A DEEPER LOOK INTO THE GEOGRAPHIC AND PRODUCT DIVERSIFICATION-PERFORMANCE RELATIONSHIP

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Primer borrador

Abstract

This chapter extends previous empirical studies developing separate hypotheses in which each type of diversification may moderate the performance of the other type differently. Wet also expands previous results exploring the side effect of product and geographic diversification on relationship between company performance and other firm characteristics. For this propose, we used a novel panel data set comprising 85 Spanish listed companies from non–financial sectors during 2006–2011 and We conducted a Structural Threshold Regression correcting for the endogeneity of both types of diversification and firm specific characteristics. The results reveal that geographic diversification positively influences the product diversification–performance relationship. But product diversification has no clear impact on geographic diversification-performance relationship. Further, results portray that a minimal upfront investment in geographic diversification strategy is needed to generate a positive effect on product diversification performance. Finally, product diversification has a significant positive side effect on liquidity performance and geographic diversification shapes the long-term debt performance. The findings imply that the combination of both, product and geographic strategies, are needed to fully determinate diversification performance. Further, this paper offers guideline for managers to improve firm performance by combining both strategies.

Keywords - Geographic diversification, Product diversification, Firm performance, Spanish firms, Structural Threshold Regression.

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Introduction

An increasing number of companies are diversified in products and foreign markets at the same time. Nowadays, it is difficult to find listed companies not diversified in product or geographic diversification. Firms seeking to expand the scope of their activities can do so by encompassing in dimensions of geographic as well as product markets (Bowen & Wiersema, 2009; Kumar, 2009; Mayer et al., 2015; Ref, 2015). Theories as resource-based and transaction-cost describe similar mechanisms through which product and geographic diversification can impact firm performance, as synergies, building capabilities, or increases in coordination and governance cost (Bowen & Wiersema, 2009; Hitt et al., 1997; Hitt et al., 2006; David J. Teece et al., 1997). However, product and geographic diversification are usually analysed as different corporate diversification strategies with their own effects on firm performance (Kirca et al., 2011; Peng & Delios, 2006)[1]. Firms involved in both types of diversification can generate additional costs and benefits which cannot be taken into account analysing only product or geographic diversification. Consequently, analysing both strategies together provide a more effective understanding of product and geographic diversification-performance relationship.
Although there are a few studies that have tried to examine the interaction between the two strategies, they provide mixed evidence. Whereas Geringer, Tallman, and Olsen (2000) and S. Tallman and Li (1996) did not find significant effects of the interaction on firm performance, Garrido-Prada, Delgado-Rodriguez, and Romero-Jordán (2016) and Hitt et al. (1997) found positive relationship. Further, Chang and Wang (2007) and Y. Chen et al. (2014) showed that while related product diversification positively influences the performance of multinational firms, unrelated product diversification negatively moderates the geographic diversification–performance relationship. And finally, Oh and Contractor (2012) portrayed that product diversification moderate positively geographic diversification in distant regions but negatively in proximate regions.

One possible explanation of the mixed results is the causality assumptions. Previous studies assume and justify that product diversification strategy influences the geographic diversification–performance relationship. However, Hitt et al. (1997) or Hitt, Hoskisson, and Ireland (1994) have found more complex relationship between both strategies, suggesting that geographic diversification is also a moderator of the product diversification–performance relationship and that product and geographic diversification also can affect other key variables

[1] Some studies use alternatives terms for geographic diversification such as global diversification, degree of internationalization or multinationality. In this article, geographic diversification means a firm's sales level of international expansion into different geographic locations, or markets, measure through Entropy and Herfindahl index.

of the firm**.** Thus, on the one hand, the direction of the influence can go from geographic diversification to product diversification performance, upside down, or be mutual. And on the other hand, both strategies may also influence some control variables generally used in models of corporate diversification which may change the net impact of product and geographic diversification on firm performance. For instance, Kuppuswamy and Villalonga (2015) and Hovakimian (2011) found that product diversification generates financing and investment advantages in the last period of financial crisis. Hence, the relationship between both strategies and their potential effect on some control variables need to be analyzed and controlled to fully understand how both strategies influence firm performance.

Further, previous studies are kindle aware to address whether be diversified is a firm's endogenous choice. But it is also important to address endogeneity bias from omitted firm specific characteristics or capabilities (Abdallah et al., 2015; Bowen & Wiersema, 2009). Firms can generate sustainable competitive advantage through resources and capabilities unobservable in the dataset, but that determine the performance of the firm. Therefore, failure to correct for any type of endogeneity may led to the wrong causal inference (Abdallah et al., 2015).

Finally, another reason is the bias that can occur when measuring related product diversification through the NACE code, or other similar as NAICS code[2]. These types of codes are widely used to measure product diversification but they have limitations (Villalonga, 2004). Firms exercise considerable discretion in disclosing segment–level information. The extent of disaggregation in segment reporting is much lower than the true extent of a firm's product diversification. Firms tend to aggregate related product segment into a single segment report, causing a bias in the measure of "related product diversification". This potential bias has serious implications for the statistical validity of prior findings.

