effect, it is statistically insignificant. In the case that States had implemented historical or hybrid SPS and partial convergence in 2013, the capitalisation rate was lower than in member states that implemented a homogenous payment. Also, in line with theoretical research, production-coupled payments appear to influence the rental rate less than DDP payments (European Commission. Joint Research Centre. 2021b).

Regarding the value of land, except for DDP payments, it does not appear that subsidies have a statistically significant effect. According to the empirical research, in the short run, the annual capitalisation rate into land value of DDPs is between 28.8% and 32.1%, and in the long run between 154% and 164%. If the implementation of DDPs models is also considered, the situation changes. For the value of land, only the heterogeneity of the payment level influences the capitalisation effect of DDPs. The capitalisation rate varies between 38% and 12% in regions with heterogeneous subsidies (European Commission. Joint Research Centre. 2021b).

Contrary to theoretical assumptions, in regions where homogeneous DDPs are implemented, capitalisation has a negative effect on land value. According to the authors, these estimates concerning the capitalisation of subsidies on land values should be considered with caution due to the data analysed, the methodology used to obtain the land values in the FADN database, problems with the economic model, and the combination of all these factors. According to the authors, the FADN data do not fully and correctly reflect the actual dynamics of market returns (European Commission. Joint Research Centre. 2021b)

Also, according to the JRC study, farm size and livestock units, the amount of rented land, population density, employment rate, and inflation rate influence the rent. A factor that seems to have a positive and statistically significant effect is market return (e.g. Goodwin, Mishra, and Ortalo-Magné 2003;

Lance and Mishra 2003; Roberts, Kirwan, and Hopkins 2003; Ciaian and Kancs 2012; European Commission. Joint Research Centre. 2021b). Agricultural profitability appears to be an important driver of farmland rental rates. Contrary to theoretical assumptions, land regulation does not influence the subsidy capitalisation rate within the rental rate. According to the authors this result could be related to the imperfect proxy considered for land market regulations (European Commission. Joint Research Centre. 2021b). Theoretically, the more stringent a land regulation is, the less the subsidy will be capitalised within the land price (European Commission. Joint Research Centre. 2021a; 2021b; Ciaian et al. 2021). In the land market, land regulation does not only play a role because it interacts with agricultural policies and influences the potential capitalisation of subsidies (Ciaian et al. 2021; European Commission. Joint Research Centre. 2021a). Through more or less stringent land regulation, the government can condition the allocation of land and thus the distribution of income and CAP subsidies. Land regulation is an instrument through which the government influences the relationship between the agricultural land sales market and the agricultural rental market (Johan Swinnen, Van Herck, and Vranken 2016). In Europe, each Member State has implemented and implements its land regulation autonomously. Land regulation also varies significantly between New Member States and Old Member States for historical-political reasons (Johan Swinnen, Van Herck, and Vranken 2016; J. F. M. Swinnen 2002; Bradfield et al. 2023). The European Union cannot influence the Member States' land regulation even through secondary directives(European Commission. Joint Research Centre. 2021a). In recent years, European institutions have grown increasingly concerned about the concentration of land in the hands of a few large companies. The European Parliament in 2017 called on each Member State to review its land regulation and to ensure that it is implemented in such a way as to prevent the concentration of land in the hands of a few large companies and to facilitate access to land (European Parliament 2017; European Economic and Social Committee 2015).

4.3 Case studies

4.3.1 Italy

In 2020, 12.5 million hectares in Italy were used for agricultural production managed by 1133023 farms (Henke and Sardone 2022; ISTAT 2022). Between 2010 and 2020, the number of farms decreased (-30%), while the national UAA remained almost stable (-2.5%) (ISTAT 2022). Farms with an area of less than 2 ha decreased by about 20%, while the number of farms for all other UAA classes increased. The average farm area is 11 ha, increasing by about 3 ha compared to the previous decade. 64% of the farms produce arable land on 57.4% of the national UAA. Of these, 29% (25.1% of the national UAA) produce cereals, 27.2% (19.2%) fodder crops, 7.3% horticulture (2% of the UAA), and 5% industrial plants, 4.7 legumes (2.1%). 71% of the farms produce permanent crops, of which olive, vines, and apple trees are the main ones. 25% of farms manage 25% of the UAA for grassland and pasture in 2020. There are 213,984 livestock farms in Italy, of which 44% breed cattle, 26.7% livestock, 26.4% sheep and 17.8% pigs (ISTAT 2022).

In 2020, compared to 2010, more farms diversified their activities. Agrotourism, energy production, and sub-contracting activity represent the main agricultural- related activities carried out by farms. Compared to 2010, the number of farms led by farmers under the age of 44 has decreased. Of the 11% of farms conducting innovative investment between 2018 and 2020, 55.6% did so by purchasing a machine. Age and targeted education positively affect farm innovation. When the farm is led by a young farmer, the incidence of innovative investment is 4 times higher than on farms led by older farmers (ISTAT 2022).

Like most EU member states, the Italian agricultural sector is characterised by a strong presence of family farms (Eurostat 2022; ISTAT 2022). Together with "*azienda individuale*" (individual company), these represent over 93.5% of Italian farms. Although this type of management has decreased during the reference period, it remains the predominant one. The other forms of management are growing. In particular, partnerships and capital companies represent 4.8% (+1.9%

compared to 2010) and 1% (+0.5%) of Italian farms in 2020, respectively. The average farm size varies greatly according to the form of tenure. It is 8.6 ha for family farms, 41.5 ha for partnerships, and 41.6 ha for capital company (ISTAT 2022).

The 7° census of Italian Agricultural Sector highlights how the incidence of non-family paid labour in Italy has increased significantly (ISTAT 2022). Between 2010 and 2020, the non-family labour force increased by about 23%, and the percentage of the number of companies with non-salaried labour increased by 3%(ISTAT 2022). According to research conducted in April 2022 by ISMEA, the search for non-family labour is one of the main issues of concern for Italian farmers, rising running costs, the difficulty of finding raw materials, and the climate emergency (ISMEA 2022).

Between 2010 and 2020, the number of farms cultivating land exclusively through ownership decreased, although it continues to be the preponderant form followed by ownership+rental and leasehold. The rental form of management is still on the rise. Already between 2004 and 2014, Italy was one of the European countries to record an important increase in the amount of land managed under rented form (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a). This form of land management increased by 23% between 2000 and 2016 (European Commission. Joint Research Centre. 2021a). The tenancy is emerging as a key tool for business consolidation, especially for large companies(European Commission. Joint Research Centre. 2021a). According to Eurostat data, in 2020, 54% of the Italian UAA was conducted in rented form, three percentage points below the European average (57%)(European Commission 2022).

In 2003, Italy opted for the historical model to switch from coupled to decoupled aid. With the 2013 reform, Italy implemented the model of partial convergence and capping/degressivity payments to reduce the heterogeneity of payments within the national territory (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a; European Commission. Joint Research Centre. 2021b; Ciliberti and Frascarelli 2018).

The law regulates agricultural land leases in Law 203/82(*Legge 203-1982 -Norme Sui Contratti Agrari* 1982) . According to this law, the lease must have a duration of 15 years, but if the contract is signed in the presence of the professional organisation, the duration can be freely fixed by the parties involved(*Legge 203-1982 -Norme Sui Contratti Agrari* 1982). Until 2002, the rent of the lease was established based on the "*reddito domenicale*" of the land determined based on the cadastral data from 1939. In its judgement No. 318 in 2002, the Constitutional Court ruled that it was unconstitutional to determine the rent in this way since the cadastral data from 1939 had lost its ability to represent the actual characteristics of the land and since more recent cadastral data existed. This ruling was not followed by legislative action, and thus, a legislative vacuum was created.

In 2011, the IV Section of the Supreme Court of Cassation ruled on the determination of the rent, stating that the rent due by the tenant party was to be freely established by the parties involved and that the determination of the rent had to take into account: the productive capacity of the land, the number of existing plants, the quality of the product obtained, the position of the land, the irrigated land and the ownership of the direct payment.

Just as Italian law does not provide rent control, it does not provide land sale price control.

The right of pre-emption and tax concessions are the main instruments through which the Italian State intervenes in the land market, and it does so to reduce farm fragmentation and consolidate the farm size. Art. 8 Law n. 590/1965 and art. 7 Law n. 817/1971 establishes that the Italian farmer may exercise the right of pre-emption of land if at least one of three cases occurs:

- he/she is the co-owner of the farm,
- he/she is a professional farmer who directly borders land for sale,
- if he/she has been renting the land for at least two years (*Legge 590/1965- Disposizioni per Lo Sviluppo Della Proprietà Coltivatrice* 1965; *Legge 817/1971- Disposizioni per Il Rifinanziamento Delle Provvidenze per Lo Sviluppo Della Proprietà Coltivatrice.* 1971).

The right of pre-emption has also been extended to agricultural partnerships (as a rule, simple partnerships, and general partnerships) if at least half of the partners are “coltivatore diretto”. These agricultural partnerships must have the exercise of agricultural activities as their exclusive activity.

Between 2009 and 2016, the Italian State implemented tax concessions to improve the farmer's position. The law states that:

a) The Italian farmer with a family farm does not have to pay income tax or land use tax.
b) The Italian farmer is exempt from paying income tax on the use of the land.
c) In case of land purchase, when the buyer is a direct farmer (“*coltivatore diretto*”) or professional agricultural entrepreneur, he will pay only 1 % of the purchase price as tax, while any other buyer will pay 15 %.

According to Italian legislation, the “*coltivatore diretto*” is the person who, alone or with his family, cultivates and manages the land and whose labour covers at least one-third of the total labour force of his farm and, in any case, for at least 104 working days. The agricultural activity must be conducted continuously and predominantly and be the farmer's main source of income. According to legislative decree no. 99 of 29 March 2004, the “*professional agricultural entrepreneur”* is an farmer who possesses the knowledge and skills in accordance with Regulation (EC) no. 1257/1999 and who spends at least 50 %of his/her working time on the agricultural activity of the enterprise, deriving at least 50 %of his/ her total income from these activities (*Decreto Legge 99/2004-Disposizioni in Materia Di Soggetti e Attività, Integrità Aziendale e Semplificazione Amministrativa in Agricoltura, a Norma Dell’articolo 1, Comma 2, Lettere d), f), g), l), Ee), Della Legge 7 Marzo 2003, n. 38.* 2004).

4.3.2 France

In 2020, 26.7 million hectares represented the nationally utilised agricultural area managed by 389,800 farms(Agreste 2022c; 2022a). France, as in other European countries, experienced a reduction in the number of farms (-20%) between 2010 and 2020, while the French national UAA remained more or less stable (-0.8%). In general, small, and medium-sized farms decreased, while

large farms increased. Farms with less than 100 ha are progressively decreasing, and large farms (>100 ha) are increasing. In particular, between 2010 and 2020, large farms with a Standard Output of around 250 thousand euros and an area of 200 ha increased by 3.4%, while micro-small farms with a Standard Output of less than 25 thousand euros and an average area of 12 ha decreased by 31% (Agreste 2022c; 2022a). The weight of farms with an area of less than 20 ha decreased from 43% to 38% (-5%) and accounted for 2/3 of the farms lost in the decade of reference. Nevertheless, fewer than 50 ha will make up 54% of French farms in 2020. In 2020, non-specialised farms represented 10% of French farms and have decreased since 2010 (Agreste 2022a).

Except for horticulture, the number of farms decreased for all specialisations. Farms specialising in livestock farming fell by 30%, making it the second most common specialisation in France, leaving the top spot for farms specialising in crops, which recorded a 9% decrease. An increase in surface area accompanies the reduction in the number of farms in this specialisation (Agreste 2022a).

The average French farm surface area increased by 14 ha compared to 2010 and is 69 ha, with significant differences depending on the farm specialisation. Farms specialising in cattle breeding have an average area of 93 ha, followed by field crops (83 ha) and mixed farming with livestock (81 ha). On the other hand, farms specialising in wine, fruit, permanent crops, and horticulture have an average UAA of 19 ha, 18 ha, and 11 ha, respectively. Field and livestock farming occupy 2/3 of all French territory. In the 10 years under consideration, hectares dedicated to the production of wheat (about -300 thousand ha), oilseeds, and vines have decreased. The production of fodder and pastures, plants for fibre production, vegetables, and fruit production increased (Agreste 2022c; 2022a).

According to Eurostat 2020 data, only 42% of French farms are family-run, differentiating them and Estonia from other European countries (Eurostat 2022). This difference can be explained by the fact that French legislation provides for a specific form of limited liability farms, which is called "*Exploitation agricole à responsabilité limitée (EARL)*". This is governed by the Rural Code. This specific agricultural company can be single-member or spousal partnerships and the participation of

all partners in the work is not mandatory. From 1988 to 2016, the number of EARLs increased from 1.8 thousand to 79.8 thousand holdings (Agreste 2022b). Half of French farms are managed by farmers over 55 years of age (Agreste 2022c; 2022a).

In 2020, the 84% of French land is managed as rented land (‘Eurostat’ 2020). Tenants are strongly protected by French law. Historically, only 3 types of tenancy are allowed:

- Baux ruraux, provides for a term of 9 years
- Baux de longe term, for a term 18 years
- Baux de carriere, for a term 25 years

France is the Country with the most stringent and complex legislation in Europe. French legislation controls the price of land at the buying and selling stage, the rent and the duration of the lease (European Commission. Joint Research Centre. 2021a; Ciaian, Kancs, and Swinnen 2010; J. F. M. Swinnen, Van Herck, and Vranken 2014).

