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LOCATION EFFECTS ON THE VALUATION OF SMALL AND MEDIUM ENTERPRISES: EMPIRICAL APPLICATIONS ON THE AGRARIAN SECTOR

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Abstract

Small and Medium Enterprises (SME)' valuation is an increasingly important topic on finance accounting. While there are several procedures that could be applied to obtain firms' valuations for large companies acting in stock markets, these techniques are limited for reduced-size companies. The valuation of not listed SME in any stock market is a complex task since there is not enough information on comparable transactions. The aim of this dissertation is to consider the main SMEs' valuation methods and analyze the variables that influence on them with special emphasis on the role played by the geographical location. To get our purposes, we develop empirical applications on samples of non-listed agrarian Spanish companies. Specifically we consider the agri-food sector. We focus on these sectors because they are a fundamental pillar for the European countries. Furthermore, they have a fragmented structure, with a high percentage of reduce size companies (SMEs). In a first phase of this dissertation, we study how the geographical proximity among peer companies and/or from these companies to certain strategic points impacts on the valuation of SMEs in the agrarian sector. We combine the Discount Cash Flow (DCF) methodology and spatial econometric techniques to analyses the spatial distribution of agrarian firms' valuations and model the behavior of this variable. In a second analysis, we compare the significance of the geographical variables on agri-food firms' valuation in two regions with different economic and financial characteristics. Our results support the hypothesis that agri-food firms' valuations are conditioned by the geography. We find that firms grouped together in the territory tend to have similar valuations. In addition, we get significant effects derived from the geographical proximity from agri-food companies to external agents and transport facilities. Regarding the comparison among the different regions, we obtain that most developed regions are characterized by stronger spatial interaction structures between agri-food companies highlighting the role of agglomeration economies and economies of scale on these firms' values. Otherwise, spatial interaction effects are not as intense for the less developed region. In this case, geographical proximity from companies to external agents, easing the transfer of knowledge, favors a higher firms' value. After these empirical applications, we propose a specific procedure to get SMEs' valuations for companies with scarce available temporal information. This proposal is based on spatial information and firms' environment characteristics. To show our proposal, we develop an example on a sample of SMEs testing the deviations between the valuation from the traditional valuation techniques and our proposal. We obtain a minimum difference between these approaches. As consequence of these analyses we provide a list of conclusions and implications which could be considered in future studies in this area.

Resumen

La valoración de la pequeña y mediana empresa (PYME) es objeto de análisis fundamental en la literatura financiera. Mientras que existen diversos procedimientos desarrollados para calcular el valor de grandes empresas con participaciones en los mercados financieros, estas técnicas están muy limitadas cuando consideramos la valoración de una PYME. Esto es debido a que la valoración de una empresa de reducido tamaño adolece de suficiente información necesaria para el cálculo del valor de una empresa. En este contexto, el objetivo de esta tesis doctoral es el de considerar los distintos métodos de valoración desarrollados en la literatura para PYMES y sus factores determinantes. En particular, nos centramos el modelo basado en los Descuentos de Flujos de Caja para examinar los factores que afectan a la valoración de las PYMES con especial relevancia al papel jugado por la localización geográfica de las empresas que estamos examinando y las características de su entorno. Para conseguir este objetivo, desarrollamos dos aplicaciones empíricas sobre una muestra de PYMES españolas del sector agrario y agroalimentario, respectivamente. El análisis de estos sectores es de especial relevancia dada su importancia en el tejido productivo de los distintos países europeos. Además, estos sectores están constituidos por un alto porcentaje de empresas de reducido tamaño. En un primer análisis contrastamos si la proximidad geográfica de las empresas agrarias entre sí y de estas a distintos puntos de interés de su entorno más cercano influyen en su valoración. En un segundo análisis contrastamos la heterogeneidad de los resultados anteriores desarrollando una aplicación empírica en dos regiones con distintas características económicas sobre una base de empresas agro-alimentarias. Los resultados de estos análisis confirman nuestra hipótesis acerca de la significatividad de las variables de carácter geográfico en la valoración de las PYMES. Además, la comparación regional indica que en las regiones con mayores niveles de desarrollo económico, los efectos de interacción entre empresas cercanas influyen de forma más intensa en su valoración. En estas regiones, las economías de aglomeración y las economías de escala juegan un papel muy importante en la distribución geográfica de la valoración empresarial de las empresas analizadas. Por el contrario, en regiones con menores niveles de desarrollo económico la proximidad geográfica de las empresas consideradas a distintos agentes externos, facilitando la transferencia de conocimiento, ejerce un efecto positivo sobre el valor de las PYMES agroalimentarias. En un tercer análisis proponemos un método para calcular el valor de PYMES de las que no se dispone de suficiente información como para aplicar los métodos de valoración tradicionales. La aproximación al valor de estas empresas se basa en la información obtenida de las empresas de su entorno así como de sus características. En este caso, proponemos un ejemplo y calculamos las posibles desviaciones entre el valor calculado con las técnicas tradicionales de valoración y nuestra propuesta obteniendo una diferencia mínima. Finalmente y como consecuencia de los resultados anteriores, presentamos una serie de implicaciones y conclusiones que deberán ser consideradas en futuras investigaciones en esta área de estudio.

Introduction

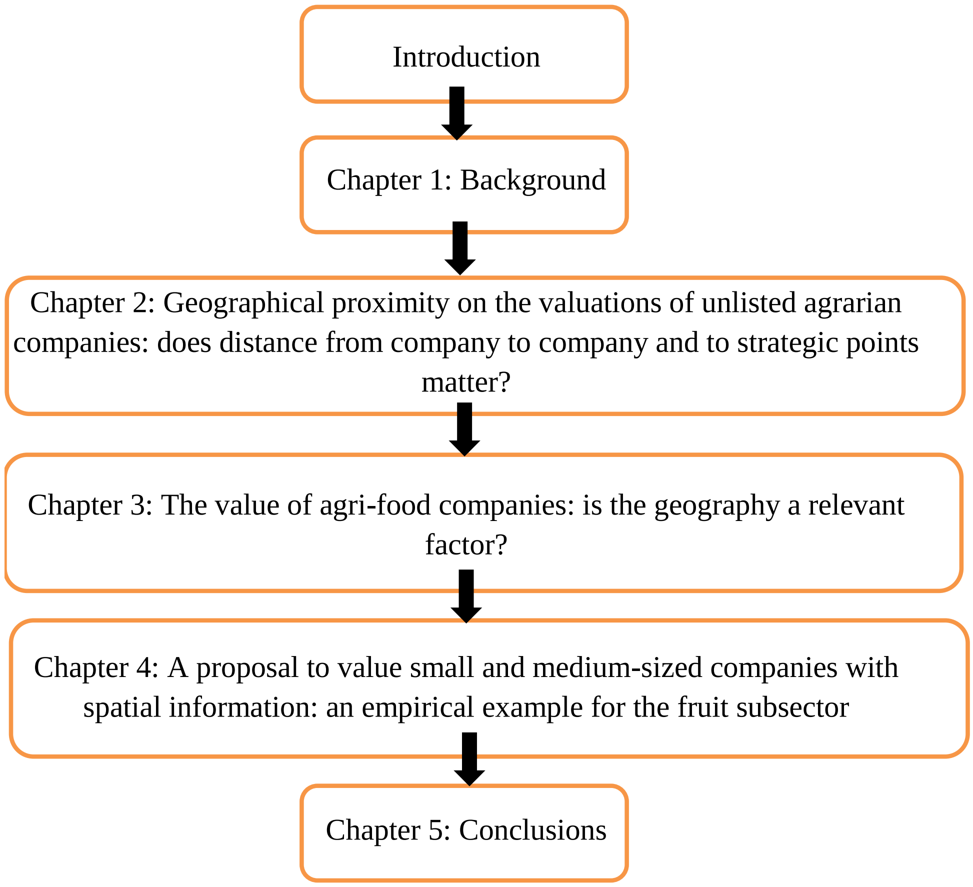
The growing changes in the current markets have caused an important interest on the valuation of the companies especially to non-listed companies. In this regard, financial literature in valuation presents different methods to compute the value of listed companies from which we could get market and comparable information. However, the literature that examines valuation of non-listed companies is scarce. In this sense, we find some studies based on a specific method for reduced size companies, which apply the traditional DCF procedure considering financial and economic characteristics (Rojo and García 2006). Despite numerous models include a wide range of variables that influence business valuation, although recognizing the importance, no one, to the best of our knowledge, has suggested models that include geographical variables. The aim of this dissertation is to close this gap determining whether there is a significant and measurable influence of the geography on firms' valuations which could be useful to get additional information to compute more accurate valuations. In case of confirming our results then we could use additional spatial information to get the valuation of reduced size companies.

In particular, this dissertation is focused on SMEs' valuation and its determinant factors, with special emphasis on the role played by geography. The main hypothesis of this thesis is that *geography is significant in firms' valuations*. As geography, we refer to local environment characteristics of each company which are considered regarding geographically closer peer companies characteristics and environment facilities evaluated in terms of geographical proximity to external agents which could impact on firms' valuation. With this purpose, we base our study on the traditionally applied DCF method to value reduced size companies and spatial econometric techniques to include the geographical factor in this context. Within this basic framework, the research is supported by different empirical applications based on samples of Spanish SMEs in the agrarian and agri-food sector.

In order to show our proposal, we structure this dissertation into five sections. The Chapter 1 corresponds with the background, which presents the different evaluation methods applied in current literature, and some theoretical arguments relating firms' valuations to geography. Chapters 2-4 introduce the different empirical applications we have developed to contrast the significance of the geographical factor on SME's valuation. In particular, the Chapter 2 shows an empirical application with agrarian

SMEs' in Murcia, Spain. In order to test the relevance of the spatial factor on the valuation of these companies, we analyse the spatial distribution of these firms' valuations. From this analysis, we get a significant spatial correlation in the valuations of geographically close agrarian SMEs. Therefore, spatial concentration areas of agrarian firms tend to have similar valuations. In a second stage of this analysis, we model this spatial behaviour by including others geographical variables. Geographical proximity to external agents positively affects firms' value in the agrarian sector. This analysis highlights that environment characteristics are an important element to be considered when companies' valuations are evaluated. Chapter 3 explores the effects of the geographical proximity on agri-food firms' valuation in other scenarios. In particular, the third chapter of the dissertation aimed to corroborate the results previously found in Chapter 2 for the agrarian sector and go one step further by developing an urban analysis comparing the significance of the geographical variables in two different Spanish regions with different economic characteristics: Madrid and Murcia. Our results show again significant results in both territories for the geographical variables but with some differences between regions. In Madrid, the most developed economic region with economic indicators above the national average value, agri-food firms take more benefits from agglomeration economies. In this sense, proximity to industrial parks and commercial centres are the most important geographical variables on these firms' valuations. In the less developed region, Murcia, with economic indicators under the national average value, however, spatial interactions between geographically close peer companies is not as intense as in Madrid. But, in Murcia, the geographical proximity to technological centres and universities is the relevant geographical factor for improving the valuation of agri-food companies. Therefore, the results of this second analysis suggest that taking in account the environmental characteristic in which agri-food companies are located is fundamental to determine their values. In the Chapter 4 of this dissertation, we propose a method to estimate firms' valuations of companies without available temporal information to apply the traditional DCF. For example, micro-sized companies that present simplified financial statements and new companies that have not data for a long number of years often presents this deficiency in information. To overcome this limitation, we propose a method that combines both data from geographically close companies to the analysed company and financial data from the studied company to obtain an economic value. This purpose is based on DFCs' valuations of geographically close peer companies and start from our previous empirical studies highlighting the relevance of their neighbours' valuations on the valuation of each company. Thus, we propose a way to determine the valuations of those companies with scarce temporal information by substituting temporal data by spatial data and considering firms' environmental characteristics. In addition, based on spatial econometric tools, we propose a procedure to select the set of spatial comparable companies to each examined company. To illustrate our proposal, we apply a sample of 280 companies in the fruit sector located in Murcia, Spain. Finally, Chapter 5 discusses the overall results of the three research chapters in a wider context. This discussion includes some reflections with regard to the methodologies, data issues and business implications. The chapter provides the overall conclusions and gives insights into directions for future research.

This dissertation contributes to the current financial literature in different aspects finding some promising results for the development of future research in this field. Our studies determine that geography is a relevant factor to be considered in different valuation methods. Even, it could be a powerful tool to overcome the limitations found in the traditional valuation methods and propose new procedures based on geographical information.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CHAPTER 1: Background

1.1. Valuation models

A firm is a business organization aimed at creating added value. The better it is managed and the more effectively it allocates its resources the greater the added value can be achieved and the higher rate of return on invested capital can be guaranteed to investors. Determining the value of the company – to make its valuation – is also necessary in the case of privatization, restructuring and mergers or acquisitions (Janas, 2013). This section seeks to compare different valuation methods considering the advantages, limitations and suitability of them. According to the Appraisers (2009), business valuation methods can be comprised in three main groups: the Asset Approach, the Income Approach and the Market Approach.

1.1.1 The Asset Approach to Valuation

The Asset Approach to valuation is a balance sheet-based method. The balance sheet-based valuation methods are traditionally used to determine the value of company's assets and liabilities. They determine the value from a static point of view and do not consider the company's futures evolution or external factors such as money's temporary value and the industry's situation which could impact on firms' valuations. Due to the fact that they are based on the balance sheet, they also tend to ignore elements that cannot be quantified from financial reports, such as human resources quality, market position, or contracts (Fernandez, 2007, Ghiță-Mitrescu and Duhnea, 2016).

The main methods belonging to this group are the *Book Value method* and *Adjusted Net Asset Method* (NAVCA, 2013). The *Book Value method* (or *Net Asset method*) is based on the financial accounting concept that *owners' equity is determined by subtracting the book value of a company's liabilities from the book value of its assets*. According to Tack (2009) the net asset approach is generally the easiest to apply. Table 1.1 (Fernández, 2007) presents an easy example to illustrate how the net asset method basically works.