This paper addresses these concerns by adopting an integrative framework that allows us to contribute toward understanding the complex interdependences between product and geographic diversification strategies on firm performance. Particularly, we theorize how geographic diversification may influences product diversification-performance relationship. This expand previous studies focus mainly on the effect of product diversification on the performance of geographic diversification. We examine the bidirectional influences between both types of diversification on firm performance. We developed separate hypotheses in which each type of diversification may moderate the performance of the other type differently. To enlarge the

[2] NACE: European Classification of Economic Activities; NAICS: North American Industry Classification System.

evidence of interaction, which symmetrically relates the influence of one type of diversification to the performance of the other type (Brambor, Clark, & Golder, 2006). We used a fixed–effect threshold regression model following the method proposed by Kourtellos et al. (2015). This technique is appropriate for several reasons. Firstly, to capture whether the product diversification–performance relationship changes due to the level of geographic diversification and vice versa. Secondly, to let product and geographic diversification influence the control variables and to detect the threshold, rather than selecting it arbitrarily. Thirdly, to calculate the effect of both types of diversification on firm performance under and above the threshold. And additionally, to control for the potential endogeneity of both types of diversification and firm unobserved characteristic. Finally, we measure product diversification as "*unrelated product diversification*" to avoid bias measuring this strategy.

The remainder of this paper is organized as follow: section 2 provides the theoretical background and the hypotheses. After that, We explain the data, method and variables in section 3. We report the results in section 4 and finish with a discussion and the conclusion of this research.

Theoretical background and hypotheses

In this section, we review the main theoretical domains to identify how the combination of product and geographic diversification determines firm performance and how product diversification–performance relationship is influenced by geographic diversification, and vice versa. Firms are dynamic organizations where the effects on firm performance of a strategy are determined by other strategies. Product and geographic diversification strategies are interdependent since both require investment commitments to leverage resources, technology, or capabilities into geographic and product markets (Bowen & Wiersema, 2009; David J. Teece, 1982). These interconnections between both strategies not only affect the degree of product and geographic diversification if not the performance of each strategies.

Starting by the mutual effects, when the company is involved in both types of diversification, there are greater opportunities for synergies. From the resource-based view, using common distribution channels, brand names, networks, production facilities, or marketing strategies, firms may enhance efficiency and reach higher levels of economies of scale and scope compared with other firms undiversified in both dimensions (Chang & Wang, 2007; Zahra et al., 2000; Zhou, 2011). Furthermore, the Industrial Organization theory advocates that by gathering different product segments and overseas market, the firm can achieve greater market power in relation to suppliers, customers and competitors (Palich, Cardinal, & Miller, 2000). However, the combination and expansion of product and geographic diversification requires substantial

amounts of managerial time and effort and may erode the benefit of synergies (David J. Teece, 1982; Vermeulen & Barkema, 2002; Zhou, 2011). According to the transaction cost theory, firms are pushed to markedly increase coordination and administrative costs to integrate their business and overseas segments (Wiersema & Bowen, 2008).

Following by the effect of geographic diversification on the product diversification-performance relationship, geographic diversification offers the possibility of increasing the potential markets, customers, suppliers and investors for each of the firm's product segments (S.-H. Lee & Makhija, 2009). On the one hand, based on the real option perspective, when firms are involved only in home country markets for their business lines, they are subject to the characteristics and boundaries of those markets. So far, when firms are also present in international markets, this increases their options and the likelihood of accessing in advance to foreign technology, extra information for any firm's business lines or take advantage of market inefficiencies (Williamson, 1981). Further, the possibilities for optimizing investment through preferential access to information are much higher when the company is also geographically diversified. For instance, through being present in international regions, changes in customer preferences, the cost of resources or regulation policies may be anticipated. Thus, managers can readapt more efficiently to the new scenario, taking advantage of the information gathered in international markets to improve the performance of any of their product segments.

On the other hand, geographic diversification may provide a flexible strategy for managers, enhancing their potential to adapt to changes in the environment and to invest efficiently (Kogut & Kulatilaka, 2001; S.-H. Lee & Makhija, 2009). Managers can mitigate product segments constraints –and rigidities– by expanding their activities overseas enhancing efficiency in resources allocation. Firms may find it easier to transfer intangible assets and tacit knowledge to various overseas markets rather than to other dissimilar product segments. Thus, companies can respond rapidly to unanticipated –and anticipated– downward changes in domestic or international demand, shifting sales and investment to other markets and segments by exploiting multinational networks for their different business lines (S.-H. Lee & Makhija, 2009; Shaver, 2011). This flexibility provided by geographic diversification may be even higher having an established exporting infrastructure. Geographic diversification expansion is usually developed on business lines already known to the company (Ref, 2015), and in similar cultural markets (Gomes & Ramaswamy, 1999), which may help reduce the costs of entry barriers and increases the adaptability of the company to the new market. This enables managers to implement more expeditiously the necessary adjustments to generate sustainability as a competitive advantage and fix imbalances in the firm's product segments. Hence, flexibility is an important moderator that positively impacts the product diversification–performance relationship.