The agricultural land market is controlled by three historic French institutions: the Sociétés d'Aménagement Foncier et d'Etablissement Rural (SAFERs), Commission départementale d'orientation agricole (CDOA), Préfet.

SAFER is a private, state-controlled institute established in 1960 that performs a public function. It consists of a committee within which the interests of various stakeholders are represented, and it operates at the local level. SAFERs have been established for each NUT3 (called “department”) plus one that deals only with Paris (Laure Latruffe et al. 2008; Laure Latruffe and Mouel 2006). The main objectives of the SAFER are to: a) support the establishment of farmers and especially young farmers; b) facilitate and help the consolidation of small farms and prevent overconcentration of land; c)foster rural development and environmental protection (Laure Latruffe and Mouel 2006; Piet et al. 2010). Whenever a purchase and sale of agricultural land is about to take place, the notary has to notify the local SAFER. The SAFER has 60 days to object to the purchase and sale. The main reasons it can object are: the price is too high, and therefore not representative of the market price; concentration of

the land in the hands of a large farm. If the SAFER were to object to the transaction, the so-called "negotiation tool" would be activated. The *SAFER* may identify a more suitable buyer or mediate the price to be more in line with the market price. Should no agreement be reached in the second phase, phase 3 follows. *SAFER*, if it has the budget to do so, can exercise its right of first refusal and purchase the land, which it will resell or lease within five years of acquisition. In 2007, the *SAFER* intervened in 15 per cent of the cases, therefore, it is difficult to reach phase 3 (Laure Latruffe et al. 2008). The *SAFER* can only intervene if the purchase involves land in an area considered agricultural. If the area is changed from agricultural to urbanised, the *SAFER* can no longer perform its function.

The *Commission départementale d'orientation agricole (CDOA*) was established in 1995 and consists of farmers, representatives of the government and agricultural professional organisation, local authorities, consumers, and experts appointed by the *Préfet*. The *CDOA* is responsible for making decisions from an economic, environmental, and social point of view and acts as an advisory body to the "*Préfet"* (Laure Latruffe et al. 2008). Unlike the SAFER, it does not intervene in the case of buying and selling or during the transaction. However, it is the body that issues the necessary authorisation to carry out agricultural activities and is involved in controlling the farm structure, policy implementation, innovation, and modernisation of the farm.

The "*Préfet"* represents local government in each "*département*" (NUT3) that is in charge of updating the minimum and maximum value of the rent every five years. This update is carried out based on the average gross income of his department, also considering the most cultivated crops within his department (L. Latruffe et al. 2008).

In 2003, France opted for the historical model to switch from coupled to decoupled aid. With the 2013 reform, France implemented the partial convergence model and redistributive payments for the first 52 hectares to reduce the heterogeneity of payments within the national territory (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2016a; European Commission. Joint Research Centre. 2021b).

4.4 Methodology

Based on a survey conducted in "*Study on the Functioning of Land Markets in the EU Member States under the Influence of Measures applied under the Common Agricultural Policy*", tender AGRI / 2007-G4-14 financed by the European Commission (Centre for European Policy Studies 2008), a questionnaire was drafted to explore through the opinion and experience of experts in the field whether and what effect endogenous and exogenous farm drivers, CAP 2014-2020, and national land regulation might have had on both the land and rental markets.

The questionnaire (Appendix 1,2) is structured as follows:

- 1 question to capture through a scale from 1 to 7 the effect of 24 drivers related to farm and socio-demographic characteristics, CAP 2014 -2020 and national regulations on the purchase and rental decision, the value of land and rent.
- 4 open questions through which the respondent was asked if there were any price changes between 2014 and 2020 and if there were any endogenous or exogenous farm drivers that could have influenced the local land market.
- 13 open-ended questions asking the respondent whether the 2014-2023 CAP, both direct payments and the RDP, had influenced the land price and what effects the 2023-2027 CAP might have on the land market.
- 7 general questions on the rental market in the local area. In particular, whether there had been any changes in terms of area rented, rent, and duration of rent between 2014 and 2020.
- 13 open-ended questions asking the respondent whether the CAP 2014-2023, both direct payments and the RDP, has influenced the price of land and what effects the CAP 2023-2027 might have on the land market.
- 7 general questions on the rental market in the local area. In particular, whether there had been any changes in terms of area rented, rent, and duration of rent between 2014 and 2020.

- 13 questions on the effect of CAP 2014-2020 on the rental market and rent. Of these 13, 3 questions related to the effect PAC 2023-2027 might have on the rental market.
- 5 questions on the effect of national land regulation on the land market and any critical elements of national land regulation that should be changed.

The overall objective was to explore the land market, both sales and rents, and to capture dynamics that cannot be captured, represented, and explained by quantitative analysis.

The questionnaire was designed and implemented to be aimed exclusively at experts in agricultural land market. The study involved interviewing experts from the Italian and French sectors. Specifically, four interviews were conducted in Italy, including two with Italian professors and researchers from Bologna and Milan and two with agronomists from Bologna (located in North Italy) and Apulia (located in South Italy), respectively. Four interviews were conducted with experts from the French market, including one from Brittany and one from Avignon.

4.5 Results

4.5.1 Italy

4.5.1.1 Drivers

According to the Italian experts interviewed, between 2014 and 2020, small farms tend to dispose of farms, and large farms mainly make the purchase. The farm size influences the decision to purchase, the decision to rent, the value of the land, and the rent with differences among local agricultural land markets. According to the expert in Apulia, farm size leads to a substantial increase in the decision to purchase, land value, and rent. According to the interviewee, it is important to emphasise the difference between purchasing to improve the efficiency of the farm and purchasing to expand the farm size. In the first case, the purchase is made if the land is neighbouring and allows to improve the configuration of the land. In the second scenario, the purchase is made regardless of whether it leads to an improvement in the layout of the land and whether or not it directly borders the property. In the

case of Emilia-Romagna and Lombardy, the effect of farm size is more important on lease decision and the rent than the purchase decision and land value. According to the agronomist, in Emilia-Romagna, medium-sized farms between 10 and 50 hectares are suffering due to the pressures from the Common Agricultural Policy. The expert from the Florence area, which has a purely wine-growing vocation, states that on the one hand, in general terms, farm size is symptomatic of growing capacities and financial availability, so there is undoubtedly a linear and progressive relationship in a positive sense. On the other hand, outside investors enter the land market in some areas by opening small farms that grow quickly because these investors pour capital from off-farm activities into the farm. These forces entering the market led to an increase in the price of the land with the risk that the price then no longer reflects the real profitability of the property. As far as the rental decision and the rent are concerned, the effect could be neutral.

All expert agreed that the price of commodities influences the decisions of farmers. The increase in price leads farmers to increase farm size. Given the volatility of commodity prices, the effect is greater on the rent and lease decision than on the land purchase and land value. Agricultural commodity prices are perceived as highly volatile and transitory. For this reason, the increase in the price of commodities influences the decision and the rent more than the purchase. This is also made possible by article 45 of law 203/1982. It allows the farmer to increase farm size for a short period and avoid making risky investments. According to the expert in Apulia, the agricultural commodity prices affect producers of agricultural commodities more than permanent crops. The increase in commodity prices creates expectations and therefore pushes the farmer to invest. This decision also depends on the farmer's risk inclination. In Apulia, the recent increase in the price of wheat due to the pandemic and the war between Russia and Ukraine has led to a frenzy and a greater demand for land even when buying. The rigidity of land supply has prevented investments in land that would most likely not have been sustainable, given the subsequent drop in the price of grain. For wine-growing areas, the price

of commodities does not influence the land market as the price of wine is much more stable than that of commodities, which is determined by global markets.

Agricultural productivity also has a positive effect on the rent and purchase decision. However, the effect exerted by this driver is less than that exerted by the agricultural commodities prices on the rental market. The effect on the purchase market and land value varies. In Apulia it seems to influence it significantly, while in Lombardy, the effect is slight and is equal to that on the rental market. In Emilia Romagna, the two experts do not agree on the effect of this driver on the land market. For the agronomist interviewed, the effect is strong and important in the purchase market and slight in the rental market, while for the second interviewee it is slight in both markets.

Concerning the effect of direct payments, the interviewees agree that the effect of this driver is greater on the rental market and rent than on the agricultural land sales market and land value. Direct payments, as in agricultural commodity prices, are related to a question of perspective and durability. It is a driver linked to maturity and variability and inevitably leads to a greater impact on rents than long-term investments such as purchases. Rural development programmes generally have a lower, almost neutral effect, on the land market. They are long-term measures that lead to structural farm changes. Therefore, if they do have an effect, this minor effect is exerted on the purchase decision.

Furthermore, according to one interviewee, the RDP measures linked to farm investments such as machinery could lead to a double effect, even a contrasting one. On the one hand, the search for economies of scale or, in any case, the maximum and efficient use of machinery. On the other hand, the economic-financial commitment to purchase the machinery could neutralise the effect of the RDP.

Organic land management did not affect the decision to buy or rent. According to an expert from the Emilia Romagna region, if organic still has an effect, it is on the purchase market rather than rental market because it is an investment that takes a time to realize. According to the expert in Lombardy, organic had influenced the market previously but no longer.

Taxes, in general, have a depressive effect and mainly influence the purchase decision rather than the rental market since the rent are not taxed in Italy. Interest rate and inflation rate also influence the land market. The increase in the cost of capital negatively influences the decision to purchase land and the price of land. The inflation rate on the one hand has a positive effect. However, the expert from the Lombardy region specified that while it is true that they increase the price to the consumer, they also increase the costs for the farmer. In general, it was pointed out by the expert in Apulia and Lombardy that in the period 2014-2020 the inflation rate and the interest rate were low and it would be interesting to understand what is happening in these years.

Urban development does not seem to influence the land market. In general, near the urban area the price of land increases, but experts do not believe that a farmer is interested in purchasing land near urban areas. This driver slightly influences the decision to buy and value land and has a neutral effect on the rental market. In regions such as Lombardy, with a very high population density leading to increased property prices and a shift of people towards the hinterland of cities, urban development inevitably influences the land market. In Apulia local policies are in place to avoid land consumption that aim to stop the growth of the urban area, and this limits the effect that this driver can have on the land market in any case. In Emilia-Romagna, experts do not agree on the effect of this driver. According to one, urban development does not affect the land market. The second states that it has a slight effect on the purchase decision and a medium effect on the land price. The creation of new infrastructure, such as railways and highways, tends to negatively affect the land market because they create “inconveniences”. The creation of road junctions or access roads will have a slight to moderate effect on farms that carry out agrotourism activities.

According to experts, the creation of new supply chains only has an impact if the farm produces fruit and vegetables, in the case of ER, also agro-energy, and if short supply chains are created. Otherwise, the creation of new supply chains or new AOC, PDO, and PGI have no effect. The Certification

schemes already in place, with established supply chains that are linked to a typicalisation for the place of production, also have an important influence on the investment decision.

The holder's age has an important influence on the farm's growth. It does not have a linear effect. Up to the age of 50 this driver leads to an increase in the business growth decision either by purchase or renting. After the age of 55-60 without successor on the farm, then age will not lead the farmer to expand. The presence of the successor and the age of the successor affect the land market in general. The presence of the successor affects if he is about 20 years old. If there is not a great difference in age with that of the holder, the effect of this driver is small. According to the interviewees, the older farmer is reluctant to hand over the land to a third party or to hand over the management of his farm to the successor. In the latter case, Tuscany is an exception, where there no longer seems to be the father-son conflict that characterized the previous generation.

Experts expect the “family business” driver to influence the business expansion decision because it has a greater interest in the growth and survival of the business and because it is assumed that there will be a successor. About 90 % of farms in Italy are family-owned, so it becomes complicated and complex to compare. The ratio of family labour hours to total labour hours leads to higher business growth because family labour costs are assumed to be lower. It is also true that if the ratio of family labour hours to total labour hours is very high, the increase in company size will lead to the farm hiring external staff and thus becoming an employer. Not all farmers are willing to make this change, considering the cost of labour and that a non-family worker cannot work as a family member. According to experts, the non-farm family income tends to influence the purchase decision more than the decision to rent and the rent.

Respondents say that no major changes in price have been noticed between 2014 and 2020. The agronomist in Apulia reports that over the last years the import of grapes from Chile and Spain has led to lower prices and small farms are divesting. In Emilia Romagna, the difficulty of finding non-family labour leads farms specialising in horticulture to shrink in size.

4.5.1.2 CAP and Agricultural sales market

The effect of CAP 2014-2020 direct payments on the purchase decision depends on the crop, the size of the land, and whether they are purchased together with the land. In particular, experts in Apulia and Tuscany state that for specific specialisations, such as wheat, or for farm in marginal areas, the weight of income subsidies is greater than for crops such as grapes and wine. On certain crops, CAP payments do not weight farm profitability. Therefore, CAP aid will be considered in decisions relating to the growth of farm size only by farms where CAP subsidies constitute an important part in the formation of farm profitability. The expert from Emilia Romagna added that if the land purchase includes CAP title, the size of the land depends on the weight that the title can have on the final purchase price. CAP title will have a greater weight as the size of the land purchased decreases.