Table 1.1 Alfa Inc. Official balance sheet (million dollars)

ASSETS		LIABILITIES	
Cash	5	Account payable	40

Account receivable	10	Bank debt	10
Inventories	45	Long-term debt	30
Fixed assets	100	Shareholders' equity	80
Total Assets	160	Total liabilities	160

'Let's assume this is the balance sheet of a random company. The shares book value (capital plus reserves) is 80 million dollars. It can also be calculated as the difference between total assets and liabilities. Both will come up with 80 million dollars' (Fernández, 2007).

While the concept is acceptable to most analysts, they agree that the method has serious flaws. Under Generally Accepted Accounting Principles (GAAP), most assets are recorded at historical cost minus, when appropriate, accumulated depreciation or cumulative impairments. These measures were never intended by the accounting profession to reflect the current values of assets. Similarly, most long-term liabilities (payable bonds, for example) are recorded at the present value of the liability using rates at the time the liability is established. Under GAAP, these rates are not adjusted to reflect market changes. Finally, GAAP does not permit the recognition of numerous and frequently valuable assets such as internally developed trademarks, trade names, logos, patents and goodwill. Thus, balance sheets prepared under GAAP make no attempt to either include or correctly measure the value of many assets. Thus, by definition, owners' equity will not normally yield a valid measure of the value of the company. Despite these significant limitations, this approach is frequently applied in buy/sell agreements (NACVA, 2013).

As said, the Asset Based approach is defined by the International Valuation Standards Council as "*a method of indicating the value of a business or a business interest based on a summation of the net value of the individual assets and liabilities*" (IVSC, 2014). Depending on the particular purpose or circumstances underlying the valuation, the Asset Based approach method sometimes uses the replacement or liquidation value of the company assets less the liabilities (NACVA, 2013). But, such an approach is not without fault since, the book value is calculated based on accounting principles and has little to do with the market value of a company. In order to overcome this limitation all assets and liabilities are often re-evaluated based on their market value, income or cost, and, therefore providing a more accurate perspective on the economic value of a company's equity. The firm's value thus calculated is usually called *Adjusted Net Asset value* (ANAV). Calculating the ANAV of an enterprise is a three steps procedure. First, all the assets are separated into operational and non-operational assets, secondly, all the operational assets are re-evaluated to their market value and finally, the adjusted net assets value is calculated by subtracting the corrected value of liabilities from the corrected value of assets. The separation of assets into operational and non-operational is based on the degree to which they participate in the achievement of the company's income. After this separation is made, all the operational assets and liabilities need to be re-evaluated by taking under consideration influencing factors such as market prices evolution, exchange rates, technical conditions or usage degree, accounting policies and any other factor that was highlighted by the diagnosis of the entity's activity (Ghiță-Mitrescu and Duhnea, 2016). The adjustments to each of the assets of a balance sheet are described below (Bethel 2006) :

- Cash is almost always treated as cash, without adjustments made to this value;
- Accounts receivable are generally reflected at their face value;
- Inventories need to be adjusted to some degree: raw materials are valued at their most recent cost; commodities may be valued at their purchase cost; "work in process" inventory may be approached either from their cost or from its ultimate sale price; the "finished-goods" inventory is typically valued by determining the amount that will be received from its sale in the ordinary course of business, less any normal discounts and allowances, less the cost that the new owner incurs in holding, transporting, and making the sale of the inventoried products, less any returns;
- Most other current assets are held at their book value. However, items such Other Current Assets as notes from shareholders may need to be adjusted if there is no intention of ever repaying these notes;
- Land and improvements should be valued at their highest and best use; machinery and equipment should be valued at their cost;
- Non-operating assets are those assets that are not critical to the operating needs of a business. Their values estimation depends on the goal of the firm's valuation

(minority valuation or control valuation); usually they are estimated using the marked to market approach or the book value;

- Intangible assets are often overlooked in a business valuation and adjustments are typically made for items;
- Long term debt, including the current portion, is valued by utilizing a bond Long Term Debt discount model;

The *Adjusted Net Assets* is a method for estimating the value of a non-operating business (e.g., holding or investment companies). It is also a good method for estimating the value of a business that generates losses or which is going to be liquidated in the near future. The *Adjusted Net Assets method* generally sets a “floor value” for determining the total entity value. Before concluding the *Adjusted Net Assets Method* has established the floor value, the valuator should consider the potential of overstating the value of assets, existence of non-operating assets, and other omissions in the determination (NCVA, 2013).

The application of this method, as the others, presents advantages and limitations: The first advantage of the ANAV method is that it is relatively quick and easy to perform. For the most part, the analyst only needs the company’s historical financial statements in order to perform the ANAV analysis. In other words, the ANAV is based on the same company financial data that the analyst would collect to perform either a market approach or an income approach business valuation. The second advantage of the ANAV method is that it is relatively easy for the analyst to explain and relatively easy for counsel and other parties relying on the business valuation to understand. The third advantage is that the ANAV method can effectively and efficiently be used to identify whether or not the company is earning a fair return on investment for the company owners. This business valuation method also quickly identifies whether the GAAP balance sheet overvalues or undervalues the company’s net assets (in the aggregate) (Miller and Reilly, 2018).

1.1.2 The Income Approach to Valuation

The International Glossary of Business Valuation Terms define the *income approach* as, “*A general way of determining a value indication of a business, business ownership interest, security, or intangible asset using one or more methods that convert anticipated* *economic benefits into a present single amount*". The methods included in this group are the *Capitalization of Earnings* and the *Discounted Earnings Method*.

The Capitalization of Earnings is an income-oriented approach. This method is used to value a business based on the estimated future benefits, and normally use some measure of earnings or cash flows generated by the company. These estimated future benefits are then capitalized using an appropriate capitalization rate. This method assumes that all the assets both tangible and non-tangible are indistinguishable parts of the business and does not attempt to separate their values. The Discounted Earnings method is another income-oriented approach. It is based on the theory that the total value of a business is the present value of its projected future earnings, plus the present value of the terminal value. Thus, this method differs to the first one by requiring a terminal value estimation. Furthermore, the amounts of projected earnings and the terminal value are discounted to the present using an appropriate discount rate, rather than a capitalization rate (NCVA, 2013). The main model included in this category is the *DCF* and determines that the value of a given company is equal to the amount of excess cash it is able to generate and distribute to its capital providers, during its lifetimes.

The methods included in this group are based on the idea that the main purpose of a firm is to invest into assets that generate the biggest cash flows, to form production in order to have more incomes and profit, thus managers would like to increase firm value (Damodaran, 2006).

According to Damodaran (2006), there are four types of discounted cash-flow models. In the first model the expected cash flows should be discounted by a risk-adjusted discount rate, the main purpose in the second model is to get a certainty equivalent cash flow which is discounted at the risk-free rate in order to value an asset. The third model is the adjusted present value model. The last type of the discounted cash flow model calculates the value of a firm by using the excess returns that are expected from its investments.

One of the main problems of the discounted cash flow based approaches is that the decision should be made at the present, while the value of the cash flows is estimated for the future. Thus, these models can many times underestimate the value of a firm. Another problem is that these models are static thus they do not consider possible changes in business conditions for the future (Abrams, 2010).

1.1.3 The Market Approach to Valuation

The idea behind the market approach is that the value of a business can be determined by reference to reasonably comparable guideline companies ("comparables") for which transaction values are known. The values may be known because these companies are publicly traded or because they were recently sold and the terms of the transaction were disclosed (NCVA, 2013).

Financial analysis textbooks commonly recommend the use of peer firms in valuation (Healy and Palepu, 2007; Stickney et al., 2007; Damodaran, 2009). Valuing firms using multiples of their financial or operating drivers is a simple and popular approach to valuation (e.g., Baker and Ruback, 1999; Imam et al., 2008; Block, 2010). There are three sources of comparable company transaction data:

- Public company transactions
- Private company transactions
- Prior transactions of the subject company

Unlike the discounted cash flow and residual income valuation approaches, the use of multiples (at least seemingly) avoids the problems of estimating the required return (i.e., the discount rate or cost of capital) and of forecasting terminal values. However, implementing a multiples approach has its challenges (De Franco et al., 2015).

Multiple or relative valuation models value assets based on the rationale that perfect substitutes should sell for the same price (Baker & Ruback, 1999) and are very often used in practice (Damodaran, 2006a; Imam et al, 2008). For example, given two comparable firms, if one has twice as much sales as the other one, It should trade at twice the price. Some examples of frequently used multiples are (Krishnamurti & Vishwanath, 2008):

- The price to earnings(P/E) multiple: $\frac{Stockprice\ per\ share}{Earning\ per\ share}$;
- The price-to-sales (P/S) multiple: $\frac{Stockprice\ per\ share}{Sales\ per\ share}$;
- The price-to-book (P/BV) multiple: $\frac{Stockprice\ per\ share}{Book\ value\ per\ share}$;
- The enterprise value to EBITDA (EV/EBITDA) multiple: $\frac{Enterprise\ Value}{EBTDA} = \frac{Market\ value\ Equity+Bookvalue\ Debt}{EBDTA}$

This model, as with any valuation approach, presents significant advantages and disadvantages. Regarding the advantages, we find that it is “user friendly” method: Companies with similar product, geographic, and/or business risk and/or financial characteristics should have similar pricing characteristics. Furthermore, it uses actual data: the estimations are based on actual transaction prices, and not on estimations based on number of complex assumptions or judgments. The data can be independently obtained, verified, and tested. Finally, it does not rely on explicit forecasts: the income approach requires a set of assumptions used in developing the forecasted cash flows. The market approach does not require many assumptions (NCVA, 2013).

Among the limitations we find the fact that, sometimes, no recent comparable company data can be found: Some companies are unusual, small or diversified and there are no other similar companies to be compared with them. Another limitation of the multiples method is that most of the important assumptions are hidden. Among the most important hidden assumptions is that implicitly it’s assumed the company valuated and his comparable will have the same sales (or income) growth rate since that one is function of the other (NCVA, 2013).

1.2 Required information for applying previous valuation methods.

Regarding previous valuation techniques, we see that firms’ financial information is fundamental to compute firms’ values. But, the use of this information sometimes is scarce and, therefore, previous valuation methods cannot be applied. This drawback could happen when we analyse micro-sized companies that could present simplified financial statements or with new companies without temporal information for an extended time period (Damodaran, 2009).

In order to overcome this limitation, we find the geography as a key element providing additional information about companies’ environments, which could impact on their valuations. In this sense, geographically close peer companies may develop positive interactions among them (Folta et al., 2006). In particular, financial literature has considered the relevance of spatial interactions among geographically close companies as a key element in different processes of business development (Pacheco, 2007). These firms tend to interact between them by establishing commercial relationships and being subject to similar financial and economic environment characteristics.

In this context, different contributions from the New Economy-Geography and Location Theory examine the relationship between the location and the company in different areas of study. From an empirical perspective, the relationship between business valuation and geography could be examined from the agglomeration economies. Thus, the location of the company plays a fundamental role in determining external elements that impact on its valuation and from which additional information could be obtained to calculate firms' valuations. But, because of companies are subjected to complex and highly competitive environments with scarce available information, we find that managers and researchers rarely undertake the traditional valuation models considering other information apart from the internal information from firms' financial statements. In addition, the general economic characteristics of the companies' environments could also provide more significant information for computing firms' values (Maoh y Kanaroglou, 2007). Despite the relevant role which could have the geography on valuation literature, the complex structures of interdependencies between geographically close companies and the lack of geo-reference information cause that literature on this topic is scarce.

Previous studies on geography effects in business behaviour consider mainly two kinds of geographical factors: territorial characteristics where companies are located such as economic and financial indicators, and spatial interaction effects between geographically close peer companies or between companies and their external geographically close agents which could impact on their behaviour. In this last category, we could consider technological centres, industrial parks or city centres among others. Nevertheless, these geographical factors have been considered in other scenarios different from valuation literature. Regarding valuation studies, we find some geographical specifications focused on prices which take into account the spatial distribution of these series (Ovando et al., 2017). These studies conclude about the existence of spatial concentration areas with similar prices. The main limitation of these studies is that they are developed from an aggregate territorial level without distinguishing between the different economic agents which define the analyzed territory and the interrelationships among them.

CHAPTER 2: Geographical proximity on the valuations of unlisted agrarian companies: does distance from company to company and to strategic points matter?

This charter is a first attempt to examine the role played by the geography on agri-food firms' valuations. The geography is evaluated through the physical proximity from agri-food companies to other companies and to some strategic points which ease their accessibility to external economic agents. To get our purpose, we develop an empirical application on a sample of non-listed agrarian Spanish companies located in the region of Murcia, Spain, over the period 2010-2015. We apply DCF methodology for non-listed companies to get their valuations. With this information, we use spatial econometric techniques to analyze the spatial distribution of agrarian firms' valuations and model the behavior of this variable. Our results support the assertion that agrarian firms' valuations are conditioned by the geography. We find that firms with similar valuations tend to be grouped together in the territory. In addition, we find significant effects on agrarian firms valuations derived from the geographical proximity among closer agrarian companies and from them to external agents and transport facilities.

2.1 Introduction

The positive trends in the level of merger and acquisition activity in non-listed companies and the capital inflow from the private sector to these companies has caused a growing interest in the determination of their value (Vydrzel and Soukupová, 2012). This attention makes necessary the application of methodological foundations considering companies' particular characteristics to get accurate valuations (Rojo and García, 2005). In the agrarian sector, the knowledge of the elements that influence on non-listed companies' values is an important issue (Ribal et al., 2010). Sales (2002) applied the analogical-stock market methodology highlighting the role played by total assets, an agrarian company stock market index, and the ratio of equity to total assets to determine agrarian firms' value. Declerk (2003) studied valuation ratios for food French companies during the period 1996-2001 applying the multiplier method. This author identified the turnover as a referenced value to estimate these firms' value. Giménez et al. (2004) also used the analogical-stock market procedure to obtain a global valuation for Spanish wine cooperatives applying financial and management variables. Other studies, such as Ribal et al. (2010), Aleknevicìene et al. (2012, 2013) overcome the limitations derived to apply the DCF model in agrarian non-listed firms examining the specific characteristics of this sector.