Finally, geographic diversification also strengthens the dominant position in a negotiation (J. Li & Yue, 2008). Geographically diversified firms have greater access to resources, information and flexibility, which afford a better position in negotiations with groups (e.g. employees, suppliers or institutional agencies). In companies that are only product–diversified, the negotiation power depends on the ability to transfer technology and resources among their different business lines (Bowman & Helfat, 2001). However, when companies are also involved in geographic diversification, with similar technology and resources, they have extra alternatives in a failed negotiation, reducing potential losses and improving their dominant position. Similarly, firms that are able to internationalize and increase their geographic diversification send signals to the market regarding their competitiveness. These signals may attract customers and investors, to any product segments who otherwise would not have been part of the range of possibilities, to their business lines. For instance, using a successful and well know brand to any of the product or geographic segment.

In the opposite direction, product diversification may also positively influence the geographic diversification–performance relationship. Apart from the benefit of synergies, a company's capability to generate economies of scale and scope depends on the ability to transfer knowledge, technology and shared resources to their different business and geographic segments. In this sense, managers learn from past experience of product diversification, applying more efficient mechanisms to facilitate transactions across overseas markets and facilitating the decision making process (Chang & Wang, 2007; Hitt et al., 1997; Mayer et al., 2015; David J. Teece et al., 1997). Thus, the lessons learned from product diversification assist managers to increase geographic diversification performance by reducing transaction costs for implementing and sharing new processes, knowledge or technology.

Further, through product diversification companies can achieve higher levels of internal capital market efficiency (Hovakimian, 2011; Kuppuswamy & Villalonga, 2015). This internal capital market can give the firm the chance to invest in product and geographic segments that would otherwise not be possible. For instance, firms can stop investments for a particular segment by transferring these funds to another more profitable segment or to an international market.

The intensity of the moderating effect of product and geographic diversification on the other type of diversification may differ depending on the firm's background, as well as other internal and external factors. We have controlled this fact using firm fixed effects and assuming that product and geographic diversification are endogenous variables in my model. But the data includes the recent economic crisis period (2008–2011). A period of economic crisis requires resources, capabilities, and strategies that are fundamentally different from those that are likely to lead to success in more stable markets (Kogut & Kulatilaka, 2001; S.-H. Lee & Makhija, 2009).

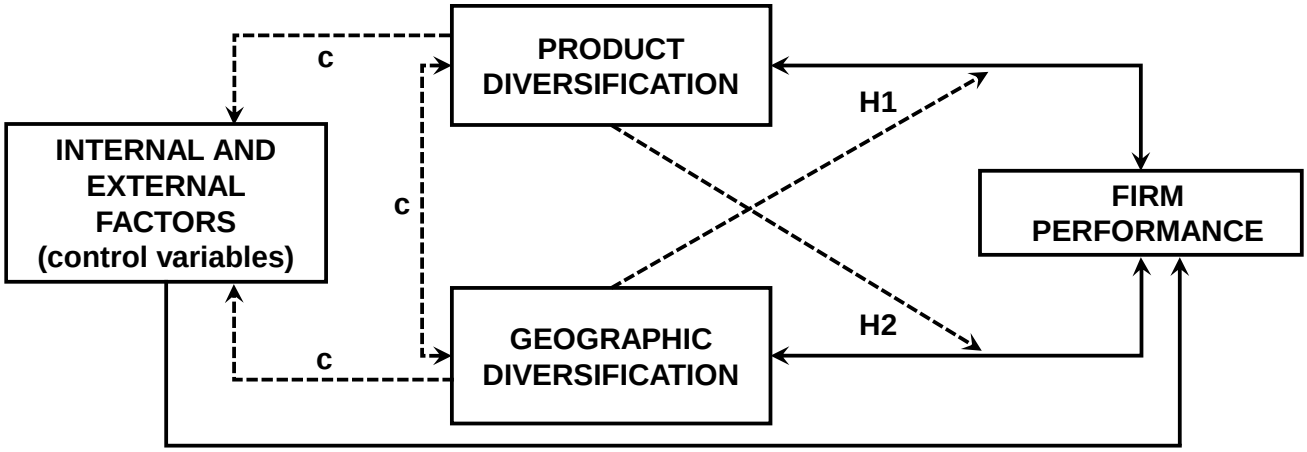
Thus, although the channels through which geographic (product) diversification influences the product (geographic) diversification–performance relationship are the same as explained above, their intensity and weight may differ. Under this circumstances, we suggest that the potential benefits of flexibility, negotiation power, access to information and synergies can surpass the costs of dealing with firms' more complex environmental and internal structures. Additionally, product diversification can improve geographic diversification performance through managers' experience, potential synergies and the promotion of the internal capital market. Thus, we propose the following hypotheses:

Hypothesis 1. Increased geographic diversification positively moderates the product–diversification performance relationship.

Hypothesis 2. Increased product diversification positively moderates the geographic diversification–performance relationship.

The above hypotheses are sketched out in my research framework. Figure 1 shows that the effect of product and geographic diversification on firm performance is moderated by the other type of diversification. Firm performance is also affected by internal and external factors which are included as control variables. Finally, the level of geographic and product diversification is determined endogenously depending on the other type of diversification. See section 3 for a full understanding of the research model.

Figure 1. Research Model.



A solid line arrow means direct relationship whereas a dotted (dashed) arrow implies moderation effect. *C* means relationship controlled in the model using Structural Threshold Regression.