The introduction of the "basic payment + greening" has impacted the farms affected by this measure. According to the expert, in Emilia Romagna, this payment has had an impact mainly on small and medium-sized farms (up to 50 ha). These farms have been divested by selling or renting land. Farmers are more likely to rent the land than to sell it. The sale tends to take place if there are inheritance problems.

According to the two agronomists interviewed, Rural Development Programme have led to structural changes within the sector, particularly a shift from family farms to other corporate forms. According to the expert from the Florence area, the implementation of well-defined and attractive development programmes influences and positively affect the local land market. Where there is an organic and coherent policy and government of the territory with more convincing and incisive development plans, the potential of the context in which the land is located increases. Therefore, the productive potential and value of the local fixed assets increase. Furthermore, in general, in the agricultural sector and even more so in productions such as winegrowing, long-term planning and design of the agricultural sector and territory is necessary. According to the agronomist in Emilia Romagna, to remain in the sector, a farmer must be able to make good use of Rural Development Programmes,

and according to the agronomist from Puglia, they could facilitate the generation renewal within the farms. When asked about the effectiveness of the measures related to “Young farmer” in facilitating the entry of new young farmers into agriculture and succession within the farm, the experts seem sceptical about the actual success of this effect. According to the agronomist in Apulia, he says that the numbers would seem to say yes, but he is not convinced that this is the case. According to the agronomist in Emilia Romagna, the measures encourage succession but not the introduction of new farmers into the sector. The RDP measure is a means by which to convince the elderly farmer actually to bring his successor onto the farm. According to the same agronomist, the farms that will go ahead will be second and third-generation farms. According to the Florence-based expert, they help make the agricultural sector attractive to young people. Unlike the other experts, he believes that there is no longer that father-son rivalry. All the experts agree that the subsidy contributes to generational turnover on the farm rather than to the entry of new young farmers. This subsidy needs to be higher to guarantee access to the agricultural sector for a new entrant. There is indeed a barrier to entry into the agricultural sector given by the price of land and the cost of machinery. The amount of money allocated by the RDP measure to incentivise the entry of new young farmers into agriculture is not enough. According to most of those interviewed, the presence of other subsidies, such as that provided by ISMEA, due to their size and scope, certainly do not have the capacity to influence the national land market. On the other hand, if enhanced, they could play a role in reviving those stagnant and unsaturated land markets.

Concerning the effect of agricultural-related activities on the farm size growth, in particular purchase, except the expert in Tuscany, all other interviewees agree that activities such as agrotourism and direct sales do not lead to an increase in farm size. Agritourism represents an activity conducted to make the most of what is already present on the farm. According to the expert in Tuscany, agritourism activity could lead to company enlargement because it must create and maintain an attractive environment for the second activity, and if it must conduct, like all other agricultural-related activities,

the necessary requirements to take advantage of the tax benefits linked to the definition of a farm. In Apulia, agritourism has been strongly facilitated by the RDP measures because the costs of renovating old typical buildings ("Masseria") are too high and would be difficult to achieve without the help of public funding. Everyone agrees that subcontracting activity and renewable energy production contribute to increasing farm size. Apulia differs from regions like Emilia-Romagna and Lombardy because renewable energy production is purely wind and solar and in non-agricultural companies' hands. In Emilia-Romagna and Lombardy, the presence of livestock farms has contributed to the emergence of biogas plants that help farms solve a problem related to livestock waste. Initially, large biogas plants were created as a matter of plant efficiency, and the regulations stipulated that to benefit from incentives, one had to be a farm with a professional farmer. As a result, companies were mainly composed of non-agricultural professionals with only one agricultural entrepreneur. This led to distortions and increased land prices and rents. As a result, regulations changed, and smaller, farm-managed biogas plants emerged. As far as subcontracting is concerned, this is instrumental in creating dynamics within the land market. According to the agronomist in Apulia, a company that performs subcontracting activities means that it has machinery that it cannot exploit to the fullest within its own farm. However, rather than exploiting it on other people's land, the farmer increases his own farm size either by buying or renting. The expert emphasises how subcontracting activity maintains the status quo because it allows for small farms to survive within the sector and enables the market to remain dynamic. In particular, there are psychological components that play within the market. Companies that are in the hands of elderly farmers and have no successors do not give up ownership because they are tied to this concept of ownership, which is a cultural fact. They turn to subcontract companies to carry on the activities of the field and fulfil the commitments to maintain the CAP payments. They create a relationship of trust with the subcontractor to whom they first lease and then sell the land. Thus, sub-contracting activity influences the agricultural land market because through it, dynamics are created that then tend to lead first to the rent and then to the sale. According to the

agronomist from Emilia-Romagna, subcontracting influences the rental market rather than the sales market because the company has a lot of machinery immobilized. Generally, companies buy if the land is close to the company otherwise, they prefer to rent. According to the agronomist, when the farm has the means at its disposal and intends to invest much land, it tends to rent to set aside some margin to invest later in the purchase of land, which is not necessarily the land it previously rented, but almost certainly will be land adjacent or at least close to the farm's land. This dynamic occurs to accumulate margin and avoid excessive interest payments at the purchase stage. This is especially the case with large farms that purchase large plots of land. Proximity to the corporate centre is the first driver for buying.

4.5.1.3 CAP and Agricultural land rental market

According to the interviewees, renting is becoming a structural phenomenon, and according to the agronomist in Apulia, Italy is catching up with other European countries even if it always depends on the type of crop. According to the expert in Emilia-Romagna, from 2010 to today the rented area has increased gradually and progressively. It has gone from 30% to 50% of rented land. The elderly component has also begun to rent to young farmers. This change has been supported and induced (depended) on factors that are also physiological, such as age, the absence of a successor and the size of the farm. Even in the case of wine farms, small farms that are unable to have economies of scale and/or managed by elderly farmers rent out their land and sell it only when necessary. Also in Tuscany, when the market, especially for commodities, is profitable, there are farmers who rent land and turn to contractors to cultivate it, outsourcing all costs and avoiding capitalisation.

Energy production in previous years has also led to changes within the market. According to all interviewees, however, the divesting company prefers to rent rather than sell either because of a cultural heritage or because land is considered a *"safe haven"* asset. In addition, the taxes paid on contracts are low and therefore people prefer to keep ownership of the land, unless there are inheritance problems.

The duration of the contracts varies. According to the agronomist in Apulia, contracts can be either 15 years and are registered in full compliance with law 203, or annual or even seasonal and these can also be verbal. In the Tuscan wine-growing areas, contracts are a minimum of 10 years. In Emilia-Romagna they are mainly contracts in derogation of Article 45 with a duration of 3-5 years. 5 years for two reasons for a question of rotations and because 5 years is the duration that allows a return from a year that was not favourable. It is a duration that allows the contract to be stabilised and avoids friction between the owner and the tenant and at the same time the owner avoids there being any deterioration of the land by leasing it. The agronomist in Emilia Romagna said that it is also becoming an important issue to demand surety from the owners. The request for surety is in use in Lombardy and is now beginning to spread in Emilia Romagna as well. However, the surety involves costs.

In Apulia, the contract is paid in November post-harvest (table grapes) and August post-threshing. In Emilia Romagna in the agricultural year and tend to be divided into two instalments one immediately after harvest June-July, and then October-November. The CAP2014-2020 payments have increased and incentivised farms to rent land and are included in the lease contract and also included in the rent causing an increase. In Emilia Romagna it does not seem that the CAP payments have incentivised the farmer to rent out the land, while in Puglia it seems that they have incentivised both the farmer to rent out the land and to demand a higher rent. In Emilia Romagna, according to the agronomist, they affect the duration of the contract because it has now become a consolidated situation, according to Prof. instead, they affect the duration since they require a 5-year commitment. In the Emilia Romagna and Puglia regions, there are differences in CAP payments between eligible and non-eligible areas in favor of eligible areas. Rural Development Plans have also influenced the rental market to some extent. In particular, the purchase of new equipment leads to a demand for new land and measures for initial establishment. Related activities, such as contracts and energy in Emilia-Romagna, have affected the rental market, while agritourism and direct sales have not. According to the Apulian agronomist, the effect is limited; there are other factors that have a greater impact on the rental market.

In Puglia, those who engage in rental contracts do so as a preparation for purchasing and allow the establishment of a trust relationship that typically leads the owner to sell gradually. In Puglia, the bioenergy market is managed by non-agricultural companies, and they have created turbulence in the rental market, particularly regarding rents. They promise rents that are not actually contracted, but this can lead to moments of upheaval within the market, and the farmer experiences the actions of these outsiders. This effect is comparable to the influence exerted by rising commodity prices.

4.5.1.4 Land regulation

All experts agree that Law 590, which provides tax benefits for purchases made by professional agricultural entrepreneurs or “coltivatore diretto”, has had a significant impact and has been crucial for the increase in farm size and prices. According to the agronomist in Emilia Romagna, it prevented the presence and entry of certain actors into the land market and allowed for price stabilization. However, in the opinion of the agronomist in Puglia and the expert in Tuscany, the law has now become automatic. It may have led to distortions in conjunction with the right of first refusal. It has prompted individuals without a vocation to assume the qualifications of a direct cultivator and professional agricultural entrepreneur to access tax benefits.

According to the agronomist, it would be advisable to link the tax benefits and the right of first refusal to the buyer's project, ensuring that the project is financially sustainable. All interviewees agree that introducing even stricter regulations like those in France would not be appropriate. It is important for Italian law also to protect the freedom of the landowner. Stringent lease contract duration regulations would be restrictive and could collapse the supply of rented land.

The agronomist in Puglia finds SAFER, as an entity for monitoring and providing transparency in the market, interesting but opposes the interventionist role of SAFER within the market. The expert interviewed in Emilia Romagna believes that institutions like SAFER are more effective in theory than practice. Regarding lease contract duration, it could be a way to encourage young people to enter agriculture, as it represents a commitment.

According to the agronomist in Puglia, any new type of lease contract that wants to be added to Italian legislation is welcome, and the involved parties will then choose which instrument to use. According to the experts, allowing freedom of action to the parties involved will enable the market to find the best solution and reach its equilibrium.

The expert in Tuscany hopes for a free market without information asymmetry characterized by information transparency. Monitoring the market to understand what is happening is important, but allowing different actors to act freely is also essential. While speculative forces exist, they are not always necessarily negative. In some cases, the arrival of entrepreneurs from other sectors has revitalized both the market and the territory.

4.5.2 France

4.5.2.1 Drivers

According to the only French expert who compiled the table related to the drivers, among those proposed, the size of the farm slightly influences business growth, both through purchase and rental, leading to an increase in land value and rental fees. The price of agricultural commodities and agricultural productivity had a neutral effect on the land market during the period under observation. Direct payments from the first pillar have influenced the decision to expand the business through both purchase and rental, but they have not affected the land's value and rent. For both agricultural commodity prices and direct payments, the effect depends and varies depending on the type of production. In general, Rural Development Programmes have not influenced the land market, but for this driver the effect may vary depending on the measure considered. The farm's production structure has influenced the decision to increase the farm's size and has increased the rent and, to a greater extent, the value of land in case of purchase.

Urban development, population dynamics, and the development of new infrastructure do not influence business growth, but they have a strong impact on prices and rental fees. According to the interviewee, the development of new markets, supply chains, and products with Protected

Geographical Indication (IGP) and Designation of Origin (DOC) has no impact on the land market. Drivers related to socio-demographic factors, such as the age of the farmer, the presence of a successor, the perception of a non-farming income and the family management of the farm, were as important as they were in the past.

The researcher in the Brittany region stated that, in France as in Italy, there are significant regional and local differences that affect land prices. For example, in the Champagne region, land prices are much higher than in other areas. In general, the productions that most influence the land market are wine and cattle. According to the interviewee, the key drivers influencing the French market, especially the decision to purchase, are the type of crops and livestock, soil quality, production returns, the farm's production structure, and distance from urban centres. The initial farm size and the machinery it possesses theoretically influence because they serve as collateral and allow access to bank loans.

Soil quality and its productivity are influencing prices, causing a continuous increase in Avignon. This leads to increased competition for these lands and the abandonment of less profitable ones, such as limestone soils in arid areas. The rising prices exclude small farms because they cannot compete for profitable land acquisitions, leading to the emergence of capital-based enterprises. The formation of capital-based companies is one of the main drivers of the French land market. For example, in the Avignon area between 2014 and 2020, land prices increased due to the common phenomenon of the intensification and concentration of farms across Europe, the strong wine market, and the rise of agricultural businesses organized as companies.

Historically, France was characterized by individual and family farms that have received subsidies since 1962. In recent years, there has been a shift towards forms of companies consisting of farmers. There are speculative forces in the market, often coming from non-agricultural sectors and involved in biogas and/or bioenergy production. These companies exclude family farms from the market and

make regulation implementation challenging. Lack of transparency in companies and the market itself is a concern.

In addition to these factors, other considerations are emerging based on specific productions and geographic locations. For example, summer drought in the mountain pastures in the southern French Alps (Mercantour) is increasing competition with mountain pastures in the central French Alps (Écrins). Despite no significant effects on prices due to institutional market oversight, this new competition is altering traditional ways of sharing land. Another example concerns the pressure from wildlife (wolves, bears), which tends to increase the abandonment of remote and unsafe lands and increase competition for lands near farms or shepherd huts (easier to defend).