Declerk (2016) analyzed firms' financial performance for the period 2002-2009 applying multiplier methodology for food companies. Previous studies focus on financial and economic characteristics to determine agrarian firms' valuations without considering other variables. The absence of additional elements in the valuation process could cause biased results due to the lack of relevant information. In this sense, Giménez et al. (2004) concluded that their analyzed firms did not behave as it was expected according to their valuation results "due to several reasons that this econometric model does not take into account". According to these authors, other elements, such as the transport costs or facilities should be considered. Despite this recommendation, we did not find studies examining firms' valuation and considering other variables apart from the economic and financial elements.

In this context, we think that the geography could play a fundamental role in the determination of the agrarian firms' valuation. As geography we consider the effects derived from the geographical proximity between agrarian companies and other economic agents and transport facilities. Regarding previous literature, we found studies that highlight geographical proximity to other peer companies as a potential advantage for agrarian companies (Rallet and Torre, 2005; Delgado et al., 2014). These studies consider that closer relationships among agrarian companies and some external agents, such as investors or financial intermediaries, cause positive effects on their productivity derived from the input-output linkages, labour market pooling and knowledge spillovers (Porter, 1998). Therefore, the interconnection among closer companies strengthens the competitive and productive capacities of agrarian companies (Chiffoleau and Touzard, 2014). We also found empirical studies that analyze the effect caused by agrarian firm's location, evaluated through its proximity to certain strategic points (such as city centers, shopping centers, road nodes, airports, train stations, technological centers and industrial parks), on these firms' results. In this sense, Davis and Schluter (2005) developed a disaggregated analysis for food industries and found relevant elements that attract food manufacturing companies to operate where they have more accessibility to other agents. Nguyen et al. (2013) indicated that firms are more attracted to regions with high accessibility. In fact, agrarian firms do not act in isolation during their decision-making processes but are influenced by other peer firms located nearby. Using data from a recent survey of New York State food processors, Schmidt and Keil (2013) demonstrated that increasing access to raw agricultural inputs and growing population centres are important upstream and downstream market conditions for improving firm growth. Holl (2013) found a significant and positive relationship between the accessibility of the company to external agents and their productivity. Läpple and Kelley (2014) analyzed spatial dependence in the adoption of organic farming for almost 600 Irish dry stock farmers. Their results revealed that farmers located in close proximity to one another or with easy access to interconnection channels experience benefits. Indeed, communication and interactions among farmers influence their economic and financial behavior. However, there are no studies examining the effects of the geography on agrarian firms' valuations.

The aim of this study was to determine whether the geography, evaluated though the distance between agrarian companies and from them to some strategic points which improve their accessibility, has a significant and measurable influence on agrarian companies' values. To achieve our purpose, we developed an empirical application with a sample of 548 non-listed agrarian companies in the province of Murcia[1] , Spain for the period 2010-2015. The Spanish food sector was an adequate scenario to develop this study since listed companies in the food group are very rare (Ribal et al., 2010).

2.2 Material and methods

2.2.1 Non-listed agri-firms' valuation

The value for each firm of the sample was estimated as the Enterprise Value (EV). This value does not consider firms' financial position but it was focused on the cash flows generated by operating activities. Our premise was that geography may influence on the input-output linkages in agrarian firms altering the capacity of these companies to generate cash flows. In order to estimate the EV, we applied the DCF model. This was one of the most commonly used methods to calculate firm's value (Verginis and Taylor, 2004; Rojo and García, 2006; Dönbak and Ukav, 2016). DCF procedure discounts the future cash flows (FCF) that the firm will create in the future to present value by using an appropriate discount rate referred to as Weighted Average Cost of Capital (WACC). However, we found different specifications from this model in order to face particular characteristics of non-listed firms. In the present study, we applied Rojo and García (2005, 2006)'s proposal to estimate the discount rate for the case of non-listed companies.

[1] Spain for the period 2010-2015. The Spanish food sector was an adequate scenario to develop this study since listed companies in the food group are very rare (Ribal et al., 2010).

The difference between Rojo and García (2005, 2006)'s approach and that commonly used based on the Capital Asset Pricing Model (CAPM) is the addition of a specific risk premium in order to take into account the higher risk faced by non-listed companies when compared to their listed counterparts. Specifically, Rojo and García (2005, 2006) compute the expected return of equity (k_e) for the case of non-listed companies by adding three components: the risk free rate (R_f), the market risk premium (P_m) and a specific risk P_e (see (2.1)).

$$\mathrm{k}_e = R_f + P_m + P_e \tag{2.1}$$

R_f and P_m were computed following the traditional literature (Damodaran, 2002; Baginski and Wahlen, 2003) while P_e was calculated based on the concept of total beta (Damodaran, 2002) as shown in (2.2).

$$\mathrm{P_e} = \beta_\mathrm{i} * \mathrm{P_m} \tag{2.2}$$

where the coefficient β_i is computed as the ratio of the standard deviation of financial profitability of the firm i after interest and taxes to the standard deviation of market return.

Once k_e was computed, we could estimate the WACC (k) by applying the following expression:

$$k = \mathrm{k}_e \frac{E}{E + D} + k_d(1 - \tau)\frac{D}{E + D} \tag{2.3}$$

Where k_d is the cost of debt, E represents equity, D is financial debt and τ is the effective tax rate.

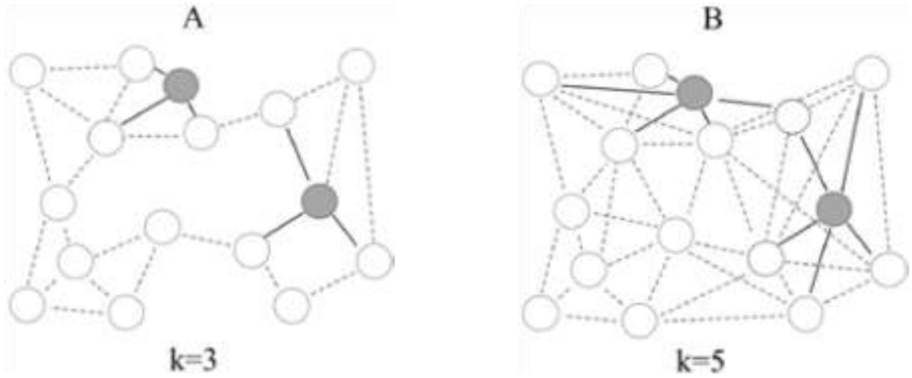
2.2.2 The spatial econometric model

We part from the following spatial econometric model (2.4) (Anselin, 1988; Le Sage and Pace, 2010):

$$y = \rho W_M y + X\beta + u \text{ with } u = \lambda W_E u + \varepsilon \quad (2.4)$$

where y is a $(N \times 1)$ vector containing the valuations for each non-listed agrarian firm i in our sample, with $i = 1, \ldots, N$; X is a $(N \times (r+1))$ matrix containing a constant term and r explanatory variables. In our case, the explanatory variables are representative of the distance between each company i and a strategic point that favors accessibility between the company and other economic agents. W_M and W_E are $(N \times N)$ spatial weight matrices that define, with values different from zero, the interconnections among companies; u is a $(N \times 1)$ vector of the spatially correlated residuals; ε is a $(N \times 1)$ vector of normally distributed errors with mean zero and variance σ^2; ρ is the spatial lag coefficient reflecting the importance of spatial autocorrelation in the valuation of non-listed Spanish companies with $0 < |\rho| < 1$. If this coefficient was significant, this indicates that the analyzed firms' valuations depend not only on the internal firms' characteristics but also on their vicinity firms' valuation. β is a $(r+1) \times 1$ vector containing the regression coefficients for the explanatory variables, and λ is a coefficient reflecting the spatial autocorrelation of the residuals u. The difference between previous spatial structures (in the dependent variable $(W_M y)$ vs in the error term $(W_E u)$) was explained by the source of interdependence among companies' valuation. In the first case, the spatial effect was caused by the structural character of firms' valuation variable. If this structure was significant, then we can conclude that the particular characteristics of a company influence the valuation of companies in their vicinity. In the second case, spatial interactions in the error term are explained by the omission of relevant variables into the model that generates this result. Previous model (2.4) was estimated applying Maximum Likelihood (ML) (Elhorst, 2010). The ML estimation is the most commonly used method based on the maximization of the log-likelihood function. The significance of the spatial structure ($(W_M y)$ vs $(W_E u)$) can be determined by computing the Lagrange Multipliers (LM) tests and their robust versions for the POOL-OLS estimation: LM-LAG (LM-LE the robust version) and LM-ERR (LM-EL the robust version) (Anselin, 1988; Anselin et al., 1996). Both tests have as null hypotheses the absence of spatial autocorrelation and as alternative hypotheses the existence of a spatial autoregressive structure in the dependent variable for the LM-LAG test and a spatial dependence structure in the error term for the LM-ERR test. Following the methodology of Florax and Former (1992), from the particular to the general, we compared the values of both tests (LM-LAG and LM-ERR) and their robust versions. When representative tests of one spatial structure were significant but the others were not, then we selected the significant spatial structure according to them. For example, if we got a significant value for the LM-LAG and the LM-LE and non-significant values for the others, then we selected a model that only contains spatial autoregressive structure in the dependent variable ($W_M y$). This model is known as the Spatial Lag Model (SLM), whereas the model with only spatial autocorrelation in the error term is known as the Spatial Error Model (SEM). However, when we obtained significant values in both spatial structures, then we estimated a spatial model as (2.4) known as the Spatial Autocorrelation Model (SAC). In this study, we did not differentiate between the spatial weight matrices W_M and W_E. From a theoretical perspective, the SAC model was identified when there were additional explicative variables apart from the spatial effects (Le Sage and Pace, 2010). Therefore, it was not necessary to apply different weight matrices. From this premise, empirical studies assume that both matrices are equal (Kelejian and Prucha, 2010). The idea behind this assumption was that the weight matrix describes the space in which you are working and the spatial variables, that are the spatial interaction mechanisms associated to each variable in the explanatory part of the model or in the error term, adapt to this space but the space does not adapt to the variable. For the common spatial neighborhood matrix W, we considered different standardized alternatives based on the q nearest neighbors. For example, if we consider the three nearest companies to each company i ($q = 3$), then we are assuming an interconnection structure shown in Fig. 2.1 where each company, represented by a circle, has its three nearest companies as neighbors (Fig. 2.1A). In Fig. 2.1A, grey color circles represent two different companies, and the continuous lines from each of them link these companies with their neighbors according to this criterion. If we consider a connectivity criterion based on the five nearest companies to each company i ($q = 5$), then we have a connection structure as shown in Fig. 2.1B. In this case, grey color circles also represent the companies to be considered as examples, and the continuous line connects each of them with their neighbors according to this criterion. Based on previous q neighbour criterion, we defined the binary row standardized weight matrix W in which elements w_{ij} value one if the company i and j are neighbors and zero otherwise.

Figure 2.1. Example of q-nearest neighbours.



2.3 Empirical application

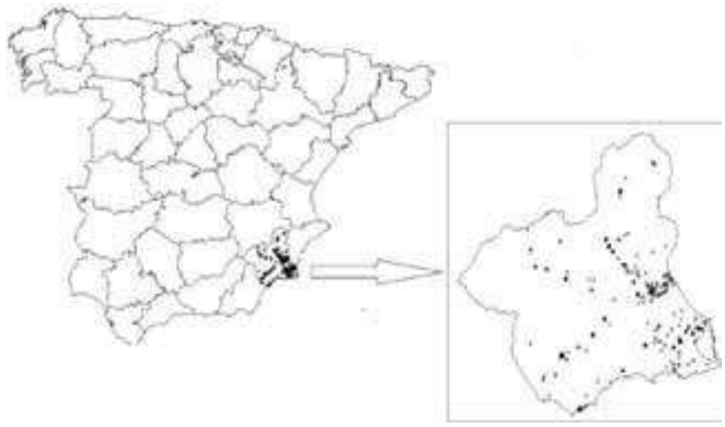
We part from the DCF valuation method for no listed companies to show an empirical application on a sample of Spanish agrarian companies with the aim of testing whether the geographical proximity among peer companies and/or from these companies to certain strategic points influences the valuation of these firms in the agrarian sector.

2.3.1 Database

The information to develop this empirical application was obtained from SABI (Sistema Annual de Balances Ibéricos) database. This database provides a wide range of information about the different business dimensions of Spanish firms. We chose Spanish agrarian companies[2] following the criterion established in the National Classification of Economics Activities (NACE, 2007). In order to avoid heterogeneity in the sample, we selected companies located in the province of Murcia in Spain (Fig. 2.2).

[2] Agrarian sub-sector includes the NACE codes A1.1 (Growing of non-perennial crops excluding tobacco), A1.2 (Growing of perennial crops), A1.4 (Animal production), A1.5 (mixed farming) and A1.6 (Support activities to agriculture and post-harvest crop activities)

Figure 2.2. Firms' spatial distribution. Provincial map.



We selected this territory because of the important weight of the agrarian sector on the global production of this region (INE, 2013). Once we obtained all of the information, we removed the observations with missing information to the calculation of the EV and those having anomalies in their financial statements, e.g., negative values in their sales or assets that distorted the behavior of the firms. Companies with negative values in their cash flows were also excluded from the analysis. Furthermore, to reduce the effect of outliers in our sample, we dropped extreme values in all of the variables that were not included in the ± 3 interquartile range. Our sample contained information for 548 non listed-agrarian companies over the period 2010-2014.

In addition to firms' financial information, SABI database also provides the location of each company through the geographical coordinates of each. Finally, we also hand-collected the geographical location of some strategic points (such as airports, train stations, and city centers) in Murcia using Google-Maps.