Data, method and variables

I built a balance panel database of independent Spanish listed companies from 2006 through 2011, not belonging to the financial sector[3](See Appendix B in chapter 2 for further information about the database used in this chapter and chapter 1). We gathered raw corporate diversification data extracting the product and geographic segments information for each company and year directly from their annual reports, which follow the International Financial Reporting Standards Operating Segments (IFRS 8). Each of the product segments has an associated NACE2009 activity code. This database allows, first, to select companies with autonomous decision in product and geographic diversification strategies, in a European country generally less analysed than other regions as USA, Japan, UK, or same emerging countries. And second, to collect homogeneous data of the degree of geographic and product diversification, available freely, that is a good alternative to increase analysis of corporate diversification in European firms. The final sample includes 85 firms, the broadest balance database I can gather from the most comprehensive sample of Spanish listed firms not limited to the IBEX35 group[4].

I tested whether firm performance depends on product and geographic diversification, but I allowed for a structural break where the slope of product diversification can be moderated by geographic diversification (table 2) and vice versa (table 3). For this propose, we used the Structural Threshold Regression model described in Kourtellos et al. (2015)[5] (See Appendix A for further information). We addressed endogeneity bias from omitted firm specific characteristics or capabilities through fixed effects, assuming that firms have different resources or capabilities and belong to different sectors, which may impact performance. Further, we considered the potential endogeneity of the degree of both types of diversification, and I included control variables which can be also affected by product and geographic diversification. This model expands previous studies elaborating a joint analysis between both strategies and their direct and indirect effect on firm performance and control variables. Concretely, we fit the following regression:

$$y_{it} = \beta_1' x_{it} I(q_{it} \leq \theta) + \beta_2' x_{it} I(q_{it} > \theta) + \eta_i + e_{it} \quad (1)$$

Subscript *i* indexes firms (85 companies) and the subscript t indexes time (6 years). The dependent variable y_{it} is performance, while q_{it} is an observed threshold variable that splits the

[3] I consider that a company or corporation is independent when not more than 25% of its capital is controlled by another company or corporation. Thus, we have selected Spanish parent companies that have autonomy over their decision-making process.

[4] IBEX35: it is an index comprising the 35 most liquid Spanish stocks traded in the Spanish Stock Exchange.

[5] I used the MATLAB code provided by the authors in:
https://sites.google.com/site/kourtellos/resear/research

sample into two regimes. In this article, q_{it} is product or geographic diversification, which are treated as endogenous variables. The matrix x_{it} includes control variables and product or geographic diversification variables. The idiosyncratic error term is represented as e_{it} and η_i is the individual effects. Finally, θ is an unknown threshold parameter which determines the indicator $I(\cdot)$. The indicator values are one and zero if θ is under or above the threshold variable q_{it} respectively. The individual effects are modelled as fixed to include unobserved firm characteristics in the models controlling for heterogeneity among firms. We removed individual specific means to eliminate the individual weight η_i. Each model provides corrections for the presence of heteroskedasticity in each regime. Finally, we calculated regression slopes, under and above the threshold value, using GMM estimation controlling for the endogeneity of product and geographic diversification.

One advantage of this model is that the value θ is estimated instead of chosen arbitrarily. Concretely, threshold θ is estimated by using a two-step concentrated least squares, minimizing the concentrated sum of squared error and assuming that the threshold variable is endogenous. Following Kourtellos et al. (2015) inverse Mill ratio is introduced to ensure bias correction term in each regime. We inverted the likelihood ratio (LR) statistic to construct the confidence interval of the threshold estimator following Hansen (2000) suggestion.

I used Earnings Before Interest and Taxes to total assets (EBIT/Assets) as the measure of firm performance. The degree of product and geographic diversification was measured by the sales–based Entropy index[6]. This measure highlights sales distribution by segments, giving information on whether the company is diversified as well as the level and evolution over time of firm diversification. The degree of geographic diversification was calculated assuming 7 different regions, namely, Spain, Europe, Latin America, USA and Canada, Africa, Asia and Pacific, and a non–specified region. The non–specified region included sales reported by the firm which cannot be attributed to any of the six regions described previously. We measured the product Entropy index using a two–digit NACE–2009 code. The Entropy index is widely used to measure diversification, as in K. Park and Jang (2012), Chang and Wang (2007) or Colpan and Hikino (2005).

I controlled for variables that may affect firm performance and are widely used in similar research. Concretely, we used size, liquidity, long–term debt, intangible assets, and a dummy for the period of economic crisis started in 2008. Size is measured by total sales to test the significance of economies of scale and market power (Gomes & Ramaswamy, 1999; J. Li & Yue, 2008). Liquidity and debts, two variables highly affected in this period of economic crisis, are

[6] I used Jacquemin and Berry's (1979) definition of Entropy measure.

measured by the current ratio defined as current assets to current liabilities, and by long–term debt to total liabilities, respectively. In the case of intangible assets, these are measured as the ratio of intangible assets to fixed assets to control for the firm's fixed assets structure. Finally, a dummy variable was used to control for the period of economic crisis started in late 2008. We also include the square of each control variable, except the dummy variable, to reduce the possibility of spurious correlation due to omitted variables bias.