According to all interviewees, the Protein Plan has not led to changes in the land market but has merely supported the industrialization of the agricultural sector.

According to three of the interviewed researchers, the rental market in France is tightly regulated, and significant changes, especially in prices, are not allowed. The purchase market is theoretically regulated through SAFER, but according to two interviewees, it does not always have the means to act, and there are ways to avoid its intervention, such as creating companies or buying business assets. SAFER can only intervene when there is a sale of purely agricultural land, and it must be informed. In all other cases, it cannot and should not be informed by the notary.

SAFER, despite appearing rigid from the outside, is not inflexible. Each SAFER has priorities and objectives based on which it operates, representing the interests of the local community (farmers' association, property owners' association, etc.), and it serves the community. SAFER is a flexible organization that evaluates each case, provides reasons for opposing a sale, and its decision can be challenged in court. If SAFER believes that a purchase would lead to land concentration in the hands of large businesses, it can propose a new buyer. The new buyer can be chosen from farmers who have expressed interest in acquiring land through SAFER, or SAFER can publish an advertisement. SAFER's objective is not to limit sales but to encourage young farmers to enter and avoid land

concentration. Even though French regulation is strict, SAFER's presence does not directly or indirectly influence the number of transactions in the land market or discourage land acquisition/sale, with rare exceptions. By 2022, approximately 800,000 hectares have been subject to sales. Currently, in the Avignon area, in cases of disputes due to very high prices, it is always a judge who decides, and SAFER does not have enough resources to intervene. In the current situation in the Avignon area, the price increase and non-transparent company forms limit SAFER's control and action on the market. When the sale price is too high and SAFER does not have the budget to exercise the right of first refusal, the sale can still take place and constitutes a significant part of the market.

An expert in Brittany suggests that in addition to SAFER, CDOA also plays a significant role. CDOA does not directly affect sales but instead focuses on authorizing individuals to carry out agricultural activities. This authorization is granted to qualified individuals, typically those who have completed a diploma or a course. If someone has this qualification, they can apply to purchase land, whereas it is not possible otherwise. Whether one is a full-time or part-time farmer does not matter; having this authorization is essential. According to the researcher in Brittany, SAFER is an organization that operates in the public interest, with the ultimate goal of protecting and safeguarding a public good, namely, land. SAFER essentially functions as a guarantor of a public good. This role, as previously emphasized, is increasingly compromised by the fact that SAFER can act on agricultural land but not when business assets are transferred. According to the Avignon expert, SAFER and French regulation do not ensure transparency within their department, and macroeconomic issues have a more significant effect on the French land market than land regulation. Additionally, the entry of new young farmers into the sector is a recent issue and is more related to land prices than the length of lease contracts.

4.5.2.2 CAP and Agricultural land sales market

The payments associated with the 2014 reform are linked to land ownership and have favoured large enterprises, encouraging competition within the land market. They have indeed led to an increase in

prices and the capitalization of premium prices. There is also an effect on collective land management practices (where they exist), as it is in the interest of group members to reduce the number of participants. There are indeed price differences between eligible and non-eligible areas. The 2014 reform represents a continuation of a process moving towards the concentration and industrialization of the agricultural sector (more employees, fewer family farms, less production diversity, etc.). There has been a shift in France from family farms to corporate enterprises, but this may not necessarily be attributed to the 2014 CAP payments. The Rural Development Plan has not had a visible impact on a national scale, but perhaps in some cases at the local level. According to one of the experts, the objectives of the RDP are ambitious. Given the prevailing macroeconomic trends, they do not believe that RDP subsidies can incentivize young farmers to enter the agricultural sector. Furthermore, the entry of new young farmers into the sector is a recent issue and is more related to land prices than the duration of lease contracts.

Subcontracting activity does not significantly impact the French land market. Bioenergy activity has had some localized effects on prices in certain areas when large farms are acquired to raise livestock primarily for methanization or when crop choices favour biomass over food. However, such cases are relatively small in France.

4.5.2.3 CAP and Agricultural land rental market

All the interviewees emphasized that Eurostat data, which states that 84% of the national Utilised Agricultural Area (UAA) is managed through leases, does not entirely reflect the reality. A portion of this percentage includes farmland that farmer-owners lease to companies they themselves have formed. This mechanism is implemented to separate business risk from personal risk. The actual percentage of leased farmland is approximately 65%. This percentage is not uniform across all of France and depends on the type of production.

The portion of the rental market is influenced by two main factors: a) the political legacy of land ownership and b) the French legislative corpus (“Statut de fermage”) In France, the ratio of rented

land to owned land varies and the situation is not homogeneous within the Member State. However, the history of French farmland is marked by a large proportion of large landowners from the former nobility leasing their land to farmers. The "*Statut de fermage*" legislation, promoted after World War II, aimed to reduce the power of landowners with the objective of encouraging young farmers with limited means of production. Leasing land is not a prerequisite for purchasing it, and the law protects lessees. If and when lessees wish to purchase the leased land, they can do so, but they will still be protected and cannot be displaced by the new owner.

Typically, lease contracts are for 9 years, although there are some for 18 or 25 years. There can also be one-year contracts for grazing or verbal agreements. In the latter case, if disputes arise, and the existence of the verbal contract is confirmed, it is converted into a written and registered lease with a minimum duration of 9 years, as stipulated by law. There are other types of contracts with durations shorter than the legal minimum, such as "*commodat"* contracts, contracts when SAFER leases its own lands, or contracts involving lands that could be converted into urban areas, or pasture contracts typical of mountain regions.

In general, the figure of the farmer represents a risk-averse economic producer. For this reason, contracts of less than nine years are seldom used because they do not allow them to avoid problems in obtaining bank loans, for example. The duration of contracts is a means to protect and safeguard farmers. A nine-year lease also protects the farmer economically in case of loans from banks that are familiar with such contracts and are considered. Between 2014 and 2020, there have been no changes in lease rates. The range within which the rental rate (the maximum and minimum of the lease) can fall is theoretically based on the price of the product, but the decision rests with the Préfet, who also consults a committee of experts. Existing lease contracts do not necessarily maintain a fixed rate throughout their duration; it can vary over the years if the minimum and maximum rates set by the Préfet change during the 9-year contract. The increase in the lease rate for an existing contract will depend on an index, also determined by the Préfet. Therefore, it is an adjustment of the rate, but it

cannot be entirely renegotiated during the contract's duration. It can only be renegotiated upon renewal. Notarised leases can be quite complex and detailed, as seen in a lease relating to wine production. For instance, within the lease itself, the determination of the rent may be directly linked to the lessee's production. It is as if the rent were determined through a price/rent mechanism.

"Bail Cessible" and "Bail environment" contracts are seldom used, with "Bail Cessible" possibly being more associated with dairy production or intensive farming regions.

Common Agricultural Policy payments have not influenced the duration of contracts or lease rates. The duration of lease contracts is linked to the tenant's age, economic performance, and urban growth. Payments from the CAP 2014-2020 have influenced and increased pressures on pastures. There is a distinction between eligible and non-eligible areas, and the lease rate depends on the production value, including incentives and rights, etc. Measures from the Rural Development Program have not directly or indirectly affected the rental market.

According to one interviewee, it is the lease legislation that influences the agricultural land market more than SAFER.

4.6 Discussion

The size and structural production of the farm, especially machinery, affect farm growth and the farm’s survival in both analysed countries. In general, experts confirm what emerges from the two censuses conducted by their respective Old Member States, which is that small farms discontinue their activities in favour of those with the means to expand their size. Small farms need the structural and financial means to compete in the land market especially if an external investor with non-agricultural capital intervenes. In both countries, the type of specialization plays an important role in the land market. In Italy, depending on the specialization, the weight of CAP subsidies in business profitability varies. The less profitability depends on CAP subsidies, and the more stable the market price, the more willing the farm is to expand by purchasing land. What happens in the agricultural

output market remains one of the main drivers of farm growth, whether it concerns land or rental markets.

Environmental restrictions, such as manure management, have led farmers to increase their size or establish biogas facilities. Environmental policies whether determined by the CAP or by the local or national authorities can influence the land market by affecting farmer behaviour. The effect of environmental policy depends on both the type of regulation and the type of incentive provided (Letort and Temesgen 2014).

In France and Italy, the effect of related activities differs when considering sub-contracting activity, but it is similar when considering energy production. Sub-contracting activity is a related activity that creates dynamics in the Italian land market but has no effect in France. This difference may be because French farms have larger average sizes and possess the necessary machinery. So, French farmers do not need to resort to sub-contracting activity.

In general, renewable energy production has led to an increase in land prices and lease rates in both countries. This is because agricultural companies themselves have diversified their businesses to address issues related to manure management, and external non-agricultural entities have entered the market. The qualitative analysis does not allow us to understand how much this activity has contributed to the price increase, but there are multiple studies in the literature on this matter in local European land markets.

Although the research does not allow us to estimate the capitalization rate of subsidies, the results suggest that CAP subsidies have increased rent in Italy between 2014 and 2020. This does not seem to have happened in France where, however, CAP subsidies contribute to the value of production and therefore influence the determination of the rent. CAP subsidies appear to have influenced the French land market by favouring large companies and increasing competition within the land market. Depending on the specialization, CAP payments have had an effect in Italy as well, and in both countries, there is a difference in value between eligible and non-eligible areas.

Understanding the potential effects of RDPs between 2014 and 2020 in both states is more complex. In this case, the effect depends on location and the type of measure. Unlike CAP subsidies, RDPs, because they are implemented regionally and not nationally, may be measured in terms of how the measures have been developed and how well they have met the local area's needs. In particular, regarding the measure related to subsidies for young farmers, in France, experts indicate that other factors, such as macroeconomic factors and the alignment of projects between new and older generations, predominate. In Italy, this measure influences generational renewal but does not result in the entry of new young farmers into the sector. According to Italian experts, there is a barrier to entry to the agricultural sector, which can be attributed to land and machinery prices. According to Eurostat data, land and lease prices in Italy are higher than in France(Eurostat 2023). This difference could be related to differences in land regulation and supply-demand characteristics in the two markets. The French agricultural area is more than twice that of Italy, and there are 30% fewer companies in Italy than in France. It is also important not to forget what emerged from the interviews regarding land rent and land value in France. About 20% of the rented land is owned by the farmer who rents it to the company he/she has established. As in Italy, there are differences in the value of land in France. For example, in the Champagne area the price is significantly higher than in other areas. The Eurostat data on price and rent refer to arable crops (Eurostat 2023) and for this crop there are important differences between the two countries in terms of national UAA dedicated as there are important differences in terms of average farm area (ISTAT 2022; Agreste 2022c; 2022a). It would therefore be interesting to understand the difference in prices when other specialisations are also considered.

When examining and comparing the two land regulations, it is evident that the French land regulation is complex and intricate by its nature and more complex compared to the Italian one. It is complex not only due to the various bodies involved in regulating land and rentals but also because of the variety of possible lease contracts and the determination of rent. The two States developed land

regulations in the second post-war period and, over the years, implemented them through fiscal policies with different objectives. In Italy, the objectives were related to consolidating the Italian agricultural sector and reducing fragmentation. ISTAT data (ISTAT 2022) and the opinions of interviewed experts show that the implemented regulations have had their effects. Introducing fiscal policies has led to distortions as entities sought to qualify as “coltivatore diretto” to obtain tax benefits. This could certainly have repercussions on market availability. According to the interviewees, despite the legislative gap regarding lease rates, they believe that Article 45 of Law 203 has provided farms with the flexibility they would not have had with 15-year contracts.

In France, the objectives were to protect farmers, facilitate the entry of young farmers, and prevent land concentration in the hands of large companies. While it seems that the regulations protect farmers, they have not been able to prevent land concentration, according to census data (Agreste 2022c; 2022a) and experts' opinions. Moreover, French farmers have put in place mechanisms to circumvent the system, such as under-the-table payments or by creating capital companies (European Commission. Joint Research Centre. 2021a; Levesque 2016). French farmers created farms to evade both the control of the SAFER and to obtain the redistributive payment introduced with the reform of the common agricultural policy. Companies circumvent the SAFER control by selling assets or company shares up to a maximum of 98%. Starting from a few large production units, they set up several agricultural companies to be able to guarantee the CAP subsidy for the first 52 hectares (Levesque 2016). Both different land regulations adopted by France and Italy do not prevent the entry and influence of speculative forces, which come from the national non-agricultural sector and foreign investors. Even in France, despite the presence of SAFER, foreign investors have entered the land and agricultural markets, acquiring shares in companies, and evading the system(Levesque 2016). Therefore, despite stringent regulations and the risk of burdening the system, it still does not manage to prevent or protect the land market from the entry of other entities. To overcome this, the legislator

was forced to update regulations and demand that capitalized companies be transparent during the share transfer to improve market transparency.

The Table 14 reports the effects of each driver in Italy and France.