2.3.2 Variables

Firms' values

In order to estimate the EV, the DCF model was disaggregated into two stages. A first stage focused on the current value of future cash flows and a second stage which calculates the Residual Value (RV) (or continuing value) (Jennergren, 2008; Ribal et al., 2010). The EV for each company for the year 2014 was calculated as (2.5).

$$\mathrm{EV}_{t-1} = \sum_{t}^{l} \frac{\mathrm{FCF}_t}{(1+k)^t} + \frac{\mathrm{RV}_l}{(1+k)^l} \tag{2.5}$$

where t represents every year in the period from 2015 to 2019 and l the number of years of this period (l=5). FCF was calculated for each company in t using the standard formula (2.6)

$$\mathrm{FCF} = \mathrm{EBIT}(1-\tau) + \mathrm{D\&A} + \mathrm{Imp} - \Delta\mathrm{WC} - \mathrm{I} \tag{2.6}$$

where EBIT is the earning before interests and taxes; D&A, depreciation and amortization; Imp, impairments; ΔWC, working capital changes; and I, investments in noncurrent assets. Depreciation and amortization as well as impairments related to non-current assets are added to EBIT in so far as they do not involve a cash outlay while working capital variation was considered in order to take into account those sales and purchases on credit recognized in EBIT that have not yet generated a cash movement. Therefore, in order to estimate future FCF for the next five years (2015-2019) we had to assume the evolution of the main components of FCF. In this regard, we fitted a linear regression based on data on each company's historical sales and extrapolated future sales based on the linear model fitted (Alekneviciene et al., 2013). Once future sales were estimated, we projected the rest of the components of FCF by applying the mean of the annual past values of the proportion (ratio) that each FCF component represents with respect to historical sales (Alekneviciene et al., 2012).

We got the discount rate (WACC) applying the previous expression [2.3] for non-listed companies. The cost of debt (k_d) was calculated as the ratio of interest expenses to the financial debt of the company. As usual when implementing DCF, the risk free rate (R_f) was proxied by the 10-year government bond interest rates. We obtained this information from the webpage www.datosmacro.com, which provides financial sector information about different Spanish markets. The market risk premium (P_m) was considered to be the average historical differential between market returns and risk-free rates during the last years. We got this information from Damodaran's webpage[3] which provides market risk

[3] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/home.htm

premiums by industries and countries. The specific business risk (P_e) was computed according to expression (2.2) where financial profitability of the firm i after interest and taxes (i.e., ROE) was obtained from firms' accounting information and market return from Damodaran's webpage. Finally, we determine the RV by applying the Gordon model that assumes that FCF will grow at a constant rate (g) after the estimation period. Analytically:

$$RV_l = FCF_{l+1} \frac{(1+g)}{(K-g)} \qquad [2.7]$$

In our case, g was considered to be 1.5%, which was the long-term GDP growth expected for Spain in the next 20 years (PricewaterhouseCoopers, 2013).

Explanatory variables

Explanatory variables in this analysis were representative of the distance between each company in the sample and a strategic point. In order to determine the geographical distance between each company and these strategic points, we built an algorithm in R software. Following previous literature, we considered these strategic points: a) industrial parks, b) shopping centers, c) road nodes, d) airports, e) train stations, f) technological centers and g) city centers. Apart from these variables, we also included control variables to take into account the characteristics of each company. In this regard, we defined the age and the size of the company, establishing different categories for each variable. Following Bergel and Udell's (1998) study, we defined four groups of companies according to their ages: infant (0 to 2 years), adolescent (3 to 4 years), middle-aged (5 to 24 years) and old (more than 25 years). The variable size was based on the number of employees. From this information, we followed the Commission Recommendation 2003/361/ EC (OJEU, 2003) to determine different groups. Micro was composed of companies with fewer than 10 workers. Small was defined as the set of companies with between 11 and 50 employees. Medium refers to companies with 50 to 250 employees. Finally, Large indicates the group of companies with more than 250 employees. Small and young firms have specific characteristics, such as informational asymmetries, that make them riskier and with a higher probability of bankruptcy (Dhawan, 2001; Chava and Jarrow, 2004; Vassalou and Xing, 2004; Chen, 2010). Therefore, we expected that these companies would present lower valuations. In this sense, the high bankrupt's risk was reflected in the DCF model with a higher discount rate (WACC) influencing negatively on firms' valuations.

2.4 Results

To begin, we analyze the spatial distribution of the value of the companies in our sample (see Fig. 2.3). We got that companies with the higher values tend to be concentrated among themselves and close to the main city centers in Murcia (Cartagena and Murcia).

Figure 2.3. Quartile map. Spatial distribution of agrarian firms' valuation in Murcia, Spain. Source: Own elaborated

In order to corroborate this finding, we estimated the Global Moran's I test to find spatial autocorrelation in no listed agrarian companies. Global Moran's I represents the regression coefficient of Wy on y (Anselin, 1988), where y is the representative variable of agrarian firms' value. Therefore, a significant Global Moran's I test means that each agrarian company valuation depends not only on the own firm's characteristics but also on the valuations of its vicinity peer companies. The global Moran's I is given by (2.8)

$$I = \frac{z'Wz}{z'z} \tag{2.8}$$

where $z = (y - \bar{y})/\sigma y$ with y is a vector of the valuations for the non-listed agrarian companies i, with $i = 1, \dots, 548$. $\bar{y}$ is the arithmetic mean of y, and σ_y the standard deviation of y. W is the standardized weight matrix built based on the q nearest neighbour criterion.

Table 2.1. Moran's I test considering different weight matrix based on q nearest neighbours

	$q = 3$	$q = 5$	$q = 8$
Morans' I test	1.1325*	1.4261**	0.9872
p-value	0.0825	0.0335	0.2058

*,**: significant at 10% and 5%, respectively

Resulting values of the Global Moran's I tests (Table 2.1) indicated a significant and positive spatial autocorrelation for agrarian firms' values. In this sense, p-values were less than 0.1 and 0.05 for $q = 3$ and $q = 5$, respectively. Therefore, the null hypothesis of no spatial auto-correlation was rejected. This means that agrarian firms' valuations were related to their neighbor firms' valuations at a certain distances. For $q = 8$ this spatial effect became non-significant. Thus, the interaction effect in agrarian firms' valuations vanished with the distance[4].

To get a better understanding of the previous spatial pattern, we applied spatial econometric methods. We propose a spatial econometric model to analyze the effects of the geographical proximity among peer agrarian companies and from these companies to some strategic points on the valuation of these companies. The former was tested by analyzing the existence of a significant spatial autocorrelation structure into the model. The latter was contrasted including as explanatory variables different factors representative of the distance from each company to the strategic points. With this aim, we parted from a pool OLS model and test spatial autocorrelation in this process.

The first column in Table 2.2 shows pool OLS estimation results. Based on this structure, we computed the spatial Lagrange Multipliers (LM) tests to determine if there was a significant spatial structure into the model and, in this case, determine the more adequate spatial structure (SLM vs SEM). LM tests indicated that the hypotheses of no spatially lagged dependent variable (LM-LAG) and of non-spatially auto-correlated error (LM-ERR) term were rejected. LM-EL and LM-LE tests reject the null hypothesis of absence of spatial dependence. Therefore, both spatial structures (LAG and ERROR) were significant, and we estimated a SAC model as proposed in [2.4] to control for both spatial autocorrelation structures. The adjusted R^2 indicated that SAC model best described the

[4] $q = 8$ corresponds with a radius of approximately 10 kilometres of distance from each company.

data in comparison with the OLS (0.3633 vs 0.2781 respectively), In addition, we computed the likelihood ratio (LR) test based on the log likelihood function values of nested models. In this way, we tested goodness of adjustment of the SAC model in comparison with the pool OLS estimation. The significant value of this test also corroborated that the SAC model works better in our specification. Regarding the coefficients of the SAC model (Table 2.2, 2nd column), we found that spatial autocorrelation effects had an important influence on agrarian firms' value. In this sense, both, the spatial lag (2.5391) and the spatial error (0.6004) were positive and significant. In addition, the spatial lag coefficient seemed to be more relevant in terms of its value highlighting the structural character across the space of agrarian firms' valuation. Regarding the explicative variables representative of the distance from companies to strategic points, we got that the representative variable of the distance from firms to technological centers was significant and negative (-4.0716) indicating that short distances between the company and technological centers increased the value of the company. Variables of the distance between the company and industrial parks (-3.0034) and shopping centers (-1.9532) were also negative and significant. Previous variables could be seen as representative of links with external agents that favors the integration of this company in the markets.

Table 2.2. Estimations of the agrarian valuation on locational variables

	POOL-OLS estimation	**SAC Model**
Constant	6.9814*** (0.000)	1.8401*** (0.000)
Distance to technological centres	-1.8872** (0.0515)	-4.0716*** (0.0003)
Distance to train stations	-1.3683** (0.0116)	-4.7056** (0.0213)
Distance to industrial parks	-1.6891* (0.0930)	-3.0034* (0.0537)
Distance to shopping centres	-1.7783* (0.0119)	-1.9532** (0.0132)
Distance to city centres	-0.4395 (0.9256)	-2.8063 (0.5562)
Distance to airports	-0.2887 (0.3281)	-0.0206 (0.9702)
Distance to roads nodes	-2.1265** (0.0372)	-2.3396** (0.0691)
Midle age [1]	0.4042 (0.3655)	0.3560 (0.3603)
Old age	0.7406** (0.0265)	0.6959** (0.0105)
Small size firm [2]	1.4335*** (0.000)	1.3259*** (0.0000)
Medium size firm	2.6229*** (0.000)	2.2578*** (0.0000)

Rho	-	2.5391** (0.0164)
Lambda	-	0.6004*** (0.000)
Post estimation tests		
R^2	0.2973	0.3812
Adjusted R^2	0.2781	0.3633
LM-LAG	11.373*** (0.0033)	-
LM-LE	3.9772** (0.0227)	-
LM-ERR	10.395*** (0.0012)	-
LM-EL	6.0734** (0.0137)	-
LR test (POOL-OLS *vs* SAC)	-	18.719*** (0.000)

p-values in brackets. *,**,***: significant at 10%, 5%, 1%, respectively. [1] Regarding the age of the firm, the sample did not include any "infant" company with available information. Therefore, this category was dropped from the analysis. "Adolescent" is the referenced category for the age. [2] About the size of the company, the sample did not include any non-listed "large" company with available information. Therefore, this category was eliminated. Micro size companies was the referenced category. POOL-OLS refers to Ordinary Least Square estimation.SAC is the Spatial Autocorrelation Model. LM represents the Lagrange Multipliers tests.

Our results indicated that agrarian companies located closer to these strategic points presented higher valuations. Contrary to what we expected, we found that geographical proximity from companies to city centers was not significant in the model.

About the representative variables of the geographical proximity from companies to transport centers, we got a negative and significant effect for road nodes (-2.3396) and train stations (-4.7056) on agrarian firms value. Therefore, agrarian companies situated at a short distance from the train stations or road nodes will get higher valuations. Distance to airport was nonsignificant.

Finally, control variables indicated that the size and the age of the variable had a positive and significant result on agrarian firms' valuation. In other words, mature and large firms will have higher valuations.

2.5 Discussion

This study was a first step in understanding the mechanisms from which the geography influence on agrarian firms' valuations. As a difference from previous studies, we considered not only financial and economic variables but also environmental variables related to firms' geographic proximity from companies to other external agents and facilities. Our results showed significant geographical effects on firms' valuation. In this sense, we got that agrarian companies with similar values tended to be grouped in the territory. Moreover, this effect had a structural character highlighting the fact that nearby companies will strength their input/output linkages causing interdependences in their economic and financial behavior (Rallet and Torre, 2005, Delgado et al., 2014). Agrarian firms do not act in isolation during their decision-making processes but were influenced by other peer firms located nearby (as in Nguyen et al., 2012). Therefore, a company surrounded by firms with economic or financial difficulties will receive negative external shocks. This will increase their specific risk decreasing its value. The opposite will happen when the company is surrounded by companies with good economic and financial results. In this sense, the advantages derived from shorter distances between companies in the agrarian sector can be attributed to the benefits associated with labour pooling, decreasing costs of intermediate inputs and/or technological spillovers (Schmidtner et al., 2011).

Apart from this geographical effect, we also found significant results when the proximity from firms to other external agents and transport facilities was considered. In this case, agrarian companies geographically closer to clustered activities (industrial parks or technological centers) and/or transport nodes (train stations, road nodes), received a positive effect on their valuations. From this perspective, closer distances eased the interconnections among economic agents strengthening the input-output linkages among companies. This result coincides with previous studies which analyzed firms' accessibility to external agents and transport facilities on their productivity. These studies found relevant elements that attract food manufacturing companies to operate where they have more accessibility to other agents (Davis and Schluter, 2005; Targa et al., 2006, Holl, 2013, Läpple and Kelley, 2014). Nevertheless, previous literature was focused on accessibility effects on agrarian firms' productivity or growth. Our contribution was focused on firms' valuation finding also a positive effect. Control variables gave a positive sign for the size and the age of the company. These results coincide with previous empirical tests (Dhawan, 2001; Chava and Jarrow, 2004; Vassalou and Xing, 2004; Chen, 2010) that have related size and age variables to risk and business failure. This higher risk will increase the discount rate decreasing firms' values according to the DCF model.

Our study was a first step into the analysis of the geography on firms' valuation. Thus, a promising avenue of research in this context might be to deem in the effects of the geographical proximity on agrarian firms' valuation considering other scenarios. Another aspect that has not been addressed due to the lack of data was the temporal dimension. Accounting for longer time series would contribute to further discussions on the effects of geographical proximity on the valuation of agrarian firms. In addition, other locational aspects, such as agglomerations effects, accessibility and proximity to the other markets, could also be considered when the valuation of agrarian companies was examined. Finally, further research about the strategic points' relevance is needed to identify some open questions in this study: why does proximity to industrial parks is relevant on agrarian firms' valuations but to city centers is does not? We think that this result could be explained by the specific agrarian characteristics which give more relevance to the market accessibility throughout other channels. Nevertheless, next studies should be developed examining the importance for agrarian companies to be close to the city centers and the optimal distances.

CHAPTER 3: The value of agri-food companies: is the geography a relevant factor?

The effect of the geography on agri-food firms' valuation is examined by treating companies as global assets with an heterogeneous behaviour across space. In order to control for the endogeneity suscited by the territorial characteristics, we develop an urban analysis comparing the significance of geographical variables in two municipalities with different economic growth rates. In addition, we consider the existence of non-linearities when geographical factors are considered on agri-food firms' valuation. In this charter, findings show significant results for the geographical variable interesting differences between municipalities. The most developed municipality is characterized by stronger spatial interaction structures between agri-food companies highlighting the role of agglomeration economies and scale economies on the value of these companies when the environment of these companies is developed. Otherwise, spatial interaction effects are not as intense for the less developed municipality. In this case, geographical proximity from these companies to external agents easing the transfer of knowledge plays an important role on the value of these companies.