1. Endogeneity of product and geographic diversification.

I considered the potential endogeneity of the degree of both types of diversification. A large group of authors analyse whether being diversified is a firm's endogenous choice (e.g. Campa & Kedia, 2002; Gande et al., 2009; Villalonga, 2004), but even the level of diversification can be decided by the corporation, e.g. Increase diversification, refocus, or do nothing (Çolak, 2010). Therefore, we checked instead the endogeneity of the degree of both types of diversification. We included four additional instruments for geographic diversification: the lag of geographic diversification variable, the lag of the number of operational segments, the lag of the ratio of long–term debts and the lag of the current ratio.

The previous geographic diversification level, and previous number of operational segments are good indicators of the diversification evolution and the previous experience of managers in corporate diversification strategy (Kumar, 2009; Mayer et al., 2015; Ref, 2015; Wiersema & Bowen, 2008). The number of operational segments is based on the International Financial Reporting Standards, Operating Segments (IFRS 8), which is included in the annual reports of listed companies[7]. Managers may also make their choices depending on previous performance (C. Park, 2003; Villalonga, 2004). Previous liquidity and debt structure were two variables highly affected by the crisis, and that were taken into account by managers before making their choices. The long–term debt ratio lag, the current ratio lag, and the lag of the number of operational segments are also used as instruments for product diversification, but I have included two additional variables: product diversification variable lag and the lag of the number of regions where the company is present in each year. For models that include the diversification variables squared, we added the squared fitted values of the diversification as instruments following Wooldridge (2010). We tested the validity of the instrument selected with the Kleibergen–Paap LM rk test (under–identifying restrictions) and the Sargan–Hansen test (over–

[7] Operating segments differ from product diversification segments of the firm. The former is based on the internal structure of the firm whereas the second is associated to the NACE code. For instance, *Adolfo Dominguez*, a clothing retailer, reports 3 different operating segments based on the potential clients for its products. However, these 3 segments belong to one product diversification segment with NACE–2009 rev2.code: 4771, "Retail sale of clothing in specialised stores".

identifying restrictions), respectively. The Kleibergen–Paap LM rk test reveals that the instruments chosen correlate with the endogenous regressor, and the null hypothesis of under identification is rejected. Similarly, the Hansen J–Statistics test reveals that the instruments are exogenous (or not over–identified)[8].

Results

I started analysing the moderating effect of both types of diversification as shown in tables 2 and 3. This was followed by the robustness check. Table 1 reports the correlation matrix as well as the minimum, mean and maximum values for the variables included in the model after subtracting individual means.

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Table 1. Variables correlation

	Min.	Max.	Mean	S.d.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)EBIT/assets	-0.41	0.34	0.04	0.08	1.00										
(2)Geo. Div	0.00	1.54	0.70	0.44	-0.01	1.00									
(3)Pro. Div	0.00	1.43	0.45	0.43	-0.10	0.00	1.00								
(4)Sales (ln)	1.70	11.05	6.38	1.85	0.25	0.09	-0.05	1.00							
(5)Sales sq (ln)	2.89	122.06	44.12	25.0	-0.02	-0.03	0.05	0.05	1.00						
(6)Liquidity	0.22	7.91	1.36	0.91	0.16	-0.08	-0.06	-0.11	0.02	1.00					
(7)Liquidity sq	0.05	62.55	2.67	5.96	0.07	-0.05	-0.06	-0.11	0.00	0.82	1.00				
(8)Long debt	0.00	0.93	0.43	0.21	0.12	0.07	0.05	0.02	0.07	0.46	0.08	1.00			
(9)Long debt sq	0.00	0.87	0.23	0.19	-0.09	-0.05	-0.02	-0.07	-0.01	0.17	0.03	0.09	1.00		
(10)Intangibles	0.00	0.80	0.22	0.23	0.06	0.07	0.03	0.15	-0.05	-0.07	-0.08	0.08	0.06	1.00	
(11)Intangibles sq	0.00	0.64	0.10	0.15	-0.01	-0.02	-0.04	0.05	-0.00	-0.05	-0.10	0.05	0.11	0.70	1.00
Dummy crisis	--	--	--		-0.28	0.29	0.10	-0.15	-0.03	-0.00	-0.02	0.12	0.03	0.09	0.09

N=425. Pearson correlation partialled for fixed firm-effect

Tables 2 and 3 report the regression output by GMM with geographic diversification and product diversification, as the threshold variable respectively. Regimes 1 and 2, respectively, present the results under and above the threshold point. The Inverse Mill's ratio is included to

[8] Results of these tests are included in tables 2 and 3.

correct the potential endogeneity of the threshold variable. Firms' fixed effects were also added to the threshold estimation and in the main regression, correcting for unobserved firm characteristics. Positive values for the threshold point indicate an increase in the level of geographic (or product) diversification, whereas a negative value signals a decrease in the firm's geographic (product) diversification level.

Starting with the model in table 2, the threshold point of 0.037 represents low–medium increases in geographic diversification. The findings show that product diversification variables yield a negative coefficient (–0.1383) in regime 1, but positive (0.0323), although not significant, in regime 2. The two–tailed test of difference between two beta coefficients confirms that, in the sample, the product diversification coefficients in regime 2 are significantly higher than in regime 1 (p–value = 0.0137). This result means that geographic diversification moderates the product diversification–performance relationship. Specifically, an increase in the level of geographic diversification decreases the product diversification discount. The above results support the Hypothesis 1, that an increase in the level of geographic diversification positively moderates the product diversification performance.