Driver	Italy	France
Endogenous factors		
Farm structural characteristics		
Farm size (UAA)	Positive effect because represent collateral capital; Large farm increase their size, small farms rent out the land	Positive effect because represent collateral capital. Large farms increase the size more than small farm.
Farm production structure	Positive effect. Machinery positively affects farm size growth to achieve scale economy.	Positive effect, machinery represents a capital collateral and positively influence the decision to buy land
Agricultural productivity	Positively affect the land sales and rental market, but less the agricultural commodity price	Neutral effect
Agricultural-related activities (agrotourism, bioenergy production, subcontracting activities etc…)	Energy production and subcontracting activities positively influence the agricultural land market, subcontracting activity creates dynamics in the markets for the sale and rental of agricultural land	Energy production positively influence the farmland market and land price
Organic soil management	Neutral effect	Neutral effect
Socio-demographic characteristic		
Age of the farm holder	Non-linear effect. Over the age of 50 and no successor negatively influences the decision to buy and rent.	As in the past

Presence of successor	Positive effect	As in the past
Age of possible successor	Positive effect if he/she is between 18 and 35 years old	As in the past
Off-farm income	Positively effect	
Family farm	Positive effect	As in the past
% family work hour	Positive effect. If too high, it depends on whether the farmer wants to change from a family farm to a company	As in the past
Exogenous factors		
Urban development (population dynamics)	Increases the price of land and rent, but does not affect the farmer's decision to buy or rent land	Increase the price of land and rent
New infrastructure (motorways, railways, airport, etc.)	Depend on form infrastructure	Increase the price of land and rent
Development of new markets/new supply chains	Neutral effect	Neutral effect
PGI, DOC, PDO products etc.	Neutral effect for new products of certified origin, positive influence in the case of products already historically certified	Neutral effect
Agricultural commodity prices	Depend on type of production. Positively influence the decision to rent and rent in case of commodity culture	Depend on production
Direct payments	Depend on type of production	Depend on type of production
Rural Development Program	Depend on type of Programme	Depend on type of Programme
Other subsidies	Neutral effect	Neutral effect
Interest rate	Negatively effect	Neutral effect
Inflation rate	Positively effect	Neutral effect

Taxes	Positively influence on land value and farmland market, neutral effect on farmland rental market	Neutral effect because the property taxes are low
Regulations	Positively effect on decision to purchase and rent land	Neutral effect
Informal institutions (customs/consuetudes, etc.)	Neutral effect	Neutral effect
Land market, policy and land regulation		
Price of land	Not major change	Not major change. Constant increasing for productive soil.
Price of rent	Increase	Not major change
CAP on agricultural land sales market	Positive effect, difference in land value between eligible and non-eligible areas	Favouring large farm and encourage competition on land market; Favouring shift form family farm to agricultural family;
CAP on agricultural rental market	In case of annual crops and livestock, positively influence the rent. Positively effect in rent between eligible and non-eligible area	No effect on the duration of contract; depending on production and incentive, stimulated land rental; difference in rent between eligible and non-eligible areas.
Land regulation	Improve the consolidation of agricultural sector and reduce the fragmentation of farm; Improve the flexibility of the farm and farmland market; Distortion related to “coltivatore diretto” qualification. No avoid the action of speculative forces from no-farm actors.	Protects tenants; farmers implement mechanisms to circumvent the system; no avoid the action of speculative forces coming from the agricultural and non-agricultural actors
Other drivers (please specify)	Quality of soil	Quality of soil

Table 14 The effects of drivers in Italy and France

4.7 Conclusions

From the analysis of the questionnaires conducted to experts in the sector in Italy and France, it emerged that large farms are the ones that have increased in size during the reference period. Small farms do not have the means to compete in the market and tend to dispose of land. Farm size and machinery represent two forms of collateral capital influencing purchase and rental decisions.

The effect of certain variables, such as commodity prices and CAP subsidies, influence the farmer's decision depending on the type of specialisation. Thus, specialisation does not directly influence the farmer's decision, but the effect that other drivers may have on the farmer's decision depends on specialisation. The price of commodities is volatile and transitory, and for this reason, the commodity farmer will be more inclined to increase farm size by leasing land rather than buying it. This is also the case when CAP payments weigh on farm profitability. For farms where the CAP contribution is marginal in the formation of farm profitability, farmers at the investment evaluation stage rely on other elements, such as the output price and its stability. Certain restrictions imposed by the Common Agricultural Policy, such as the management of manure by livestock farms, have led these farms to increase in size. Thus, CAP subsidies influence land markets, at least indirectly.

RDP subsidies generally do not directly influence agricultural land sales and rental markets. However, if well implemented, they can make contest territories more attractive and indirectly influence the land market.

Energy production is an agricultural-related activity that influences local land markets, leading to higher land prices and rents in both countries. Sub-contracting activity, on the other hand, influences the Italian land market by creating dynamics within the markets themselves. The effect of this activity only on the Italian market rather than the French market could be related to differences between the French and Italian agricultural sectors. Socio-demographic characteristics continue to have an importance within both the French and Italian agricultural sectors. Although RDPs do not seem to influence land markets, they have contributed, at least in Italy, to the generation turnover within the

farm but not the entry of new young farmers. There is a barrier to entry into the agricultural sector in Italy due to the price of land and machinery. In France, it seems to be mainly dictated by macroeconomic factors. French regulation is more complex and, at the same time, more flexible than it seems. French stringent regulation seems to have more of an effect in the rental markets than in the purchase market.

In Italy, the regulation is much more liberal. It has contributed to improving the consolidation of the Italian agricultural sector and the reduction of fragmentation and to providing through Article 45 of Law 203/82 flexibility in the rental market. Thus, the main objectives for which it was implemented and updated over the years have been achieved.

Both land regulations do not seem to succeed in preventing the action of speculative forces and the implementation of mechanisms and behaviour aimed at circumventing the system. This contributes to less transparency in the market and to the risk of overburdening the bureaucratic system. The fact that a land regulation is stringent does not necessarily mean that it succeeds in limiting the growth of large companies compared to small ones and limiting and counteracting speculative forces and behaviour that affect market transparency.

The land market appears to be a complex system influenced by several endogenous and exogenous drivers that do not act independently but influence each other. Understanding what these drivers are, how they change, and how the farmer reacts to them is necessary for policymakers to develop effective policies and land regulations that directly or indirectly can influence farmer behaviour and beyond.

In the future, it might be interesting to study and understand whether policies and land regulation based on economic and tax advantages can be more effective and efficient than strict land regulation in improving farm competitiveness and limitation speculative forces from the non-agricultural sector. Furthermore, the interviews revealed that in France, the rent can be based on what the farmer produces. Thus, the rent is not fixed but varies as if there were a real “rent mechanism”. It could

appear as a complex and weighty mechanism, but at the same time, it could be a useful tool for the tenant to share the production risk with the owner. In the future, it would be interesting to understand whether contracts of this kind are also implemented for other crops (besides wine) and how this mechanism works. This tool could be useful in Italy, given the unresolved regulatory vacuum on rent determination. Moreover, its introduction could lead to a reduction in the price of rents and allow new young farmers to overcome, in part, the barrier of access that there seems to be to the Italian agricultural sector.

The main limitations of this qualitative research lie in the number of interviewees. Since the land market is a local market, the more experts are interviewed, the more information about the internal dynamics of the specific land market and the effect of endogenous and exogenous factors can be gathered. In the future, it could be considered to increase the number of interviewees and to include interviewees with different qualifications such as intermediaries and professional agronomists.

5. Discussion

5.1 Summary of results

This thesis was developed to explore which factors could influence the decision to invest in land in Italy between 2013 and 2020, and whether agricultural policy and land regulation influenced not only the agricultural land sales market but also the rental market in Italy and France. These are two Old Member States that, in 2003, adopted historical models to transition from coupled to decoupled subsidies. In 2013, both countries adopted partial convergence, but Italy implemented degressivity/ capping payments while France implemented redistributive payments. The main difference between the two countries is related to land regulation. Italy is one of the member countries with more liberal regulations that do not involve pricing or rent controls and do not offer greater protection to tenants compared to landowners. France has some of the strictest regulations in Europe, including controls on rent prices and duration rent to protect tenant farmers. It also tries to prevent land concentration in the hands of large farms or when prices are considered too high compared to the market.

To achieve the thesis's objectives, the research was conducted in three phases:

1. Literature review to identify the main endogenous and exogenous drivers that could influence the decision to increase farm size and the decision to purchase land.
2. Based on the literature analysis, a basic conceptual model was developed with the main endogenous and exogenous factors related to agricultural farms that could influence the farmer's decision to acquire land. For the analysis of FADN-Italy data from 2013 to 2020, a probit regression model was developed with the dependent binary variable being the investment decision in Italy between 2013 and 2020 and explanatory variables related to farm structural characteristics, farmer socio-demographics, and the exogenous environment.
3. Quantitative analysis could not capture the dynamics that characterize and help explain the land market, nor could it consider factors related to the external environment that might influence investment decisions, such as land regulation. For this reason, a qualitative analysis

was conducted through questionnaires to experts in Italy and France, two Old Member States with heterogeneous national agricultural sectors, differing agricultural policies with respect to the adoption of redistributive payments, but most importantly, with completely different land regulation.

Since there were no studies in the literature that focused exclusively on land investment decisions, the literature analysis was conducted by examining and integrating theoretical and empirical studies on structural change, investment decisions, and land markets. The analysis revealed that there are endogenous and exogenous characteristics that influence farm growth and the land market. These elements are not independent but can influence each other. From the literature review, it emerged that the availability of data, both in terms of quantity and quality, has always influenced land market research and has represented one of the main causes of limited empirical research. The literature analysis was functional to the development of the basic conceptual model on which the quantitative and qualitative analyses conducted in this dissertation were structured. Qualitative analysis helped to understand and contextualize the results from the FADN data analysis and capture the dynamics of the local and national land market. The two types of analysis complemented each other and were necessary to analyse the dynamics of a complex sector and explore the effect of elements like land regulation that are rarely explored in the literature.

From the research, it emerged that the land market is a complex system where different elements and actors come into play and influence each other. Although ISTAT(2022) and Eurostat (2022) data have shown the disappearance of small farms and an increase in farms with a surface area of 2 hectares, the quantitative model shows that, as farm size increases, the probability of investment decreases. The fact that large farms characterize the analysed sample might have influenced the result, as very large farms prefer to invest in other assets, such as machinery, rather than land. Specialization does not increase farm size, but it is a crucial factor to understand what happens. Subsidies from the Common Agricultural Policy are linked to farm profitability, and the more the profitability depends

on CAP subsidies, the more likely the farm will seek to expand through renting rather than purchasing land. For farms whose profitability depends on production returns, they are more inclined to buy land. Macroeconomic factors strongly influence and represent the main drivers. Farmers producing commodities are highly exposed to price increases and volatility. For this reason, they might be more inclined to rent land rather than buy it. Article 45 of the 203 law that regulates the rental market in Italy can represent a useful tool for Italian farms to manage this situation. This article allows farms to be flexible and contributes to making the land market dynamic. In the case of farms that do not produce agricultural commodities, the price tends to be more stable and less volatile. Nevertheless, they are still affected by the market price and market conditions. When the product price decreases, small farms without the means to scale production will discontinue their activities. Due to cultural reasons and because land remains a safe asset, farmers are more likely to lease the land than sell it. If in Italy specialization also influences the duration of the land rental contract, in France this does not happen. Although it is possible under certain conditions to contract short-term rentals, in France the most widely adopted rental contract is the 9-year one. This contract protects and preserve the figure of the farmer and allows such contracts to be taken into consideration also in the case of bank loans. Interest and inflation rates are two other macroeconomic drivers influencing the farmer's decision. An increase in the cost of capital reduces the probability that the farmer will invest in land. In general, an increase in the inflation rate leads to increased land investment. However, increasing the inflation rate may simultaneously increase costs for farmers, limiting the positive effect of this rate increase. Farmers are the most exposed to risk for less vertically integrated farms and could suffer the negative effect of inflation rates. Farms with a more vertical structure will be less affected by the negative effects of inflation because they can pass the effects downstream.

In the Italian land market, the value of machinery and plant and subcontracting activity influence the investment decision, possibly because farms try to maximize their resources and seek economies of scale. Farms that generate extra income beyond traditional agricultural activities, such as

subcontracting, energy production, and non-agricultural activities, are more likely to invest in land. Subcontracting is an activity that affects and contributes to keeping the Italian land market alive. On one hand, it allows medium to large farms to generate income to reinvest by buying land close to their farms. On the other hand, it enables farms to establish trust relationships with agricultural landowners, often elderly, who do not want to sell their land. Based on this trust relationship, the landowner is more likely to rent and eventually sell the land to the subcontractor.

Qualitative analysis suggests that while energy production has affected and influenced European land markets, albeit only at the local level, subcontracting activity is characteristic of the Italian context but likely not that of other European countries. This could be due to the size of the Italian state, the generally available agricultural land, the farm size, and the predominance of family farms. Subcontracting has likely helped small farms survive and remain active in the agricultural sector.

From quantitative analysis, it emerged that an increasing RENT/UAA ratio and FWU/TWU ratio reduce the probability that farms will expand their size through land purchase. This result might confirm what was found in ISTAT (2022) data and from qualitative research, namely that land rental in Italy is gradually increasing and consolidating as a form of land management. Specialization is likely a significant factor influencing this trend. Farms that specialize in permanent crops may be more inclined to buy land rather than rent it, while farms with annual crops may prefer renting due to price volatility and crop rotations. The supply of land in the market is also essential. Italian regulations regarding lease duration allow for the flexible management of this form of land management, meeting the diverse needs of farmers with very different requirements for the lease contract duration. The fact that, as the FWU/TWU ratio increases, farms are less inclined to expand their farm size through purchases can be connected to several factors. Labor is a productive factor that varies proportionally with land and machinery. Increasing the size through acquisition may require hiring external labour. External labour entails a financial commitment, and investment through acquisition could lead to increased financial commitment for the farm, draining liquidity. Therefore, farms might not have the

financial means to grow in size and employment. Furthermore, ISMEA's survey shows Italian farmers are concerned about labour availability(ISMEA 2022). There seems to be an ongoing trend, likely exacerbated by the 30% reduction in the number of agricultural companies. The incidence of non-family salaried labour has significantly increased in Italy over the last 10 years, and Italian farms seem to be moving towards more structured business forms (ISTAT 2022).