3.1 Introduction

The recent financial crisis has favored mergers and acquisitions with a special relevance in the agri-food sector given the low competitiveness of these companies derived from their reduced size (Crescimanno et al., 2014). In this sense, we find that more than an 80% of agri-food companies in the EU have less than 10 hectares (Eurostat, 2017). The smallness of these firms limits their competitiveness considering mergers an important strategy for their survival in current economies. This has suscited an extense literature focused on the valuation of these companies including not only internal factors but also external elements related to these companies' environment characteristics. Regarding the external factors, we find the geography as a key element conditioning agri-food firms' value. From a theoretical perspective, geographically close agri-food companies may develop positive interactions (Giacomini and Mancini, 2015). These externalities may generate economies of scale, reduce transport costs and promote the transfer of information and productive inputs between suppliers and clients (Garcıa-Alvarez-Coque et al., 2015). But, from an empirical point of view: which elements should be examined when geography is included?. Geographical studies in this context, consider the particular characteristics where companies are located and spatial interaction effects between geographically close peer companies or between companies and external agents which could influence on firms' behavior such as technological centers or industrial parks. In particular, we find studies applying spatial autocorrelation statistics to test whether agrarian land prices depend on their neighbors' prices (Patton and McErlean, 2003; Ready and Abdalla, 2005; Maddison, 2009). These analyses tend to be developed from an aggregate perspective considering global analysis for different territories and therefore, economic agents located at large distances between them (Maddala, 2009). In addition, we find papers considering the geographical distance from agri-food companies to the nearest city or the population density of the territory where the company is located on the valuation of these companies (Cho et al., 2010; Salois et al., 2011; Occhino and Mate, 2017). These studies are based on the assumption that the geographical positioning of the firm in relation to external actors provides certain advantages or disadvantages to these companies reflected on their values. But, previous studies in this area are mainly focused on land valuation models estimating prices and this approach presents difficulties related to the lack of reliable and constant data about land values and rents (Maddison, 2009).

Following previous literature, the aim of this chapter is to contrast the role of the geography on agri-food firms' valuations. But, as difference with previous literature, our approach is based on the valuation of the agri-food company as a global asset applying accounting firms' information and estimating the value of their assets. Thus, we apply reliable information from the financial statements of agri-food companies provided by the Official Accounting Registers. This information is trustworthy and has a stable behavior along time. In particular, we base our study on the DCF model, previously applied in agri-food literature to get land prices (Mela et al., 2013). This model has a dynamic character updating the future cash flows that the firm will create in the future to present values. In addition to this, our analysis has an urban character defining the municipalities as the areas of analysis. The fact of limiting our study to a specific territory reduces the possible endogeneity bias when the territorial analysis is examined (Leary and Roberts, 2014). This is explained by the existence of groups of companies affected by similar local characteristics and therefore, the possible interaction effects could be caused by spurious relationships. In order to overcome this limitation, we develop an urban analysis. This approach is also applied in Occhino and Mate (2017) but as difference with this study, we discount the institutional component by developing an empirical application for two different territories in Spain: Madrid and Murcia (see Figure 3.1). The former with GDP above the Spanish national average value and the last with values below the Spanish national average (INE, 2017). In this context, different institutional environments may provide specific assets which condition firms' valuations and which would be difficult to transfer to other institutional scenarios in other regions (Arauzo-Carod et al., 2006). Therefore, a territorial comparison provides general conclusions about the geographical impact on agri-food firms' valuations. In addition, as difference from previous studies, we test for the presence of non-linearities in geographical proximities for the agri-food sector when firms' valuations are studied. Previous studies on this topic seem to be more interested in mapping the existence of geographical factors than to define how geographical proximity effects may vary across space. Therefore, our study adds additional understanding on this topic.

Figure 3.1. Map of Spanish regions.

Our results indicate that geographical factors, differencing between spatial interactions and geographical proximities, impact on agri-food firms' valuations finding differences between municipalities. In this sense, we identify agglomeration economies as a fundamental element in agri-food firms' valuations in Madrid. In addition, geographical proximity between agri-food companies and Industrial Parks and Commercial Centers play an important role on firms' valuations of these companies highlighting the benefits from interactions with other agents and labour pooling in more developed regions. In Murcia, however, spatial interaction effects between peer companies are not as intense as in Madrid. In Murcia, geographical proximity to technological centers and universities is the relevant factor for improving the valuation of agri-food companies.

The remainder of the chapter is organized as follows. Section 3.2 describes the dataset upon which the model is estimated. Section 3.3 presents a series of econometric models for Murcia and Madrid. The final section concludes and provides the policy implications of our study.

3.2. Data

3.2.1 Database

We collect the information from SABI database (Iberian Balance Analysis System) which provides comprehensive financial and accounting information on Spanish companies. We select the agri-food sector following the criterion established in the National Classification of Economics Activities (NACE 2007). In order to overcome limitations due to the lack of information, we remove the observations with missing values, those having anomalies in their financial statements and firms with negative cash flows. The data covers information over the period 2010-2014. In addition, SABI database allows us to geo-locate the different firms providing their geographical coordinates. Finally, we get a sample composed by 306 non-listed agrarian companies: 106 located in Murcia municipality and 228 are located in Madrid. These Spanish regions have different economic characteristics. Madrid is one of the Spanish regions with the highest GDP and with a high concentration of mature companies focused on high technologies. Murcia presents GDP values under below the national average with companies in low-medium technologies and low productivities (Mate et al. 2009). The following Table 3.1 shows sample distribution for different categories of size, sector and age.

Table 3.1. Sample characteristics of agri-food in Madrid and Murcia, 2010-2016. Average values in percentages on the total value

SIZE(1)	**Cases**		**Percentage**	
	Madrid	**Murcia**	**Madrid**	**Murcia**
Small (10 to 50 employers)	127	60	51	57
Medium (51 to 250 employers)	68	40	39	37
Large (more than 250 employers)	33	6	9	6
TOTAL	228	106		
SUB- SECTOR(2)	**Cases**		**NACE code**	
	Madrid	**Murcia**		
Cereals	42	15	111, 4621	
Fruits	51	68	112,122, 123, 124, 125,4631,1032,1039	
Meat	43	9	141,1053,1054	
Support	55	3	161,162, 1091	
Other activities	37	11	NACE codes corresponding with the agri-food sector and not included before	
AGE(4)	**Cases**		**Percentage**	
	Madrid	**Murcia**	**Madrid**	**Murcia**
Middle age (5 to 24 years)	137	75	60	71

Old (more than 25 years)	91	31	40	29

Source: [(2)]NACE 2009. http://ec.europa.eu/eurostat [(3)] Cases represent the count of which firms operate in covering the 228 and 106 cases in the sample.. [(4)] Following Berger and Udell (1998) and the characteristics of our sample, we established two groups based on their age: middle-aged firms (10 to 24 years) and old firms (more than 25 years). There are not companies in the sample with less than 10 years.

Small companies account for 53% and 60% of the sample in Madrid and Murcia respectively. In addition, there is a high percentage of companies with less than 25 years in both cases. Nevertheless, the proportions of reduced size companies and mature companies are higher in Murcia. Finally, the productive activity in Murcia is more concentrated in Fruits subsector while there is a homogeneous distribution of activities in Madrid. Apart from SABI database, we use Google-Maps to collect geographical location of external agents to agri-food companies whose geographical proximity could influence on firms' valuations.

3.2.2 Variables

Dependent variable

The dependent variable in our analysis is the value of the different agri-food companies which compose our sample. To evaluate this variable, we use the Economic Value (EV) applying the DCF model as we discussed in the previous Chapter 2.

Explanatory variables

Geographical variables

The density of a firm's environment is measured through two density variables. Density (Dens) evaluates the diversification of firms' environments by computing the density of companies operating in all industrial sectors within the circle of radius r_d. Sectorial Density (DensSS) measures the amount of firms producing in the same subsector inside of a circle of radious r_{ds}. Following previous literature, these variables should capture the potential networks between companies. Companies in dense environments will benefit from external economies of scale and the exchange of knowledge impacting positively on the value of these companies (Läpple et al. 2016).

Apart from density variables, we also build geographical proximity variables evaluating the geographical distance from agri-food companies to different external economic agents which could impact on these firms' valuations. In this sense, we define the variable (DminIS) computing the geographical distance from each agrarian company in the samples to its closest industrial park. This variable captures industrial territorial interrelationships where geographical proximity to other companies in the same or different sector allows the diffusion of knowledge providing additional understanding to managers in firms' economic decisions. So, this will have a positive effect of these firms' values (Mota and Castro 2004). Using GoogleMaps, we locate twelve industrial parks in the municipality of Madrid and seven in Murcia . We also include the distance to the closest research centers or universities (DminR&D); geographical proximity to these technological agents is expected to benefit firms with higher innovation performance and therefore, higher valuations (Romijn and Albu 2002). With Goggle Maps, we geo-located universities in the municipalities of Madrid and Murcia and technological centers. Another geographical proximity variable evaluates the geographical distance between agri-food companies and logistic centers (DminLC). These centers are considered as specialized buildings in which firms stock their agri-food products to be redistributed to external agents (such as retailers, wholesalers, consumers). Geographical proximity to these centers benefits firms' activity decreasing transportation costs. In addition, easy access to logistic centers should strengthen interrelationships among companies (Zaheer and Bell 2005) fostering the valuation of these companies. We use Google Maps to find out and geo-locate the logistic centers in the municipalities of Madrid and Murcia. We find thirteen logistic centers in the municipality of Madrid and six in Murcia.

The geographical distance between agri-food companies and their nearest large shopping center (DminSC) is also included in our analysis. Geographical proximity to shopping centers will strengthen cognitive and social interactions between agri-food companies and customers favoring different firms' activities (Trigueros et al. 2013) and, therefore, giving additional value to these companies. From Google Maps, we geo-locate one hundred and forty five shopping centers in the municipality of Madrid (major shopping centers and local supplies markets) and twenty-nine shopping centers in Murcia. Geographical distance between agri-food companies and city centers are also considered. Similar to geographical proximity to shopping centers, geographical proximity to city centers should exert a positive effect on agri-food firms' valuations. This is explained by the benefits derived from closer geographical proximity to final customers which provides competitive advantages to the economic results of these companies. In particular, DminCC measures the distance from the company to its closest city center or town in the municipalities of Madrid and Murcia. Following the National Institute of Statistics, we identify two hundred and twenty six cities and towns in the municipality of Madrid and fifty-seven city centers and towns in Murcia.

Control variables

The size of the company is included and defined as the number of employees from SABI database. Larger companies enjoy advantages as economies of scale and greater market presence, which result in positive results for these companies (Chen 2010). Therefore, we expect a positive relationship between the size of the company and the valuation of large size companies. Following the criteria established by the European Commission on 6 May 2003, we consider three categories in this regard: micro-companies (<2 millions of total assets), small firms (2-10 millions of total assets) and medium size companies (10-43 millions of total assets). We also control for the NACE (Nomenclature of Economic Activities) codes distinguishing the following subsectors: cereals, fruits and milk (see Table 3.1 for NACE codes). We include firms' age as the number of years since the firm was founded; older firms generally have a more stable position in the market providing additional value to these companies.

Table 3.2 shows some descriptive statistics for these variables in Madrid and Murcia. As we can see, the valuation is higher for companies in Madrid than in Murcia. This difference is statistically significant (LR test= 2.431 p-value=0.000). This could be related to economic differences between these regions. In this sense, we also find higher density rates in Madrid and easier accessibility from agri-food companies to their external agents in terms of closer distances.

Table 3.2 List of dependent and independent variables included in the model

Variable	**Description**	**Mean†**		**St. dev†**		**t-test‡**
Dependent Variable		**Madrid**	**Murcia**	**Madrid**	**Murcia**	
Firms Value	Firms' valuation of each company applying the DFC method	9.848	7.865	1.948	1.761	2.3412^{***} (0.000)
Control Variables						
Small	1 if firm size is small (10-50	0.4649	0.5686	0.4998	0.4977	0.5531

	employees), 0 otherwise.					(0.398)
Medium	1 if firm size is medium (51-250 employees), 0 otherwise.	0.4342	0.3727	0.4938	0.4865	0.2215 (0.342)
Large	1 if firm size is large (more than 250 employees), 0 otherwise	0.0788	0.0588	0.2631	0.2312	1.2314** (0.045)
Cereals	1 if firm main activity is Cereals subsector, 0 otherwise	0.1842	0.1470	0.2834	0.3558	0.3321 (0.276)
Fruits	1 if firm main activity is Fruits subsector, 0 otherwise	0.2236	0.6555	0.4131	0.4774	1.4552** (0.030)
Meat	1 if firm main activity is Meat subsector, 0 otherwise	0.1885	0.0889	0.2554	0.2561	1.2981 (0.067)
Support	1 if firm main activity is Support subsector, 0 otherwise	0.2412	0.0290	0.1939	0.1697	2.7721*** (0.000)
Other agri-food subsectors	1 if firm main activity is in agri-food subsector but not included before, 0 otherwise	0.0221	0.0151	0.2796	0.3422	0.5674 (0.445)
Age	Age of firm (*t* minus year opened +1) in years	27.4429	22.2352	12.2621	10.2606	2.6761*** (0.000)
Geographical variables						
Dens(*)	Number of total firms of all sectors within a radius of one hundred and fifty metres	31.568	12.702	39.458	26.556	3.0988*** (0.000)
DensSS (**)	Number of firms of the same subsector (NACE-2007, 2 digits) within a radius of two hundred and eighty metres	6,386	3,876	2,45	1,758	2.8344*** (0.000)
DminIP	Distance to the closest industrial park	4.142	3.019	1.511	4.819	1.1476* (0.072)
DminR&D	Distance to the closest technological centre or university	2.317	6.383	2.252	5.351	2.9112*** (0.000)

DminLC	Distance to the closest logistic centre	4.081	5.580	1.753	4.661	0.8642 (0.112)
DminCC	Distance to the closest City Centres or Town	3.665	5.980	2.980	6.456	1.5565*** (0.003)
DminSC	Distance to the closest Commercial Centre or local supplies market	1.470	5.603	1.712	5.341	2.8783*** (0.000)

(*) r_d that maximizes likelihood functions in the estimation process is 0.15. (**) r_{ds} that maximize this likelihood function is 0.28.