Analysing the control variables, performance is positively related to company size and negatively with the period of economic crisis in both regimes. The liquidity ratio and the ratio of intangible assets are positive related to firm performance, decreasing in regime 1 but not significant in regime 2. By contrast, the long–term debt ratio reveals an inverted U–shaped relation to performance in regime 1 and significantly positive in regime 2. This result means that debt composition has an important role in the geographic diversification expansion of firms. Increasing the level of geographic diversification also means generating more benefits from the establishment of a long–term liabilities structure.

Table 3 reports the regression output allowing that geographic diversification may be determined by product diversification. The threshold point (–0.0384) is negative, representing decreasing levels of product diversification. We find that geographic diversification is significantly positive in relation to firm performance below (0.1266) and above (0.1189) the threshold.

The test of difference between two beta coefficients does not reject that both coefficients are the same (p–value = 0.9247). Thus, product diversification does not alter geographic diversification performance.

Table 2. Structural Threshold Regression. Geographic diversification as threshold variable.

Variables	Regime 1 (beta1)			Regime 2 (beta2)			Diff. betas
	Coefficient	Std. Error	P-value	Coefficient	Std. Error	P-value	P-value
Sales (size)	0.024	0.0124	0.0534	0.0569	0.0191	0.0029	
Sales Square	0.0072	0.0154	0.6397	-0.1283	0.0454	0.0048	
Liquidity	0.0473	0.0125	0.0002	-0.0064	0.0131	0.6281	
Liquidity Square	-0.0075	0.0024	0.0021	0.0006	0.0019	0.7597	
Long debt ratio	-0.0143	0.0441	0.7455	0.1085	0.0446	0.0149	
Long debt ratio Square	-0.3125	0.1299	0.0161	-0.0835	0.1303	0.5217	
Intangibles ratio	0.1071	0.0428	0.0125	-0.0127	0.0526	0.8084	
Intangibles ratio square	-0.2850	0.1459	0.0507	0.0088	0.126	0.9444	
Crisis	-0.0235	0.0051	0.0000	-0.0144	0.0062	0.0197	
Product diversification	-0.1383	0.0493	0.0051	0.0323	0.0484	0.5050	0.0137
Inverse Mill Ratio	0.0032	0.0029	0.2743				
Firms fixed effects	Included						
Threshold (1)	0.0370						
Threshold Interval	[0.0060; 0.0464]						
Nº obs. under/above	280/145						
Observations	425						
Firms	85						
R-squared adjusted	0.3712						
F	28.8166		0.0000				
Sargan-Hansen J test	5.4039		0.2483				
Kleibergen-Paap test	38.404		0.0000				

Dependent variable: EBIT/Assets. GMM estimation with product and geographic diversification as endogenous variables. Robust standard errors. Two-tailed p-values

I could not confirm that product diversification positively moderates the geographic diversification-performance relationship, rejecting the hypothesis 2. Further, the wide confidence interval of the threshold point [–0.044, 0.056] confirms the absence of a strong moderating effect of product diversification on geographic diversification performance.

These results expand the knowledge of how both types of variables interact, because I find a unidirectional effect of geographic diversification on the performance of product diversification, but I cannot establish that product diversification moderates the performance of geographic diversification with our data.

Table 3. Structural Threshold Regression. Product diversification as threshold variable.

	Regime 1 (beta1)			Regime 2 (beta2)			Diff. betas
Variables	Coefficient	Std. Error	P-value	Coefficient	Std. Error	P-value	P-value
Sales (size)	0.0246	0.0137	0.0715	0.0242	0.0157	0.1220	
Sales Square	0.0061	0.0135	0.6517	-0.0109	0.0195	0.5751	
Liquidity	0.0034	0.0156	0.8300	0.0472	0.0124	0.0001	
Liquidity Square	0.0007	0.0038	0.8535	-0.0059	0.0019	0.0022	
Long debt ratio	-0.0215	0.0409	0.5990	0.0061	0.0350	0.8608	
Long debt ratio Square	-0.1315	0.1443	0.3620	-0.2808	0.1247	0.0243	
Intangibles ratio	0.0662	0.0509	0.1939	0.0067	0.0427	0.8759	
Intangibles ratio square	-0.1031	0.1445	0.4757	0.0054	0.1219	0.9646	
Crisis	-0.0390	0.0087	0.0000	-0.0298	0.0064	0.0000	
Geographic diversification	0.1266	0.061	0.0380	0.1189	0.0544	0.0290	0.9247
Inverse Mill Ratio	-0.0052	0.0029	0.076				
Firms fixed effects	Included						
Threshold (1)	-0.0384						
Threshold Interval	[-0.0444; 0.0564]						
Nº obs. under/above	93/332						
Observations	425						
Firms	85						
R-squared adjusted	0.3349						
F	24.7285						
Sargan-Hansen test	4.5112		0.2113				
Kleibergen-Paap test	20.611		0.0004				

Dependent variable: EBIT/Assets. GMM estimation with product and geographic diversification as endogenous variables. Robust standard errors. Two-tailed p-values.