Sociodemographic factors related to the holder's age and the presence of a successor are important factors influencing the decision to purchase, as well as the divestment of the farm, especially small ones. From quantitative analysis, it emerged that sociodemographic factors related to the presence of a successor aged between 18 and 40 positively influence the probability of purchasing land. From qualitative research, it was revealed that farmers over 50 years of age without a successor are less inclined to expand their business size through purchase. Furthermore, regardless of specialization, small companies that tend to divest in Italy are those with operators who do not have a successor. Due to cultural and emotional factors, these farmers tend to lease their land, mainly to secure a rental income. Farmers that sell land often do so either out of economic necessity or due to inheritance issues. Sociodemographic factors, farm size, and production structure appear to be endogenous socio-demographic characteristics that influence the land market beyond specialization.

From quantitative analysis, income subsidies and Rural Development Program did not directly influence the purchasing decision. However, the first type of subsidies, unlike Rural Development Program, influenced agricultural rental market, according to experts, in both Italy and France. In Italy, depending on the specialization, CAP payments have had an effect mainly on the agricultural rental market rather than on the purchasing market. In France, the rent must fall within a maximum and minimum range. This range is established on the profitability of the crop and subsidies are included in this. The qualitative research does not allow us to understand whether how much subsidy has been capitalized into the rent and whether there is a difference between the two countries. In addition, it is unclear whether the strict land regulations in France have effectively countered and

slowed down the capitalization of subsidies within rent and land value, as some researchers have hypothesized. There are two additional factors to consider: firstly, 20% of the land is managed as rent by the farmer, who rents it to his own company to spread the risk between the person and the company. Secondly, French farmers created farm corporations to sell shares in companies instead of land, up to a maximum of 98%(Levesque 2016), to circumvent the SAFER control. In this way, the SAFER cannot intervene because there is no transfer of land but of shares. In order to monitor what has been happening since 1 January 2016, all transfers of company shares must also be reported to the SAFER for information purposes (Levesque 2016). The creation of companies does not only make it possible to circumvent the SAFER but also to obtain other advantages relating to CAP subsidies and tax. Levesque 2016 reported an example of what happened in Upper-Normandie. Twenty production units of over 300 hectares create 48 agricultural companies. Thus, each agricultural company created can apply for the CAP subsidy for the first 52 hectares. In addition, French law stipulates that agricultural companies with a gain capital of less than EUR 250000 are not taxed. Thus, the company, to reduce its taxable income, buys equipment that it will resell to increase its non-taxable income. The company that buys it repeats the process. So, it seems that stringent and complex land regulation like the French one does not prevent farmers from using mechanisms to evade the system, such as the establishment of corporate entities that escape French law's control. This has prompted the French legislator to intervene again at the regulatory level (Levesque 2016).

Italian land regulation appears to have contributed to the consolidation and reduction of fragmentation among Italian farms. Tax benefits for certain categories of farmers (“coltivatore diretto” and professional agricultural entrepreneur) concerning income and taxation in the case of sales have created distortions. They led individuals to acquire the qualification of a “coltivatore diretto” primarily motivated by the desire to access specific benefits, without having an agricultural vocation. In this way they contribute to the subtraction of land that could be useful for agricultural production.

Furthermore, the comparison between Italian and French land regulations has helped to understand that strict land regulation does not prevent the entry and action of external investors in the land market, resulting in a potential localized price increase and land concentration in the hands of large companies. The ambiguous behaviour of entities operating within the market leads to a lack of transparency within the land market, undermining one of the objectives of land regulation. This compels the legislator to continually intervene in regulations to monitor and control what happens in the land market. Stringent land regulation is not necessarily synonymous with a transparent market.

The Table 15 reports, for each group of drivers, the factors and their effects on the land market detected in the two analyses conducted.

	Quantitative analysis	**Qualitative analysis**
Farm structural characteristics	Positive effect*: Machinery and Plant value, Energy production, Subcontracting activities; Negative effect*: RENT/UAA, FWU/TWU; Generally, Farm size(UUA) negatively affect the decision to purchase. Positive effect for fruit crops, viticulture, horticulture and granivores specialisations. GDP/ha positively affects fruit crop farm; CAP/RDPs payments received by the farm do not influence the investment decision	Positive effect*: Farm size, Machinery, Agricultural productivity; Energy Production and Subcontracting activities
Farm sociodemographic characteristics	Positive effect*: Successor between 18 and 40 years of age; Off-farm income; Negative effect*: Farmer over 60 years of age	Positive effect*: Farmer up to 50 years of age; presence of the holder's much younger successor; Family farm, Off-farm income. Negative effect*: Farmer over 60 years of age
Exogenous Variables	Positive effect*: Inflation rate; Negative effect*: Interest rate	Positive effect*: Inflation rate; agricultural commodity price (on rental market),CAP subsidies (depend on the specialisation), land regulation Negative effect*: taxes, interest rate; specialisation-dependent variables :agricultural commodity price; CAP subsidies; land regulation

***The type of effect exerted by the increase in the variable.**

Table 15Main aspects that emerged from the analyses conducted.

5.2Limitation and future research

The agricultural land market is a complex system subject to the influence of multiple factors that can affect each other. For this reason, the research and the results obtained have important limitations and must be taken cautiously. The main limitations of the research can be traced back to the theoretical framework, the quantity and quality of the available data, and the number of experts interviewed.

1) The scarce previous research in land investment decisions forced the analysis and integration of several literatures to arrive at the definition of the conceptual model and limited the understanding and comparison when discussing the quantitative results. Qualitative research partly made up for this shortcoming by allowing a better understanding of the results obtained and the identification of dynamics within local and national land markets that could not have emerged from quantitative research.
2) The quantity and quality of the data represents the main limitation of the quantitative research conducted. Although the FADN data represent an important, perhaps the most important resource of micro-data so far available for analysing farms in Europe, it has limitations in the representation of small farms within the sample. The sample analysed consists mainly of medium-large farms, whereas small farms characterise the Italian agricultural sector. In addition, the data on economic and financial characteristics of the farms in the sample raised concerns regarding the quality of the data and for this reason it was preferable not to include these variables within the probit regression model. The economic-financial variables could be important in explaining the investment in land that may require a major financial commitment for the company, which may also have to apply for a bank loan (Elhorst 1993).
3) The absence of a precise geolocation of the farm did not allow this factor to be considered within the statistical model. Location would have helped to contextualise the results obtained since the land market is purely local. Farmers tend to buy land near their farm to reduce and

avoid downtime. Coetteleer et al. estimated that 90% of farmers in the Netherlands buy land at a maximum distance of 6.7 km from their farm (Cotteleer, Gardebroek, and Luijt 2008).

4) The sample analysed represents an unbalanced panel data where the same farm stays within the sample on average 3 to 4 years. Investment in land is a type of investment that, due to market characteristics and financial commitment, may occur less frequently than other types of investment. It is difficult for the farmer once he decides to expand his farm size to find land of the size and characteristics, he/she needs on the market. Therefore, the investment in land is unlikely to take place at the same time as it was planned (Elhorst 1993). Moreover, the investment in fixed inputs is a rational decision matured over time due to both business results achieved over several years and conditioned by the stabilisation of certain exogenous factors such as agricultural commodity prices.
5) Beyond the availability and quality of the data, it is challenging to introduce data on exogenous factors that undoubtedly influence the land market such as land regulation, into quantitative research. On the one hand, qualitative research certainly played an important role in better understanding and contextualising what emerged from the quantitative analysis, whose discussion of the results suffered from the absence of similar research. On the other hand, it is based on the subjective opinion of experts and their experience. Furthermore, the number of experts interviewed made it possible to capture differences and similarities between land markets in different regions. However, the number of respondents needs to be higher to capture the heterogeneity of the agricultural sector and, thus the national land market. Probably also due to the small number of transactions, it was difficult and complex to identify land market experts in Italy.

6) The research conducted did not directly consider and explore the impact that exogenous factors, such as climate change and local environmental policies, might have on the land market in general. The qualitative analysis allowed only a few aspects to emerge and to be grasped regarding the effect

these factors have had and are beginning to have on the land market in general. The limitations encountered are linked to the approach adopted, influenced by the scarcity of data and, thus, of information on the land market. Despite all the limitations related to the quantity and quality of the data described in points 2, 3, 4 above, the qualitative analysis made it possible to grasp some dynamics and signals, albeit apparently weak, which can be imported into the land market, and which cannot be grasped in any way by quantitative approaches based on an econometric model.

In the future, it might be useful to conduct research on balanced panel data that isolates farms by type of specialization and/or by location. The land market is local, and there are important differences in land management across the country.

In addition, research could be conducted concerning the agricultural land rental market. In particular, to understand what factors affect the decision to rent and the rent. Regarding rental, it would be interesting to explore and analyse the development of the contract in France. In particular, it would be interesting to understand and investigate how the determination of rent would develop for specialisations other than wine, and whether the mechanism present in the vineyard rental contract in France could represent a tool for the farmer to share the production risk with the landowner. Such an instrument could be useful in particular for managing damage caused by climate change, in addition to the classic adversities that can affect and characterise the agricultural sector (physiopathologies, insect and wildlife damage).

Since land prices reflect both land uses and potential uses (Plantinga, Lubowski, and Stavins 2002), it would also be interesting to understand the effect climate change and environmental policies will have on the local land market. Climate change is expected to affect the biological and economic productivity of ecosystems and threaten the yield and profitability of agriculture. The impact is not the same in all areas. For some areas, it may represent an opportunity. This may be reflected in land values and influence the land market in general (Bareille and Chakir 2023; Moore and Lobell 2015; Slaboch and Čechura 2020) . Regarding environmental policies, these can influence farmers' farming

behaviour and at the same time create new opportunities and sources of income. This generates effects within the land market. The impact depends on the type of regulation and the type of incentive provided (Letort and Temesgen 2014).

5.3Policy implications

Understanding the factors that influence the land purchase and rental markets would allow policymakers and the government to implement the appropriate policies and land regulations to support agricultural growth and prevent external speculators from finding favourable conditions to operate in different local markets.

Considering the data availability problem and the Italian contest, the policy implication can be articulated in the following 5 points:

1. Monitoring and collecting data on the market could be useful to understand what is happening and to increase transparency within the market itself. In Italy, this could be easily developed through the sharing of data between the different public entities involved in the monitoring of farms at the regional level and the entities to which sales deeds and leases are reported and registered. This could be accompanied by periodic advice from experts who could provide information on internal dynamics that might not emerge from a simple data analysis.
2. Given that the Italian land regulation: a) has been a useful tool for achieving the objectives it had set itself, i.e. the consolidation of the Italian agricultural sector and the reduction of fragmentation b) has, however, led to distortions due to subjects who access the qualification of “coltivatore diretto” to obtain tax benefits, contributing to the subtraction of land used for agricultural production. The time may have come to modify and tighten the requirements for qualifying for certain concessions, designed to improve the farmer's competitiveness when buying and selling and to allow for price stabilisation.

3. Land management in the form of rent is becoming increasingly widespread in Italy. The government could consider filling the legal vacuum regarding the rent, not necessarily by defining the maximum and minimum rent but by developing a simple method for determining the rent based on objective criteria already proposed by the IV Section of the Supreme Cassation Court. This could be useful to prevent speculative forces from exerting themselves on the rental market by having a higher willingness to pay than the farmer. This could reduce the barrier to entry, especially to new and young farmers, which is in the Italian agricultural sector due to the price of land and capital in machinery. The challenge for the legislator will be to develop a method for setting the fee that is simple and does not burden the system.
4. Land regulation can be a useful tool through which local administrators can limit and circumscribe the effect of specific speculative forces that can act on the market, such as those related to bioenergy production. Developing special regulations to plan, regulate, and limit the areas affected by such production could be useful to avoid losing land for agricultural production and a general increase in land price and rent within the local market.
5. One could act on the land market by developing policies affecting endogenic farm factors that condition its growth. The policies of the RDP can be a useful tool to develop targeted measures for growth and improvement of farm efficiency and the whole territorial context. In this way, it is possible to refrain from acting directly on the sales and rental market with stringent legislation that could lead those involved to engage in behaviour that circumvents the legislation, thus compromising transparency within the market and burdening the system and the bureaucratic machine.

Thus, by using policies and land regulation together, the government tries to influence the land market by making it as less bureaucratically burdensome as possible.

Research has shown that both internal and external factors can influence farm growth and that these factors are interconnected. The external contest, including European policies, changes, and the farmer modifies his actions according to the macroeconomic context and the local contest. For this reason, the legislator must monitor what is happening to understand whether a) the implemented policies and regulations have achieved the desired objectives and set new ones to improve the national agricultural context and b) whether the implemented land regulation gives rise to distortions and whether and how it is possible to intervene to limit them.