† Mean and standard deviation report results for agri-food companies in Madrid and Murcia.

Notes: p-Value in parentheses.

, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.*

‡ t-test is built under the assumption of equal variances between groups. Firstly, we apply Levene's test that confirms the null hypothesis of equal variances. Finally, we apply t-test in order to test similarity between the samples in Madrid and Murcia (Greene, 2008).

3.3. Results

3.3.1 The spatial behaviour of firms' values in Madrid and Murcia

In order to begin with the spatial analysis, we calculate the Global Moran's I [3.1] test for each subsample in Madrid and Murcia.

$$I = \frac{z'Wz}{z'z} \qquad [3.1]$$

with $z = (y - \bar{y})/\sigma_y$ and y the vector of the valuations for the companies in our sample distinguishing between Madrid and Murcia. $\bar{y}$ the arithmetic mean of y, and σ_y the standard deviation of y. W is the standardized weight matrix which defines the neighborhood structure. We build this matrix based on the q nearest neighbor criterion. Therefore, we consider neighbor companies the q geographically closest companies to each company in the sample. With this information, we compute the Global Moran's I tests for Madrid and Murcia. The null hypothesis states that firms' valuations are randomly distributed among spatial units. Table 3.3 shows these results.

Table 3.3 Moran I test for firms' valuations

q-value	Madrid	Murcia

2	2.5523*** (0.005)	1.9524** (0.025)
4	3.3114*** (0.000)	0.9547 (0.169)
6	3.4458*** (0.000)	0.1015 (0.459)
8	3.4082*** (0.000)	0.1225 (0.669)

We found p-values less than 0.05 for k=2 in Murcia and p-values less than 0.005 for k=2,4,6 and 8 in Madrid. Therefore, the null hypothesis of non-spatial auto-correlation is rejected concluding that agrarian firms' values are influenced by their neighbours' values. Nevertheless, we find differences between territories with a stronger spatial structure between companies in Madrid in comparison with Murcia in terms of their valuations.

3.3.2 The spatial valuation model

In order to test the significance of the spatial distribution, we estimate a spatial model explaining the value of agri-food companies in function of geographical proximity variables and firms' characteristics for Madrid and Murcia. For each equation, we test for the existence of nonlinear relationships in the geographical explanatory variables by adding, where appropriate, statistically significant squared values of these variables (see Table 3.4 at the end of this chapter).

Table 3.4 Significance values for F tests in ANOVA analysis to check linearities in the coefficients of SUR estimation

	Madrid	**Murcia**
Dens	2.0041** (0.049)	2.0595** (0.061)
DensSS	0.1876 (0.665)	0.4568 (0.500)
DminIP	5.3361*** (0.000)	1.1145 (0.362)
DminR&D	1.2701 (0.292)	3.4817** (0.064)
DminLC	0.0441 (0.811)	0.0101 (0.921)

DminCC	0.3491 (0.648)	0.0015 (0.955)
DminSC	0.4050* (0.767)	0.3489 (0.622)
Standard errors in parenthesis. (***), (**), (*) significant at 1%, 5% and 10% levels respectively		

In addition, to build density variables (Dens and DenSS) we apply an iterative procedure selecting the values for r_d and r_{ds} that maximize the likelihood function for each model. This procedure is based on De Silva and Mc Combe (2012) study. These authors define the geographical variables based on distance by considering various concentric rings r_i of different radii around each analysed companies. Then, they select those radii which provide the best adjustments of the analyzed model. Table 3.5 shows the estimation results for the spatial models in Madrid and Murcia.

Table 3.5 OLS and SAC estimations

Variable	**Valuation model (OLS estimation)**		**Spatial Valuation model (SAC estimation)**	
	Madrid	Murcia	Madrid	Murcia
Constant	2.3356*** (0.000)	2.4533*** (0.000)	2.3176*** (0.000)	2.8756*** (0.000)
Small	1.1077*** (0.000)	1.2704*** (0.000)	1.0944*** (0.000)	1.3397*** (0.000)
Medium	1.7288*** (0.000)	1.8597*** (0.000)	1.7261*** (0.000)	1.6682*** (0.000)
Cereals	-0.4404** (0.012)	-0.0265 (0.823)	-0.4043** (0.022)	-0.0388 (0.771)
Fruits	0.3158** (0.022)	0.8677** (0.014)	0.3027** (0.012)	1.0916*** (0.003)
Age	0.4663* (0.083)	0.6545** (0.057)	0.5195** (0.045)	0.6275** (0.026)
Dens (+)	3.9020*** (0.002)	3.1866** (0.011)	3.5532** (0.061)	3.4055** (0.028)
$Dens^2$	-2.8028* (0.089)	-0.5627*** (0.002)	-2.4223* (0.068)	-0.3163** (0.033)
DensSub(ç)	-0.0308 (0.538)	0.3543* (0.061)	-0.0379 (0.407)	0.3163* (0.054)
DMinIP	-0.3867***	0.2847	-0.3677***	0.2311

	(0.000)	(0.414)	(0.000)	(0.412)
DMinIP^2	0.5731* (0.075)	--	0.2003*** (0.015)	--
DMinR&D	-0.4576** (0.034)	-0.4827*** (0.001)	-0.4163** (0.031)	-0.3829** (0.054)
DMinR&D^2	--	0.5585*** (0.005)	--	0.5166** (0.039)
DMinLC	-0.1296** (0.056)	-0.1498** (0.053)	-0.0912** (0.000)	-0.1252** (0.047)
DMinCC	-0.6009*** (0.000)	-0.3038* (0.078)	-0.6556*** (0.004)	-0.2276*** (0.006)
DMinSC	-0.3454* (0.084)	-0.1140 (0.673)	-0.3062* (0.075)	-0.1002** (0.061)
rho (ρ)	--	--	0.6168** (0.017)	0.4902*** (0.027)
Lambda (λ)			0.1586** (0.065)	0.1551*** (0.021)
Spatial Dependence Tests for OLS estimations				
	Madrid		**Murcia**	
LM-ERR	1.3513* (0.067)		2.4451** (0.032)	
LM-LAG	2.9059** (0.058)		1.8519* (0.061)	
LR test (POOL-OLS vs SAC)	3.4881*** (0.002)		4.9458*** (0.000)	

(*) significant at 10% (**) significant at 5% (***) significant at 1%. $^{(+)}$ $r_d = 0.15$. $^{(Ç)}$ $r_{ds} = 0.28$

The first two columns in Table 3.5 show OLS estimations for Madrid and Murcia respectively. The density variables are both significant with different signs and show non-linearities. In this sense, we get that Dens is positive and significant highlighting the positive effect of agglomeration economies in strengthening the exchange of information among agents and therefore, giving more value to the companies located on dense environments of companies with similar activities (Läpple et al. 2016). But, this variable also show a negative non-linear effect corroborating previous literature which states that the presence of a large number of firms operating in the same industrial sector may increase competition, reducing the economic possibilities of these companies (Folta et al. 2006). Regarding differences between Madrid and Murcia, we find that the non-linear effect is more intense in Madrid than in Murcia. This result could be related to the economic characteristics in Madrid giving more possibilities to the companies growing (infrastructures, regional funding) and therefore favoring more competitive environments. Sectoral Density (DensSS) is positive and significant in Murcia, suggesting that the presence of a large number of firms operating in the same sector also increases the value of these companies and it is a potential element to be considered in less developed regions. Regarding distance variables, proximity to Industrial Parks (DminIS) and Technological Centres and Universities (DminR&D) display a nonlinear relationship in Madrid and Murcia respectively. So, close proximity to Industrial Parks in Madrid has a positive effect on the firms' values but the further a company is from Industrial Parks the positive effect decreases and then it turns negative. Therefore, agri-food companies in Madrid located at long distances from Industrial Parks will have a negative effect on their valuations. Similar results are obtained in Murcia when geographical proximity to technological centers and universities is analyzed. This result highlights the fundamental role of universities and research centers in regions with low productivity values and specialized in low technological sectors. Regarding the magnitude of the coefficients, we find that the largest effects are associated with geographical proximity to City Centers in Madrid whereas the geographical proximity to technological centers and universities again is the most relevant variable for firms' valuations in Murcia.

Regarding the control variables, the size has a negative and significant impact on firms' valuations (Chen, 2010). The age of the company is also positive and significant with a higher value in Murcia. Post-estimation spatial dependence tests for the OLS estimations indicate significant spatial structures in both models for Madrid and Murcia. In this sense, the spatial Lagrange Multipliers (LM) tests reject the hypotheses of no spatially lagged dependent variable in Madrid (LM-LAG=2.9059) and Murcia (LM-LAG=1.8519). In addition, the hypothesis of non-spatially auto-correlated error in Madrid (LM-ERR=1.3513) and Murcia (LM-ERR=2.4451) is also rejected. Finally, we calculate the likelihood ratio (LR) test based on the log likelihood function values of nested models. In this way, we tested goodness of adjustment of the SAC model in comparison with the pool OLS estimation. The significant value of this test for both estimations also corroborates that the SAC model works better than OLS estimations. Therefore, we estimate these models applying SAC specification. Table 3.5 columns 3 and 4 show these SAC estimations for Madrid and Murcia respectively. As we can see, explicative variables show close coefficients to the OLS estimation but now we also find significant spatial effects. We get that that spatial autocorrelation effects are significant and positive on agri-food firms' values. In this sense, both, the spatial lag coefficient (ρ) and the spatial error coefficient (λ) are significant in Madrid and Murcia. Regarding differences between these estimations, we find that the spatial lag coefficient is more relevant in Madrid highlighting the structural character across the space of agri-food firms' valuation in this municipality. So, the valuation of these companies will be influenced by the value in their geographically closed companies. In Murcia, we find that the spatial error structure has more relevance on these firms' valuations. Therefore, further analysis should be considered on the spatial specification on valuations' models in this territory including the spatial behavior of additional explicative variables.

3.4. Conclusions

This charter analyses the effects of geographical proximity on valuation in agri-food companies in two different municipalities in Spain: Madrid and Murcia. Our findings support the assertion that the geographical proximity between agrarian firms and between them and external agents are significant on firms' valuations. According to the previous literature, our results show how the geographical positioning of the firm in relation to external actors provides advantages to these companies reflected on their economic valuations. These studies are based on the assumption that agglomeration economies allow greater information spillovers and therefore better performances. Our findings confirm this statement. The importance of spatial variables on agri-food firms' valuations is confirmed in both analyzed municipalities finding interesting differences between territories. In Madrid, the most developed municipality, agrarian firms appears to take enormous benefits by agglomeration economies. The density variable is significant but show non-linearities implying that an overrepresentation of similar economic activity does not generate substantial localization economies. Furthermore, in Madrid the firm's value seem to be more affected by proximity to industrial parks and logistic centers. Therefore, the benefits from geography are most linked to labor pooling and decreasing costs of intermediate inputs. In Murcia, the agri-food firms' values are more influenced by the geographical proximity to universities and research centers. In addition, we find a structural character of spatial interactions between geographically close agri-food companies when the model is applied in Madrid whereas this effect is generated by the own omission of explanatory variables when we undertake this analysis in Murcia.

Our findings could be useful to managers, policymakers and researchers. Managers and policymakers should take into account the fundamental role played by research centers and universities to increase agri-food firms' values in less developed regions taking into account the areas of influence of these R&D agents. Furthermore, dense environments formed by industrial centers, technological centers, universities and markets, well linked to cities provide benefits to firms directly measurable throughout their values. Researchers on valuation should take in account the environmental characteristic in which agri-food companies are located in order to determine their values highlighting the significant role of agglomeration and more developed territories on the spatial distribution of this series. This area of study is an interesting future avenue of research since many of the geographic factors concerning business valuation remain underexplored. Unknown remain the mechanisms transmitting knowledge spillovers on firm value and equally unexplored remain the way how include spatial variables in valuation models. Finally our results need to be refine and other scenarios and different environments should be considered for corroborating our hypothesis. In this sense, we identify several limitations which could be overcome in future studies. Firstly, this study works with a limited number of observations from which we have available information. But, further analysis should be developed considering larger samples. Secondly, in order to define the geographical variables alternative procedures could be considered.

CHAPTER 4: A proposal to value small and medium-sized companies with spatial information: an empirical example for the fruit subsector

The Discounted Cash Flow model (DCF), similar to other firm valuation models, is based on using firms' temporal information to forecast the companies' future results. Nevertheless, the lack of temporal information for a wide number of companies causes this method to be difficult to apply. To overcome this limitation, we propose a procedure based on the spatial information of the analysed companies. In particular, our proposal combines both, data from geographically close companies to the analysed company and internal information from that company, to obtain a Spatial-Firm Economic Value (SFEV). In order to show additional understanding on this proposal, we develop an empirical example finding that the SFEV adjusts towards the traditional Economic Value from the DCF model.