Likewise, the results in table 2 and 3 show that firm size is positively related to firm performance, whereas the period of economic crisis has caused it to decrease. It is important to note that liquidity is not clearly related to firm performance under the threshold, but it is decreasingly positive above the product diversification threshold. Thus, product diversification

expansion produces positive side effects on liquidity performance. Similarly, the long–term debt ratio portrays an inverted U–Shaped relationship with performance in regime 2. These results evidence the potential positive side effects of product diversification in the firm's internal capital market (Hovakimian, 2011; Kuppuswamy & Villalonga, 2015).

Robustness Check

In order to validate the previous results, we conducted three additional analyses. First, we allowed that product and geographic diversification can be nonlinear in each of the two regimes, including the square term of both types of diversification. Second, we reduced the control variables eliminating their square terms to check how product and geographic diversification coefficients change in each regime. Finally, we replicated the model using the Herfindahl Index as product and geographic diversification measure. Concretely, as in other previous studies such as Y. Chen et al. (2014), or Oh and Contractor (2014; 2012), we defined the Adjusted Herfindahl Index: $AH = 1 - \sum_i^n p_i^2$, p_i being the proportion of the sales revenue from the i_{th} sector to total sales, and n the number of sectors (defined in the same way as for the Entropy Index).

Table 4. STR including the square variable of diversification under and above the threshold point.

	Regime 1			Regime2		
Variables	Coefficient	Std. Error	P-value	Coefficient	Std. Error	P-value
Controls	*Included*			*Included*		
Firms FE and Inverse Mill	*Included*			*Included*		
Product diversification	-0.1405	0.0569	0.0136	0.0196	0.0628	0.7547
Prod. diversification squared	-0.2708	0.2001	0.1761	0.1859	0.1612	0.2489
Threshold	0.0370					
Threshold Interval	[0.0368; 0.0370]					
Controls	*Included*			*Included*		
Firms FE and Inverse Mill	*Included*			*Included*		
Geographic diversification	0.0729	0.0434	0.0929	0.1283	0.0788	0.1035
Geo. diversification squared	0.0087	0.093	0.9256	-0.6498	0.5121	0.2045
Threshold	-0.0188					

Threshold Interval	[-0.0444; 0.0564]

N=425. Dependent variable: EBIT/Assets. GMM estimation with product and geographic diversification as endogenous variables. Robust standard errors. Two-tailed p-values.

Table 5. STR excluding the squared control variables.

	Regime 1			Regime2			
Variable	Coefficient	Std. Error	P-value	Coefficient	Std. Error	P-value	Diff. betas P-value
Controls	*Reduced*			*Reduced*			
Firms FE and Inverse Mill	*Included*			*Included*			
Product diversification	-0.1448	0.0574	0.0116	0.0026	0.0402	0.9476	0.0335
Threshold	0.0060						
Threshold Interval	[-0.0603; 0.0795]						
Controls	*Reduced*			*Reduced*			
Firms FE and Inverse Mill	*Included*			*Included*			
Geographic diversification	0.1008	0.0483	0.0367	0.1377	0.0773	0.0749	0.6826
Threshold	0.0032						
Threshold Interval	[-0.0444; 0.0564]						

N=425. Dependent variable: EBIT/Assets. GMM estimation with product and geographic diversification as endogenous variables. Robust standard errors. Two-tailed p-values.

The adjustment of the Herfindahl Index allowed a similar interpretation as for the Entropy Index used before to be maintained. Thus, the higher the index, the higher the firm's level of product or geographic diversification.

Tables 4, 5 and 6, respectively, report the slope of product and geographic diversification of the three additional analyses described above. In table 4, product and geographic diversification exhibit a linear relationship with performance within each of the regimes (under and above the threshold point). The product diversification squared coefficient is negative in regime 1 and positive in regime 2, but they are not significant. Similarly, geographic diversification slopes in the squared variables are not significant in either regime. Increased geographic diversification positively influences firm performance, which is not clearly affected by product diversification. Thus, geographic diversification reduces the downside of product

diversification on performance but is not enough to generate direct net benefits from product diversification.

In table 5, we reduce the control variables to check how the slopes of product and geographic diversification change. We do not consider the squared control variables. Product diversification coefficients are similar to those in table 2. The conclusion reached is the same as before: Increased geographic diversification increases product diversification performance, but not enough to generate a direct net benefit from product diversification. However, the value of the threshold parameter is closer to zero and is wider, representing loss of model accuracy by eliminating variables that can affect firm performance.

Table 6. STR using Adjusted Herfindahl (AH) as diversification measure.

	Regime 1			Regime2			
Variable	Coefficient	Std. Error	P-value	Coefficient	Std. Error	P-value	Diff. betas P-value
Controls	*Included*			*Included*			
Firms FE and Inverse Mill	*Included*			*Included*			
Product diversification (AH)	-0.3628	0.149	0.0149	0.0894	0.1449	0.5373	0.0284
Threshold	0.0014						
Threshold Interval	[0.0007; 0.0194]						
Controls	*Included*			*Included*			
Firms FE and Inverse Mill	*Included*			*Included*			
Geographic diversification (AH)	0.2078	0.1504	0.1671	0.3833	0.1478	0.0095	0.3989
Threshold	-0.0189						
Threshold Interval	[-0.0189; 0.0256]						

N=425. Dependent variable: EBIT/Assets. GMM estimation with product and geographic diversification as endogenous variables. Robust standard errors. Two-tailed p-values.