6.Conclusions

This thesis aims to identify the internal and external factors that influence the land market and how they affect it. It was developed in a context characterised by a) a continuous structural change in the Italian agricultural sector characterised by a reduction in the number of farms, especially small farms, and an increase in the average farm surface area, b) and a reduction in land managed in the form of ownership and a steady and progressive increase in land managed in the form of rental.

The literature related to structural change and farm size growth, the investment decision, and the agricultural land market has made it possible to identify those factors endogenous and exogenous to the farm that could influence the decision to invest in land. In particular, the farm size, the machines available to the farm, the specialisation, and the type of farm management are endogenous characteristics related to the farm structure that can influence the structural change and the investment decision. Besides these, the socio-demographic characteristics of the farm and the local context can also influence the investment decision and the land market in general. The macro-economic context, policies, and land regulations implemented can affect farmer behaviour and land market dynamics. What emerges early on is that all these elements do not act independently but can influence and condition each other.

The quantitative and qualitative analysis showed that farms that increase their size the most are the larger ones that have the means in capital and farm structure to increase their area. Farm size and capital in machinery influence farm growth as well as off-farm income and other activities related to agriculture (e.g., energy production and sub-contracting activities).

Specialisation does not directly influence the probability of increasing the farm area, but depending on specialisation, the propensity to grow through purchase or rent may change. This is because, according to specialisation, the weight of CAP subsidies on farm profitability and the types of initial investment for starting up production varies. In Italy, specialisations whose profitability depends heavily on CAP subsidies and/or are subject to agricultural commodity price volatility are more likely

to rent rather than buy. This has also been facilitated by Article 45 of Law 203, which allows leases for periods of less than 15 years, the length of the lease stipulated by law. Farms that specialise in permanent crops and/or whose profitability does not depend on CAP payments but on production and output price, then tend to buy rather than rent. CAP payments do not directly influence the decision to buy, but they do indirectly influence the land market.

Family farms may have more interest in increasing the size of their business, but as the FWU /TWU labour ratio increases, the farm may not be inclined to increase its farm size because it would also require an investment in external labour. The presence of a young successor between the ages of 18 and 40 seems to positively increase the likelihood of investing in land. On the one hand, the RDP funds earmarked for the establishment of young people in agriculture have helped Italy to stimulate and facilitate generation turnover within the farm. On the other hand, they do not seem to be sufficient to allow new young people to enter the agricultural sector and to overcome the barrier of entry into the sector.

In general, renting as land management is becoming increasingly popular in Italy. It allows the farm to have flexibility, to commit its liquidity to other inputs, and to manage the obligation of crop rotation. In addition, owners prefer to rent rather than sell both to guarantee a secure income and for cultural and emotional factors. In some cases, renting seems to be preparatory to buying. Moreover, renting could facilitate the entry of young farmers into the sector.

Land regulation and the tax incentives, on the one hand, seem to have contributed to the consolidation and reduction of farm fragmentation; on the other hand, they have led to the creation of distortions within the market.

Quantitative and qualitative research has shown that there is a barrier to entry in the Italian agricultural sector due to both the price of land and the cost of machinery.

The Italian State could consider revising its land regulation to resolve the current distortions and use it to reduce the barrier to access to the agricultural sector and limit the effect of certain speculative

forces. This does not mean introducing stringent land regulations to control land value because this could trigger off-buying behaviour to circumvent the system, resulting in a less transparent market and a heavier bureaucratic structure. The Italian State and regional policymakers could use land regulation and policies (e.g., RDPs and urban planning) to act directly and indirectly on the market. In particular, by filling a regulatory gap regarding the determination of rent, the government could improve access to land and reduce the barrier to access to the agricultural sector for young farmers. The policymaker could indirectly affect the land market. Through RDPs and urban plans, the government could act on the drivers that influence farm growth to improve the farmer's position by putting him in a position to compete with possible speculative forces from outside. To develop and plan policies and land regulation, it is necessary to observe farms and the agricultural land market to understand how to implement the different tools and monitor what happens to intervene in case of distortions.

The main limitations of the research can be traced back to the approach used, which was conditioned by a problem of data availability and scarce literature. It was not possible to conduct research on balanced panel data and to introduce financial and location variables into the model. These would have been important elements to introduce because the purchase of land represents a medium- to long-term investment that may require a major financial commitment and does not occur at the same time as planned (Elhorst 1993). Moreover, the farmer is likely to purchase land close to his farm centre(Cotteleer, Gardebroek, and Luijt 2008). The scarce literature search, mainly due to poor data availability, compromised the understanding and contextualisation of the quantitative results. Qualitative research has proven to be a useful approach to a) explore the effect of variables that are difficult to introduce in quantitative models (e.g., land regulation), b) contextualise the results from quantitative research and capture the indirect effects of specific drivers on the purchase and rental market c) detect dynamics that may characterise local and national markets.

Thus, using both quantitative and qualitative analysis was useful in conducting exploratory research into a land market that is a highly complex system influenced by various endogenous and exogenous factors that interact and influence each other. Furthermore, the land market continues to be characterised by a poor availability of data in terms of both quantity and quality, which limits and conditions research.

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Appendix 1: Questionnaires for Italian land market experts

QUESTIONARIO MERCATO FONDIARIO

1) Quali sono state le principali determinanti (drivers) della decisione ad acquistare o affittare terreni agricoli, prezzo dei terreni e canone di affitto nel periodo 2014-2021? Descrivere ed inserire nella tabella seguente una valutazione qualitativa delle determinanti che hanno influenzato il prezzo del terreno nel periodo.

   Specificare se l'impatto delle determinanti è stato di: 1. forte incremento, 2. incremento medio, 3. incremento lieve, 4. non ha prodotto cambiamenti, 5. lieve decremento, 6. decremento medio, 7. forte decremento.

Drivers	**Decisione Acquisto**	**Prezzo Acquisto**	**Decisione Affitto**	**Canone Affitto**	**Note**
Dimensione aziendale (SAU)					
Prezzi delle commodity agricole					
Produttività agricola					
Pagamenti diretti					
Piani di sviluppo rurale					
Altri sussidi					
Tasse (da pagare sulla trattativa)					
Normativa (diritto prelazione)					
Istituzioni informali (usi/consuetudini, etc) incentrata sulla preferenza ad acquistare					
Struttura produttiva aziendale					
Attività connesse					

Sviluppo urbanistico (dinamiche della popolazione)					
Nuove infrastrutture (autostrade, ferrovie, aeroporto, etc)					
Sviluppo di nuovi mercati/nuove filiere					
Prodotti IGP, DOC, DOP etc.					
Conduzione del terreno in biologico					
Tassi di interesse					
Tasso di inflazione					
Età del conduttore					
Presenza di un successore					
Età di eventuale successore					
Reddito Extra-agricolo					
Azienda a conduzione familiare					
% Ore di lavoro familiare					
Altri fattori (specificare)					

2. MERCATO FONDIARIO

1. Se e come il mercato fondiario nella sua regione è cambiato tra il 2014-2021 e perché? Quali sono le cause di questo eventuale cambiamento?

2. Ci sono stati dei cambiamenti rilevanti del prezzo del terreno negli ultimi tra il 2014 e il 2021? Se sì, perché?

3. Ritiene che ci siano delle caratteristiche strutturali aziendali che possono incidere sulla decisione di acquistare terreno da parte dell'agricoltore? (es. grandezza dell'azienda, specializzazione, macchine etc) Se sì, quali e come ?
4. Ritiene che la normativa italiana riguardante l'agevolazione fiscale in caso di acquisto di terreno agricolo da parte di aziende agricole abbia avuto effettivamente un'influenza nelle decisioni di acquisto e, quindi, sia stata effettivamente utile ad aumentare la grandezza media aziendale consolidando la proprietà fondiaria attraverso il mercato?
5. Ritiene che la normativa italiana riguardante l'agevolazione fiscale in caso di acquisto di terreno agricolo da parte di aziende agricole abbia avuto un'influenza sul prezzo del terreno?

2.1 PAC E PSR SU MERCATO FONDIARIO

1. Ritiene che i pagamenti diretti previsti dalla PAC2014-2020 abbiano potuto incidere nella scelta di acquistare terreno? Se sì, che tipo di impatto hanno avuto?

2. È a conoscenza di differenze (diverse tendenze) nel prezzo del terreno tra aree eligibili e aree non-eligibili (es. colture permanenti) dopo l'adozione dei pagamenti diretti della programmazione 2014-2020?
3. Normalmente i titoli sono acquistati con o senza il terreno quando cambia la proprietà? Qual è l'impatto sul prezzo del terreno?
4. Ritiene che l'articolazione dei pagamenti del primo pilastro in "pagamento base + greening" possano aver influito sul comportamento degli agricoltori che cessano l'attività relativamente alla scelta di vendere o affittare il proprio terreno?
5. I pagamenti diretti PAC 2014-2020 influenzano la crescita aziendale e l'impiego di manodopera (es. lavoro salariato, manodopera famigliare usata in azienda o manodopera famigliare impiegata in attività extra-aziendali)?
6. I pagamenti diretti PAC 2014-2020 hanno indotto altri cambiamenti strutturali nel settore (es. passaggio da imprese a conduzione familiare a società)? E i Programmi di Sviluppo Rurale?
7. I pagamenti diretti riservati ai giovani agricoltori e le specifiche misure del PSR previsti dalla programmazione 2014-2020 hanno effettivamente incentivato l'entrata in agricoltura di nuovi giovani agricoltori? E la successione all'interno dell'azienda?
8. Ritiene che aziende agricole multifunzionali siano più incentivate ad acquistare nuovo terreno? Ritiene che la multifunzionalità, indipendentemente dall'attività connessa condotta, abbia un'influenza sulla crescita dell'azienda o crede che determinate attività connesse come contoterzismo e produzione di energia possano avere una maggiore influenza su tale decisione?
9. Se sì, ritiene che il nuovo acquisto venga effettuato per aumentare la produzione agricola o sia funzionale allo svolgimento dell'attività connessa?

10. Ritiene che l'attività di contoterzismo come attività connessa abbia un effetto sul mercato fondiario? E l'attività di contoterzismo/Aziende agro-meccaniche crede che abbiano un effetto sul mercato fondiario?

11. L'Unione Europea con la nuova programmazione PAC 2023-2027, prevede che il 25% delle risorse stanziate per i pagamenti diretti siano destinati ai 5 eco-schemi. Crede che questo inciderà sul prezzo del terreno? E sulla decisione di acquistare?

12. Ritiene che per la programmazione 2023-2027, le misure del PSR della Regione Emilia-Romagna possano influenzare in maniera diretta e/o indiretta il mercato fondiario e/o il prezzo del terreno?

13. Crede che sia plausibile pensare che con la PAC2023-2027 la produzione di bioenergia/contoterzismo continui ad avere un effetto sul mercato fondiario?

3.MERCATO DEGLI AFFITTI

1) Secondo il settimo censimento ISTAT è aumentata la percentuale di superficie Agricola utilizzata in affitto e si è ridotta la percentuale di SAU di proprietà. Crede che la conduzione di terreni in affitto stia diventato un fenomeno strutturale e indipendente dal tipo di specializzazione dell'azienda agricola?

2) Secondo lei è plausibile pensare che l'affitto sia in un certo senso propedeutico all'acquisto?

3) Crede che l'aumento della superficie di terreni in affitto sia dovuto prevalentemente al fatto che il proprietario del terreno preferisca affittare piuttosto che vendere? Oppure che sia legato ad un aumento di domanda di terreni in affitto, e quindi, che sia l'agricoltore che preferisca prendere un terreno in affitto piuttosto che acquistarlo?

4) Visti gli art. 1 e 45 della Legge 3 maggio 1982, n 203, qual è la durata media un contratto di affitto in Emilia-Romagna?
5) Quale tipo di contratti di affitto sono normalmente adottati in Emilia-Romagna (scritti, registrati in presenza del notaio, registrati al catasto, orali, etc)?
6) In quali anni si sono registrati cambiamenti rilevanti degli affitti dal 2010 ad oggi (o almeno negli ultimi 5 anni)? Perché?
7) Quando gli agricoltori pagano il canone d'affitto del terreno: inizio, metà, e/o fine dell'anno/stagione? Si rilevano differenze tra le regioni?

3.1PAC E PSR E MERCATO DEGLI AFFITI

1) I titoli PAC 2014-2020 influenzano la durata media dei contratti di affitto?
2) I pagamenti diretti PAC 2014-2020 hanno effetti sul tipo di contratto di affitto?
3) Nella maggioranza dei casi i diritti vengono trasferiti con o senza la terra quando un terreno viene affittato? Qual è l'impatto sul canone d'affitto?
4) I pagamenti diretti PAC 2014-2020 hanno influenzato la convenienza a prendere terreno in affitto? Se sì in che direzione: incremento-decremento?
5) In caso di dismissione parziale o totale dell'azienda, i pagamenti diretti hanno influenzato la convenienza a cedete un terreno in affitto? Se sì in che direzione: incremento-decremento?