4.1. Introduction

The important weight of Small and Medium Enterprises (SMEs) in current productive systems and the globalization has caused a growing demand in SMEs' valuations. The reduced scale of these companies leads to certain limitations, which could be overcome by mergers and acquisitions. These operations depend on firms' valuations. While there are several procedures that could be applied to obtain firms' valuations for large companies acting in stock markets, these techniques are limited for reduced-size companies. In fact, without access to capital markets, SMEs' valuation methods have been focused on the specific risks of these firms. In particular, Rojo and García (2005 and 2006) propose a method to estimate reduced sized companies' values based on the widely applied DCF model and considering a specific risk premium for reduced size companies. The DCF methodology is based on the updating of the Future Cash Flows (FCF) that will be created by the company to the present value using an adequate discount rate. To apply this procedure, FCFs, discount rates and their value drivers must be forecasted from the temporal information. This methodology integrates forecasting based on the information from firms' financial statements and econometric calculations. Although the DCF model is an extended applied methodology for different practitioners, it has several limitations (Fernandez, 2016). One of the main drawbacks is the lack of available temporal information to estimate the future companies' cash flows. This deficiency could occur when we are analysing micro-sized companies that present simplified financial statements or with new companies without temporal information for an extended time period (Damodaran, 2009). To overcome this limitation, we propose a method to estimate the valuation of firms with scarce temporal information. This proposal is based on geographical information. In particular, financial literature highlights the relevance of geographical environmental characteristics on the behaviour of reduced size companies. These firms tend to imitate the financial practices of their geographically close peers (Leary and Roberts, 2014). In addition, reduced size companies tend to interact with their geographically closer peers by establishing commercial relationships and being subject to similar financial and economic environment characteristics (Mate et al., 2017). Based on these considerations, our proposal is based on the valuations of geographically close companies from which there are available temporal information. Although, to the best of our knowledge, this procedure has not been applied before, the essence is not new, but it is based on the procedures followed in spatial analysis when houses or land prices are considered. Regarding these studies, we conclude that land prices depend on the locational characteristics. In our case, companies (as in the case of land prices) are not translatable assets. Thus, environment characteristics where companies are located play a fundamental role in the valuation of the companies, even more in the case of reduced size companies that are highly dependent on their environmental characteristics (Beck and Demirgüç-Kunt, 2005). In a previous study, Occhino and Mate (2017) used spatial econometric techniques to find the spatial concentration areas of companies with similar valuations. From a confirmatory analysis, these researchers proposed a regional model to estimate SMEs' values and found that the location where the company is producing its main activity (evaluated in terms of geographical distances from companies to different agents in their environment) has significant effects on their values. In addition, these researchers also find a spatial concentration pattern with companies with high valuations that are surrounded by companies with high valuations and the opposite case. Given the relevance of their neighbours' valuations on the valuation of each company, we propose a method to determine the values of those companies with scarce temporal information by substituting temporal data with spatial data and considering firms' environmental characteristics.

To illustrate our proposal, we develop an empirical application on a sample of 280 companies in the fruit sector located in Murcia, Spain. Based on this sample, we apply spatial econometric techniques to determine the set of *geographical comparable companies*. Once these firms are identified for each company in the sample, we approach the valuation of a company by computing the average value of their geographically comparable companies. In this way, we have two valuations for each company in the sample: one computed by applying the traditional DCF model for SMEs with temporal information and the other computed with geographical information. When we compare both values, we determine that there is a wide gap between them. To reduce this bias, we apply the spatial approach but now also including firm specific characteristics of each company. When we integrate both the spatial and specific firm information and compute the value of the company, we reduce the bias with the value computed from the traditional DCF model.

To show this proposal, we divide this charter into different sections. In the following Section 4.2, we provide a brief explanation regarding the DCF methodology and introduce our proposal based on geographical information. In Section 4.3, we present the empirical application and test the adequacy of our approach. Finally, we present the main conclusions.

4.2. Spatial approach when there is no available information

Let us suppose a company i without available temporal information for which we need its valuation. In order to overcome this limitation, we propose an approach based on geographical information and on the steps presented in the following Figure 4.1.

Figure 4.1. Proposal.

1. Identification of the objective company i for which we need the valuation based on spatial information → 2. Determine the *spatial comparable companies to the company i* → 3. Compute the value of the objective company i applying a geographical proposal

4.2.1. Identification of the objective company for which we need the valuation based on spatial information

Regarding SMEs characteristics, we conclude that these companies have more opacity in their information in comparison with large companies. In most countries, reduced size companies are not legally obliged to present complete financial statements in the registers, but they could offer a simplified version. Thus, the available information might not make it possible to compute the value of these companies applying the DCF because this model is based on the prediction of FCFs with firms' historical information (Rojo and Garcia, 2006; Dönbak and Ukav, 2016).

Thus, DCF model is applicable in those companies with available temporal information. In this sense, the estimation of FCF will need a forecast analysis for which the data along a number of years are required. For those companies without this temporal availability (such as new firms or reduced size companies), an alternative approach should be proposed.

4.2.2. Determine spatial comparable companies

Given the extent to which we have available spatial information for firms' environment characteristics, our proposal is based on this spatial information. Thus, in this case, we should identify the spatially comparable companies. This definition is based on the financial literature applied in valuation methods of multiples that suggests that it is possible to extrapolate information using a group of similar companies as a reference. This peer group should consist of at least two and up to a maximum of ten comparable companies (Schreiner, 2009). A comparable firm is one with financial indicators that are similar to the firm being valued (cash flows, growth potential and risk). The more similar the comparable companies are to the firm being valued, the greater the degree of comparability is and the more information they provide (Eberhart, 2001). It would be ideal if we could value a firm by looking at how an exactly identical firm (in terms of risks, growth and cash flow) is valued. But, in most analyses, researchers define comparable firms to be other firms in the same firm's business or businesses. The implicit assumption being made here is that firms in the same sector have similar risk, growth, and cash flow profiles and, therefore, can be compared with considerably more legitimacy (Damodaran, 2016). If there are sufficiently numerous firms in the industry to allow for it, this list is pruned further using other criteria, such as only firms with a similar size may be considered. In this context, the distinction between small and large firms can make significant contributions (Alford, 1992). In general, large firms are less risky because their international scope gives them better access to customers and produces recurring revenues. Furthermore, economies of scale and economies of scope provide potential cost savings. However, *what happens with the geographical element in this context?* We have the reference of Schreiner (2009) that recommends choosing comparable companies from the same country or region for two reasons. First, the main competitors of small firms are typically other regional players. Second, and even more important, small firms heavily depend on the economic situation of the region in which they operate. Regarding the financial literature, we identify several examples that conclude that financial decisions of geographically close SMEs are interconnected. The explanation of this conclusion is based on the fact that reduced size companies work with asymmetric information by reducing their capacity to make financial decisions (Leary and Roberts, 2014). Thus, SMEs are more likely to mimic the financial policies of their neighbours to improve their performance (Reppenhagen, 2010).

Thus, considering the relevance of geography for SMEs, we define *geographical comparable companies* by selecting companies' functionally different criteria (size or the main activity of the company) and adding the geographical factor. In order to include geographical comparable companies, we consider the geographically close companies to the aimed company for which we are computing the value. But, *how many neighbouring companies should we consider as geographically comparable companies to each examined company?* There is not a general answer here but it depends on the specific characteristics of the territory, density or economic development where the aimed company i is located. Here, our proposal is based on the application of spatial econometric techniques to determine the number of *geographical comparable companies* that should be considered in each case. In particular, we establish a neighbourhood criterion based on the geographical distance between companies. In particular, we consider the s closer companies to each company i as its neighbours. s reflects the dependency order in firms' valuations or, in other words, the number of neighbours companies with valuations interconnected between them. To determine s, we apply the spatial dependence Moran's I test (Moran, 1950). This test measures the overall spatial autocorrelation of a variable. Thus, the test evaluates whether the value of a variable in a unit i (which in this case is a company) is similar to the others surrounding it. The null hypothesis indicates that there are no spatial associated patterns. A positive and significant Moran's I test indicates clustering while a negative and significant value indicates dispersion. Formally, Moran´s I test follows the expression (4.1) (Moran, 1950). After standardization, Moran's I test asymptotically follows a normal distribution.

$$I = \frac{n}{S_0} \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} (x_i - \bar{x}) w_{ij} (x_j - \bar{x})}{\sum_{i=1}^{n} (x_i - \bar{x})} \tag{4.1}$$

where x_i and x_j represent the value of the variable x in different companies with $i, j = 1,2..., n$. $\bar{x}$ is the average value of the variable x, and w_{ij} represents the (i, j) element of the known as weight matrix (W). This matrix connects units (companies) in the analysed sample. In particular, we define W as a binary weight matrix in which elements $\mathrm{w_{ij}}$ take the value of 1 if the companies i and j are neighbours and 0 otherwise. By definition, the elements in the main diagonal are equal to 0. Based on the geographical distance, we consider that each company i is connected with its s nearest neighbours. Following the previous literature, we adopt the row-standardization of the weight matrix W. To identify the most adequate s value, we develop an iterative procedure in R software to compute the Moran's I tests for the different companies in our sample by considering different s values. Then, we select the s value that maximizes the significance of Moran's I test for all the companies. Finally, S_0 is the sum of all the elements of the matrix W and n is the number of observations.

4.2.3. Compute the value of the objective company from a geographical proposal

Once the number of geographically comparable companies s is identified, we define a Spatial Economic Value (SEV) for the company i by applying (4.2)

$$SEV_i = {(\sum_{m=1}^{s} EV_m)}/{s} \tag{4.2}$$

where EV represents the Economic Value of each spatial comparable company by applying the DCF model presented in Chapter 2.

4.3. Empirical application

4.3.1. Database and sample

To show our proposal, we use the SABI database (Iberian Balance Analysis System) that provides financial and accounting information on Spanish companies. We choose companies working in the agri-food sector by following the National Classification of

Economics Activities (NACE, 2007[5]). In addition, we select companies located in the province of Murcia. To overcome the limitations caused by the lack of information, we drop those observations with missing values, those having anomalies in their financial statements and firms with negative cash flows. The data covers information over the period from 2010 to 2014. In addition, the SABI database provides the geographical coordinates of each company. We obtain a sample of 511 non-listed agrarian companies. From this information, in order to get a homogeneous sample of comparable companies, we select those companies in the fruit subsector and those with reduced size[6]. The following Table 4.1 shows the sample distribution for different sizes, sectors and ages.

Table 4.1. Sample characteristics of agri-food companies in Murcia. Average values (2010-2016) in percentages on the total value.

SIZE[(2)]	**Cases[(1)]**	**Percentage**	**Definition**
Micro	312	61	Less than 10 employers
Small	159	31	From 10 to 50 employers
Medium	40	8	From 51 to 250 employers
TOTAL	**511**	**-**	
SUB- SECTOR[(3)]	**Cases**	**Percentage**	**NACE code**
Cereals	85	16	111, 4621
Fruits	280	54	112,122, 123, 124, 125,4631,1032,1039
Meat	53	10	141,1053,1054
Support	33	6	161,162, 1091
Other activities	60	14	NACE codes corresponding with the agri-food sector and not included before
AGE[(4)]	Cases	Percentaje	
Middle age	349	68	From 5 to 24 years
Old	162	32	more than 25 years

[(1)] Cases represent the count of which firms operate in covering the 511 cases in the sample: [(2)]European Commission on 6 May 2003. [(3)]NACE 2009. http://ec.europa.eu/eurostat .[(4)] Following Berger and Udell (1998) and the characteristics of our sample, we established two groups based on their age: middle-aged firms (10 to 24 years) and old firms (more than 25 years). There are not companies in the sample with less than 5 years old.

Small companies account for 61% of the sample. In addition, there is a high percentage of companies with less than 25 years in business. Finally, the productive activity in Murcia is concentrated in the Fruits subsector, which represents 54% of the sample.

[5] http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2

[6] We select the Fruit sector because of the high number of companies in this group (54%).

4.3.2 Variables: economic valuation based on DCF

To evaluate the Economic Value (EV) for each company, we apply the DCF model (2.5) and (2.6) with t=2015..,2019 and l =5. To estimate the FCFs for the next five years (2015-2019), we determine the evolution of its main components based on the historical sales of each company in the sample and a regression analysis to extrapolate future sales (Alekneviciene et al., 2013). Once future sales are estimated, FCFs (2.6) are computed by applying the mean of the annual past values of the proportion (ratio) that each FCF component represents with respect to historical sales (Alekneviciene et al., 2012). The discount rate (k) is calculated applying (2.3) with the costs of debt (k_d) computed as the ratio of interest expenses to the financial debt of the company. k_e is evaluated from (2.1) where the risk free rate (R_f) is represented by the 10-year government bond interest rates[7]. The market risk premium (P_m) is the average historical differential between the market returns and the risk-free rates during last years. We obtain these data from Damodaran's webpage[8] that provides the market risk premiums by industries and countries. The specific business risk (P_e) is computed by (2.2) where the financial profitability of firm i after interest and taxes (i.e., ROE) is obtained from firms' accounting information and market return values from Damodaran's webpage. Finally, we calculate the Residual Value (RV) by applying the Gordon model that assumes that FCFs will grow at a constant rate (g) after the estimation period. Analytically, see expression (2.7).

4.3.3 Economic Value Based on Spatial Information

To show our proposal to determine the Spatial Economic Value (SEV), we develop a simulation analysis based on the available sample of agri-food companies. In particular, we select fruit companies with reduced size in order to obtain a homogeneous sample of comparable firms (Eberhart, 2001). After we select these companies, we obtain a sample of 280 firms for which we compute the EV by applying the DCF model. The next Table 4.2 show the EV distribution according to some firms' characteristics in the sample.

Table 4.2. Economic Value distribution for the Fruit subsector (in logarithm).

[7] We get this information from www.datosmacro.com providing financial information for different Spanish markets.
[8] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/home.htm

		Mean	SD
Size[1]	Micro	6.8807	1.5919
	Small	8.4215	1.5430
	Medium	9.6274	1.5919
Age[2]	Middle Age	7.2444	1.7111
	Old	8.4718	1.7134
(1)European Commission on 6 May 2003.(2) Following Berger and Udell (1998) and the characteristics of our sample, we established two groups based on their age: middle-aged firms (10 to 24 years) and old firms (more than 25 years. There are not companies in the sample with less than 5 years old.			

Table 4.2 shows a positive relationship between the size of the company and the age and the EV. This result coincides with the previous literature that states that larger and older companies enjoy the advantages of economies of scale and greater market presence, which result in positive results for these companies and higher values (Chen, 2010). The next step is to examine the spatial autocorrelation Moran's I test for the EV in the sample. Table 4.3 shows this result.

Table 4.3. Moran's I test for EV

K	Moran I	p-value
1	0.6261	0.2656
2	-0.3154	0.6237
3	-0.1213	0.5482
4	0.2270	0.4102
5	0.4146	0.3392
6	1.2783	0.1005
7	1.4847	0.0688
8	2.1738	0.0148
9	1.8841	0.0297
10	1.7961	0.0362
11	2.0297	0.0211
12	2.0405	0.0206
13	1.9131	0.0278
14	1.7963	0.0362
15	1.8793	0.0301
16	1.7922	0.0365
17	1.7765	0.0378

18	1.622	0.0523
19	1.7230	0.0424
20	1.8371	0.0330

We found p-values less than 0.09 with $s = 7$. Therefore, the null hypothesis of non-spatial auto-correlation is rejected, indicating that fruit firms' values are related to their neighbours' economic values when neighbours' orders higher than $s = 6$ are considered. However, *what would be the optimum s value to determine spatial comparable companies?* To determine the s value that best fits the SEV (4.2) and minimizes the difference EV-SEV, we develop an iterative process in R software that maximizes the spatial autocorrelation structure in the sample by maximizing the significant value for the Moran's I test. By applying this procedure, we get that s=11 minimizes the difference between valuations with EV-SEV=0.0804. Thus, in order to obtain the SEV for reduced-size fruit companies in Murcia from which there is no available temporal information, we compute the SEV by applying (4.2) with $s = 11$.