6) Si sono rilevate diverse tendenze dei canoni di affitto tra aree eligibili e aree non-eligibili (es. colture permanenti) nel periodo 2014-2021?
7) Ritiene che le misure del PSR relative alla programmazione 2014-2020 abbiano influenzato in modo diretto o indiretto il mercato degli affitti?
8) Le attività connesse influenzano il mercato dell'affitto? Se sì, in che modo?
9) Ritiene che le aziende agricole che conducano attività di contoterzismo siano più propense ad affittare nuovo terreno?
10) E le aziende agricole che producono bio-energia?
11) L'Unione Europea con la nuova programmazione PAC 2023-2027, prevede che il 25% delle risorse stanziate per i pagamenti diretti siano destinati ai 5 eco-schemi. Crede che questo inciderà sul canone di affitto ? Decisione di affittare?
12) Ritiene che per la programmazione 2023-2027, le misure del PSR della Regione Emilia-Romagna possano influenzare in maniera diretta e/o indiretta il mercato fondiario e/o degli affitti e/o il p rezzo del terreno e/o il canone di affitto?
13) Crede che sia plausibile pensare che con la PAC2023-2027 la produzione di bioenergia continui ad avere un effetto sul mercato degli affitti?

4.Altre domande sulla normativa in Italia , e Francia-Italia

1) Ritiene che normativa italiana riguardante l'agevolazione fiscale per l'acquisto di nuova terra e la normativa riguardante gli affitti effettivamente incida e faciliti il consolidamento del settore agricolo in Italia e la riduzione della frammentazione aziendale?
2) Ritiene che la normativa riguardante le agevolazioni fiscali in caso di acquisto di nuovo terreno da parte di aziende agricole e la normativa riguardo la durata e il contratto di affitto possano avere effetti contrastanti?
3) In Paesi come la Francia, vi è un ente preposto, SAFR, che ha il compito di controllare le trattative di compravendita e nel momento in cui il prezzo della trattativa risulta essere alto rispetto alla regione in cui si trova il terreno e ad altre caratteristiche proprie del terreno, interviene nella trattativa arrivando ad acquistare il terreno per poi rivenderlo o affittarlo. Crede che sia pensabile introdurre questo meccanismo in Italia per evitare forze speculative entrino nel mercato?
4) In Paese come la Francia, la normativa sui contratti d'affitto è molto più stringente. I contratti di affitto possono durare 9, 18 o 25 anni, il Governo definisce il valore minimo e massimo all'interno del quale deve ricadere il canone di affitto , e gli affittuari sono molto tutelati. Lei crede che una normativa del genere possa essere utile in Italia per utilizzare i contratti di affitto come strumento per ridurre effettivamente il frazionamento delle aziende? Oppure ritiene che sia una normativa che si adatta bene ad un paese come la Francia caratterizzata dal 54% del territorio nazionale destinato ad uso agricolo e dove 80% delle terre è in affitto e la SAU media aziendale è di 63 ha?
5) In Francia, nel 2016, è stata introdotta una nuova tipologia di contratto di affitto chiamato "cauzione ambientale". Un contratto di affitto con cui l'affittuario si impegna ad adottare delle pratiche ecocompatibili da concordare tra proprietario e affittuario. In cambio, il canone di affitto potrà essere inferiore rispetto al canone d'affitto minimo previsto dalla legge. Visti gli obiettivi della PAC 2023-2027 ritiene che possa essere utile introdurre queste tipologie di contratti anche in Italia?

Appendix 2: Questionnaires for French land market experts

QUESTIONNAIRE: FRENCH LAND MARKET

QUESTIONNAIRE ON THE LAND MARKET

I SECTION: DRIVERS

1) What were the main determinants (drivers) of the decision to buy or rent agricultural land, land price, and rent in the period 2014-2021?

Please specify whether the impact of the determinants was: 1. large increase, 2. medium increase, 3. slight increase, 4. no change, 5. slight decrease, 6. medium decrease, 7. large decrease.

Drivers	Purchase Decision	Purchase price	Decision rent	Rent	Note
Farm size (UAA)					
Agricultural commodity prices					
Agricultural productivity					
Direct payments					
Rural Development Program					
Other subsidies					
Taxes					
Regulations					
Informal institutions (customs/consuetudes, etc.)					
Farm production structure					
Agricultural-related activities (agrotourism, bioenergy production, subcontracting activities etc…)					
Urban development (population dynamics)					

New infrastructure (motorways, railways, airport, etc.)					
Development of new markets/new supply chains					
PGI, DOC, PDO products etc.					
Organic soil management					
Interest rate					
Inflation rate					
Age of the farm holder					
Presence of successor					
Age of possible successor					
Off-farm income					
Family farm					
% family work hour					
Other drivers (please specify)					

1) If you would like to add something about how the above factors may influence the decision to buy or rent land, please do so below:

II SECTION: AGRICULTURAL LAND MARKET

1) If and how has the land market in your department changed between 2014-2021 and why? What are the causes of this change, if any?
2) Have there been any major changes in land prices between 2014 and 2021? If yes, why?
3) Do you think there are any farm structural characteristics that may affect the farmer's decision to buy land? (e.g. farm size, specialisation, machinery, etc.). If yes, which ones and how?
4) According to French regulations, a designated institution known as SAFER can intervene in land purchases and sales, especially when the price deviates from the market price. How does SAFER determine the market price since buying and selling is rare, and in France, 84% of the country is rented on medium- to long-term contracts?
5) After activating the negotiation tool, SAFER could identify a new buyer. How does SAFER identify a new buyer? And once the new buyer is identified, who decides on the price?
6) It may happen that the SAFER does not intervene in a sale because it has not received the notification. Who should the notification be sent by? Are there sanctions for those who carry out a negotiation but fail to notify the SAFER?
7) If the SAFER does not have the budget to exercise the pre-emptive right, does the sale still take place on the terms decided by the buyer and seller?

8) In the event of a sale, the tenant may exercise the pre-emptive right and purchase the land and the SAFER may intervene to reduce the purchase price. Does this happen frequently? Does it affect the determination of the market price then taken as a reference point by the SAFER in the valuation of the purchase?
9) Do you think that the SAFER directly and/or indirectly discourages buying and selling? If yes, how? Do you think that it may affect the decision to sell land more and thus influence the supply of land on the market rather than the demand?
10) In the case of purchase, French law provides for the payment of 5.09% of the value of the purchase as tax to be paid by the buyer. This tax is reduced to 0.715% if the purchase is made by a young farmer. Does the definition of 'young farmer' reflect that adopted by the EU? Are there other categories of farmers eligible for tax relief?

11) Do you think that the Plan Protéins has in any way affected the land market and/or the price of land? If yes, in what way?

III SECTION: CAP, RDP, AND AGRICULTURAL LAND MARKET

1) Do you think that direct payments under the CAP2014-2020 have had an impact on farmers' decision to buy land? If yes, what kind of impact did they have?
2) Are you aware of differences (different trends) in land prices between eligible and non-eligible areas (e.g. permanent crops) after the adoption of direct payments in the 2014-2020 programming period?
3) Are titles usually bought with or without the land when ownership changes? What is the impact on the price of the land?
4) Do you think that the articulation of Pillar I payments into "basic payment + greening" may have influenced the behaviour of farmers who cease activity regarding the choice of selling or renting their land?
5) Do CAP 2014-2020 direct payments influence farm growth and labour employment (e.g. salaried labour, family labour used on the farm or family labour employed in off-farm activities)?
6) Have the CAP direct payments 2014-2020 induced other structural changes in the sector (e.g. shift from family farms to corporations)? What about Rural Development Programmes?
7) Have the direct payments reserved for young farmers and the specific RDP measures foreseen in the 2014-2020 programming effectively incentivised the entry of new young farmers into agriculture? And succession within the farm?
8) Do you think that multifunctional farms have a greater incentive to acquire new land? Do you think that multifunctionality, regardless of the related activity conducted, has an influence on farm growth or do you think that certain related activities such as contracting activities and energy production may have a greater influence on this decision?
9) If yes, do you consider that the new purchase is made to increase agricultural production or is it to carry out the related activity?
10) Do you think that contracting/agro mechanics as a related activity affects the land market? And do you believe that contracting/agro-mechanical businesses influence the land market?
11) With the new 2023-2027 CAP programming, the European Union envisages that 25% of the resources allocated to direct payments will be allocated to the five eco-schemes. Do you think this will affect the price of land? And on the decision to buy or rent?
12) Do you think that for the 2023-2027 programming period, your department's RDP measures can directly and/or indirectly influence the land market and/or land price?

13) Do you think it is plausible to think that with CAP2023-2027, bioenergy production and/or subcontracting activities will (continue to) affect the land market?

IV SECTION: AGRICULTURAL LAND RENTAL MARKET

1) According to Eurostat 2020 data, France is one of the European countries with the highest percentage of rented land (84%). Do you believe that SAFER discourages land purchase and encourages the renting of agricultural land?
2) In your opinion, is it plausible to think that the lease is in some sense preparatory to the purchase?
3) In France, contracts of 9, 18 and 25 years can only be concluded when the farmer is retiring for 1 year renewable for a maximum of 5 or when SAFER is renting. The tenant can only withdraw from the contract in the event of a sale, and the tenant when he wants to. Is it plausible to think that for crops requiring rotations, contracts last less than 9 years?
4) Which type of lease contracts are normally adopted in your department (Baux ruraux, Baux de long terme or Baux de carriere)? Are rental contracts in France written, registered in the presence of a notary, registered at the land registry, oral, etc.?
5) In which years have there been major changes in rents since 2010 (or at least in the last 5 years)? Why?
6) In France, a minimum and maximum rent is set for each department based on the average gross farm income of the department. Based on which data is the average gross corporate income set?
7) Does the average gross farm income based on which the minimum and maximum value of the rent is set also include aid from the CAP?
8) Given the length of the leases (9, 18 and 25 years) and the fact that every 5 years the rent range is updated, is there any form of adjustment of the land rent as well, especially for longstanding leases already in place?
9) When do farmers pay the land rent: beginning, middle, and/or end of the year/season?
10) In 2006, the 'Baile Cessibile' was introduced, was it accepted and introduced on a large scale, or did it have little success?
11) 'Bail environnemental' allows a reduction in the rent if the lessor and the lessee of the land agree to carry out environmental practices within the lease (such as reducing the use of pesticides, etc.). Was this type of contract introduced to try to accommodate farmers who would have adopted measures under the CAP 2014-2020? Has it been adopted, or has it had little success?
12) Do you think that the Plan Protéins has directly or indirectly affected the rental market and/or the rent? If yes, in what way?

V SECTION: CAP, RDP, and AGRICULTURAL LAND RENTAL MARKET

1) Do 2014-2020 CAP titles affect the average duration of tenancies?
2) Do the 2014-2020 CAP direct payments affect the type of lease?
3) In most cases, are rights transferred with or without land when land is leased? What is the impact on the rent?
4) Have the 2014-2020 CAP direct payments influenced the attractiveness of leasing land? If yes, in which direction: increase-decrease?
5) In the case of partial or total disposal of the farm, have direct payments influenced the convenience of leasing land? If yes, in which direction: increase-decrease?

6) Were there different trends in rents between eligible and non-eligible areas (e.g., permanent crops)?
7) Do you think that the RDP measures related to the 2014-2020 programming have directly or indirectly influenced the rental market?
8) Do related activities influence the rental market? If yes, in what way?
9) Do you think that farms conducting sub-contracting activities are more likely to lease new land?
10) Do you think that farms producing bioenergy are more likely to lease new land?
11) With the new 2023-2027 CAP programming, the European Union envisages that 25% of the resources earmarked for direct payments will be allocated to the 5 eco-schemes. Do you think this will affect the price of land? The decision to buy or rent?
12) Do you think that for the 2023-2027 programming period, Department RDP measures may directly and/or indirectly influence the land market and/or the land price and/or the rent?

13) Do you think it is plausible to think that with CAP2023-2027 bioenergy production will (continue to) affect the rental market?

VI SECTION: French Agricultural regulations

1) France is a country with a high percentage (84%) of land managed in the form of leases and has incentivised and continues to incentivise long-term contract types also through tax breaks (e.g., baux de long term). Do you think that incentivising long-term contracts rather than the purchase of land may create problems in the long run, since at least in theory land ownership increases the likelihood of access to credit?
2) Do you think that French legislation effectively regulates the functioning of the land market through the SAFER and ensures transparency in your department?
3) The SAFER also has the function of controlling that through the purchase no land concentration takes place. According to the last census: the average farm area has increased (69 ha), farms with an area of more than 200 ha have increased by 1/3, and 2/3 of the farms lost had an area of less than 20 ha. Do you think that having a medium- to long-term leases does not defeat the exercise that the SAFER is supposed to do to prevent/reduce land concentration?
4) In each department, the SAFER has control over the buying and selling of land, and the Prefet of each department updates the rent. Do you think there is a balance between land price and rent?
5) Do French regulations, which provide for a market price and rent control, make it easier for those who want to enter the agricultural sector? Do you not think that the duration of the contract instead represents a limitation for those who want to enter the sector?
6) According to the latest French census data, the average age of the farm manager increased between 2010-2020. There has been an increase in farmers over the age of 55, but also to a lesser extent farmers under 25 and those between 30 and 34. Do you think that the SAFER encourages and facilitates the establishment of young farmers?
7) In addition to the RDP measures and special tax breaks, are there any other measures that directly or indirectly incentivise the entry of new young farmers ((no inheritance)?

8) Do you think that French regulation excessively restricts the freedom of landowners considering the high percentage of leased land? If so, do you think the French government should introduce instruments to give them more freedom?