4.3.4 Limitations of the SEV

Regarding previous literature, we find that the different valuation models are based, apart from market characteristics, on the own firms' characteristics. Thus, the important limitation of the SEV is that it is based only on external information without considering firms' specific characteristics. Thus, by applying just spatial information, we could get a positive valuation of a company i when it has negative financial ratios because we are not considering its internal financial information. To overcome this limitation, we modify our initial proposal (SEV) by combining both spatial information and financial information. In particular, we propose a general spatial specification by defining a spatial first order autoregressive model with first order autoregressive disturbances as in (4.3) (LeSage and Pace, 2010).

$$\mathrm{y} = \rho \mathrm{W_M y} + \mathrm{X}\beta + \mathrm{u} \text{ with } \mathrm{u} = \lambda \mathrm{W_E u} + \varepsilon \qquad (4.3)$$

In this equation, y represents a $(280\text{x}1)$ vector of the economic valuations from the DCF method for each fruit firm i in the sample, $i = 1, \ldots, 280$, and X is the $(280 \times (r+1))$ matrix containing a constant term and a set of variables r that takes into account the financial firms' characteristics. In particular, we include indebtedness as measured by the

Debt Equity ratio (DEBT) that is calculated as Total Liabilities over Total Assets. Profitability is computed as the Profitability Ratio (PROF) with Net Operating Income divided by Total Assets. Sales growth (CCTO) is computed as the annual sales growth rate, SIZE as the logarithm of Total assets and AGE as the logarithm of the number of years of the company since its constitution. W_M and W_E are (280×280) spatial contiguity matrices that define the connections between the companies in the sample, u is a (280×1) vector of the spatially correlated residuals and ε is a (280×1) vector of normally distributed errors with mean zero and variance σ^2. Spatial interaction effects are tested by the coefficients ρ that represents the spatial lag coefficient and λ that measures the spatial autocorrelation for the residuals u. To estimate this model, we apply the Maximum Likelihood (ML) procedure (Elhorst, 2010). In addition, we apply the Lagrange Multipliers (LM) tests to contrast the spatial structures in the model. The null hypothesis of the LM tests evaluates the absence of spatial correlation. In particular, there are two LM tests, LM-LAG and LM-ERR. The first contrasts the existence of spatial correlation in the dependent variable $(W_M y)$, whereas the second (LM-ERR) contrasts the existence of spatial autocorrelation in the error term $(W_E u)$ (Anselin et al. 1996). Florax and Former (1992) proposed selecting the adequate spatial structure by comparing these LM tests. In this sense, if the LM-LAG is significant and the LM-ERR is not, then the best spatial structure is a spatial autoregressive form in the dependent variable. However, if the LM-ERR is significant and the LM-LAG is not, then the spatial autocorrelation in the error term is considered. Finally, when we obtain significant values in both spatial structures (LM-LAG and LM-ERR), then we estimate the model (4.3). Table 4.4 shows the results for this estimation that part from an OLS model without the spatial behaviour.

Table 4.4. OLS and SAR estimations. Dependent variable EV

Variable	**Valuation model (OLS estimation)**	**Spatial Valuation model (SAR estimation)**
Constant	-0.6671 (0.832)	-2.1749*** (0.083)
CCTO	0.9141*** (0.000)	0.9665*** (0.000)
PROF	0.0473** (0.013)	0.0474** (0.010)
DEBT	0.0112** (0.005)	0.0117** (0.003)
AGE	0.4325** (0.056)	0.4481** (0.042)

SIZE	0.8088^{***} (0.000)			0.7966^{***} (0.000)	
rho (ρ)	--			0.1914 (0.007)	
Spatial Dependence Tests for OLS estimations					
LM-ERR	0.3081 (0.578)				
LM-LAG	3.5887^{**} (0.058)				
LR test (POOL-OLS vs SAR)	3.661^{**} (0.022)				
Correlation coefficient					
	CCTO	RE	DEBT	AGE	SIZE
CCTO	1	0.2041 (0.001)	0.0271 (0.068)	-0.1449 (0.021)	-0.0750 (0.235)
RE	-	1	-0.1808 (0.004)	-0.0041 (0.948)	-0.0284 (0.268)
DEBT	-	-	1	-0.1731 (0.003)	-0.0745 (0.219)
AGE	-	-	-	1	0.4756 (0.000)
SIZE	-	-	-	-	1
(*) significant at 10% (**) significant at 5% (***) significant at 1%. (+) To avoid endogeneity we have instrumentalised financial ratios DEBT and PROF and CCTO by lagging them two years					

The first two columns in Table 4.4 show the OLS estimation including firms' specific characteristics. We obtain a positive and significant sign for the explanatory variables, as was expected according to the previous literature. Regarding the spatial behaviour of this model, we compute the LM tests. The LM-LAG test is positive and significant, thus showing the existence of a spatial lag structure in the model, whereas the LM-ERR is not significant. Thus, the specification (4.3) is transformed into an SAR model as in (4.4), where the spatial weight matrix (W_M) is based as a row standardized weight matrix that is based on the s closer neighbours with s=11 (according to the results we get in Section 4.3).

$$y = \rho W_L y + X\beta + \varepsilon \tag{4.4}$$

The second column in Table 4.4 shows the estimation results of the SAR specification. We obtain a spatial lag parameter that is positive and significant ($\rho = 0.1914$ ($p-value$: 0.007)). Based on the coefficients of the SAR model, we estimate the value of a company without temporal information by combining spatial and internal firms' information. In particular, for a company i, we apply the following equation (4.5) to get a Spatial-Firm Economic Value (SFEV).

$$\widehat{SFEV}_t = 0.1914W * EV_t + 0.9665 * \mathrm{CCTOV}_{t-2} + 0.0117 * DEBT_{t-2} + 0.0474 * PROF_{t-2} + 0.4481 * \mathrm{A}GE_t + 0.7966 * SIZE_t \quad [4.5]$$

4.3.5 Comparing EVs

When we compute the average value for the deviations between the SFEV and the EV by applying DCF for the fruit companies in the sample as SFEV-EV=0.00075, we determine that this difference is lower than when we calculated it as SEV-EV=0.0804. Thus, we get a better approach when both the spatial and firms' characteristics are considered in estimating the EV of a company without an extensive amount of temporal information. Specifically, we found that all the considered variables in this analysis have significant effects on firms' valuations. Sales growth and SIZE are significant at 5%, whereas indebtedness, profitability and age are significant at 10%.

4.4. Conclusions

The aims of the study are to test and propose a method to estimate the EV for firms that have short temporal histories of available data or for which it is difficult to find information. As a difference from previous studies, we consider not only financial and economic variables but also spatial factors. We observe the best results when we consider both spatial and firms' characteristics to estimate the EV of a company without an extensive amount of temporal information. In this sense, we get that companies in the fruit subsector with similar values tend to be grouped in the territory and, as a consequence, it is possible to take the peers' comparable firms' EVs as reference. For reaching the best estimation, it is necessary to adjust this value with different coefficients that take into consideration the firm's intrinsic characteristics (age, size, indebtedness, profitability and sales growth). Our results are justified by the previous literature on multiple methods. It suggests extrapolating information using a group of similar companies as a reference (Schreiner, 2009; Eberhart, 2001). The implicit assumption is that firms that have similar risk, growth, and cash flow profiles that can be compared with considerable legitimacy (Damodaran, 2016). To obtain a more precise estimation, it is advisable to consider firms in the same sector and same region that are heavily dependent of the economic situation of the region in which they operate (Schreiner, 2009). Our test provides a positive sign for all the variables considered, and it is a first step in the analysis of the firms' valuation using spatial information. Thus, a promising avenue of research in this context might be to consider the spatial firms' valuations in other scenarios.

CHARTER 5: Conclusions

5.1 Conclusions and final evaluations

The overall objective of this dissertation was to analyze the impact of the geography on SMEs' valuation. To get this purpose, the overall objective was split into three sub-objectives that were addressed in Chapters 2-4.

Chapter 2 was a first step in understanding the mechanisms from which the geography influence on agrarian firms' valuations. We started from the DCF valuation method for no listed companies, we showed an empirical application on a sample of Spanish agrarian companies located in Murcia. The aim of this study was to determine whether the geography, evaluated though the distance between agrarian companies and from them to some strategic points, has a significant and measurable influence on agrarian companies' values. To achieve our purpose, we developed the empirical application with the aim to tests the effects of the geography, evaluated through its proximity to peer companies and to external strategic points (such as city centres, shopping centres, road nodes, airports, train stations, technological centres and industrial parks) on these firms' value.

Chapter 3 analyzed the effects of geographical proximity on valuation in agri-food companies taking into account regional heterogeneity through two different municipalities in Spain. We got a sample composed by 306 non-listed agrarian companies: 106 located in Murcia municipality and 228 are located in Madrid and test hypothesis that agri-food firms' values are influenced by their neighbors' values. According to the previous literature, our results showed how the geographical positioning of the firm in relation to external actors provides advantages to these companies reflected on their economic valuations. The importance of spatial variables on agri-food firms' valuations was confirmed in both municipalities finding interesting differences between territories.

Chapter 4 proposed a method to estimate the EV for firms that have short temporal histories of available data or for which it is difficult to find information. In this chapter we selected companies located in the province of Murcia and observed the best results considering both spatial and firms' characteristics to estimate the EV of a company without an extensive amount of temporal information.

5.2. Synthesis of result

Charter 2 reveals that geography plays an important role in the determination of the agrarian firms' valuation. Our results show that accessibility, measured through geographical proximity from firms to external facilities, and agglomeration effects, evaluated by geographical proximity among peers, is determinant on firm's valuation. Our test corroborates this hypothesis indicating a significant and positive spatial autocorrelation effect for agrarian firms' valuations. Specifically, taking spatial autocorrelation into account using spatial lag and spatial error models, we find that geographical proximity from firms to technological centres, industrial parks, shopping centres are significant determinants of the value of SMEs in agri-food sector.

Charter 3 supports previous findings of significant and positive spatial autocorrelation effects for agri-food firms' values. In addition, we show more evidence developing an empirical application for different regions with dissimilar economic characteristics. In the most developed region, agri-food firms receive benefits from agglomeration economies. The density variable is significant but show non-linearities implying that an overrepresentation of similar economic activity does not generate substantial localization economies. Furthermore, SMEs' values in the sample get benefits from the geographical proximity from these companies to universities and research centres in the less developed region.

Charter 4 proposes a method to estimate the valuation of firms with scarce temporal information. The method is built based on the hypothesis that the geography influence on SMEs' valuation. Therefore, we combine financial and economic short term information from the companies with geographical SMEs' characteristics of their closest environment to propose an economic value based on spatial information. Our results indicate that differences between traditionally applied valuation methods and our proposal are minimum.

5.3 Main conclusions.

- *Agglomeration effects:* More specialization derived from firms of the same sector locating in each other's proximity allows greater information spillovers and favour higher firm's values.

- *Accessibility:* lower transport cost and better links with customers and suppliers will provide more intense flows of information between companies increasing their valuations.
- *Control variables:* the size and the age positively affect agrarian firms’ valuation. In other words, mature and large firms will have higher valuations. The reasons for this result are associated with the specific characteristics of small and young firms that make them riskier and with a higher probability of bankruptcy.
- *Financial and geographical information:* estimating the EV for firms that have short temporal histories of available data or for which it is difficult to find information we observe the best results when we consider jointly spatial and firms’ characteristics.

5.3 Future research

This dissertation is a first step into the analysis of the geography on firms’ valuation. Thus, a promising avenue of research in this context might be to consider the effects of the geographical proximity on agrarian firms’ valuation in other sectors and regions.

Our findings could be useful to managers, policymakers and researchers. Administrators and legislators should take into account the important role played by research centres and universities to increase agri-food firms’ values in less industrialized areas taking into account the areas of influence of these R&D agents. Additionally, dense environments formed by industrial parks, scientific centres, universities and marketplaces, well connected to cities offer benefits to companies directly quantifiable through their values. Academics on valuation should take in account the environmental characteristics in which agri-food companies are positioned in order to determine their values highlighting the significant role of agglomeration and more developed areas on the spatial distribution of these series. This field of research is an interesting future avenue of investigation since numerous geographic aspects concerning business’ valuation remain underexplored. Unknown are the mechanisms transmitting knowledge spillovers on firm value and to refine remain the technique how combine spatial and financial variables in valuation models. Finally, our results need to be refined and other scenarios and different environments should be considered for corroborating our hypothesis and, in order to define the geographical variables, alternative procedures could be considered.

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List of acronyms applied in the text

ANAV	Adjusted Net Asset value
CAPM	Capital Asset Pricing Model
D	Debt
DCF	Discount Clash Flow
D&A	Depreciation and Amortization
E	Equity
EBIT	Earnings Before Interest and Taxes
EC	European Commission
EV	Economic Value
FCF	Future Cash Flows
GAAP	Generally Accepted Accounting Principles
GDP	Gross Domestic Product
I	Investments in Non-current Assets
IMP	Impairments
INE	Instituto Nacional de Estadística
LM	Lagrange Multipliers
LR	Likelihood Ratio
ML	Maximum Likelihood
NACE	National Classification of Economics Activities
OLS	Ordinary Least Square
PYME	Pequeña y Mediana Empresa
ROE	Return on Assets
RV	Residual Value
SABI	Sistema Annual de Balances Ibéricos
SAC	Spatial Autocorrelation Model
SEM	Spatial Error Model
SEV	Spatial Economic Value
SFEV	Spatial Financial Economic Value
SLM	Spatial Lag Model
SME	Small and Medium Enterprises
WACC	Weighted Average Cost of Capital
ΔWC	Working Capital Changes