Moreover, geographic diversification coefficients exhibit similar values to those in table 3. This is an additional sign that product diversification has no influence on geographic diversification performance, which is also refuted by the non–significance of the difference between two beta coefficients test over the geographic coefficients (p–value = 0.6826).

Furthermore, as in the original model, the broad threshold interval again suggests that product diversification does not influence geographic diversification performance.

Finally, table 6 shows the analysis of product and geographic diversification using the Adjusted Herfindahl Index. Just as in the original model, product diversification is negative in regime 1 (–0.3628) and positive but not significant in regime 2 (0.0894). The estimated threshold point is close to zero (0.0014) indicating that an increase in geographic diversification has a positive effect on the performance of product diversification, whereas in the original model the threshold point (0.037) represented low–medium levels of increase in geographic diversification. Similar to the original model, increased geographic diversification enhanced firm performance in both regimes, but product diversification did not significantly change this relationship (p–value = 0.3989).

Discussion and conclusions

I developed separate hypotheses in which each type of diversification may moderate the performance of the other type differently. We used Structural Threshold Regression as described in Kourtellos et al. (2015). This econometric technique allows us not only to capture the intensity of the moderating effect of geographic diversification on the performance of product diversification and vice versa, but also to correct for the potential endogeneity of both types of diversification.

The results reveal that geographic diversification positively influences the product diversification–performance relationship. Specifically, increasing the level of geographic diversification decreases the product diversification discount. However, increased product diversification has no clear impact on the geographic diversification–performance relationship. These results (1) confirm that geographic diversification may moderate the performance of product diversification, expanding previous studies mainly focus on the effect of product diversification on geographic diversification performance; and (2) show that each type of diversification may exerts different moderating effects on the performance of the other type. Managers should be kindle aware than both strategies should be defined simultaneously taking into account the interrelationship that both strategies generate on firm performance. Further, researchers in product or geographic diversification should control in their model by the other type of diversification to fully determinate corporate diversification performance.

I suggest that product diversification strategy may be slower to redefine than geographic diversification, in response to short–run environmental changes. The transfer of technology, resources or assets between segments is not immediate, and companies may find it easier and quicker reorganize their geographic diversification strategy rather than adapt their product

diversification strategy (S.-H. Lee & Makhija, 2009; Shaver, 2011). Therefore, the flexibility obtained by geographic diversification positively affects performance, and positively influences product diversification performance.

Additionally, results reveal that geographic diversification, after a minimal upfront investment, generates positive effect on product diversification performance. When firms have the appropriate overseas distribution channels, network and knowledge, geographic diversification may be a good strategy to fix imbalances in the demand for some of the firm's business lines. This result reinforces the idea of an initial foothold investment in geographic diversification strategy to generate net benefits, described in S.-H. Lee and Makhija (2009), and it also expands the value of geographic diversification with positive side effects on product diversification performance. From a real option perspective, it is important to keep an investment in geographic diversification to, at least, let the company to shift easily product and services if needed.

In a related vein, as in previous studies as Braakmann and Wagner (2010) or Çolak (2010), the results show that geographic diversification is a necessary condition but not enough to generate a product diversification premium. We find a negative relationship between product diversification and performance. Product diversification does not improve firm performance in any of the models used in this research. Additionally, product diversification does not moderate the geographic diversification–performance relationship. Managers use product diversification strategy is a risk reduction mechanism and as a guarantee of firm survival, but may jeopardize firm performance.

I must point out that these results hold for a period of economic crisis. Although a period of economic crisis may limit the number of opportunities firms can exploit along both dimensions of diversification (Gaur & Kumar, 2009), it can also increase or decrease the influence of the aforementioned moderators. Similarly than Kuppuswamy and Villalonga (2015) and Hovakimian (2011), who have shown that product diversification generates financing and investment advantages during a period of financial constraints because, we find that product diversification has a significant positive effect on liquidity performance. Liquidity is an internal resource for firms' investment capacity. The recent period of economic crisis was also characterized by huge financial constraints. This reflect the positive side effect of product diversification on the internal investment firm capacity.

Additionally, we find that companies which increase their level of geographic diversification gather greater returns from having a large long–term debt liability composition. Shaver (2011) finds that, in a period of economic crisis, geographic diversification mitigates investment liquidity

constraints, which may enhance firm performance. Firms that expand their level of geographic diversification also gather greater benefits from having a long–term debt ratio.

To further examine the robustness of my findings, we ran models with nonlinear product or geographic diversification under and above the estimated threshold point. We also excluded the control variables squared to check how the slope coefficients changed. Finally, we used an alternative measure for product and geographic diversification (Adjusted Herfindahl Index). In all cases, the results were similar to the findings given above.

This study has several limitations. First, we use a panel data of 85 independent Spanish listed companies, which may reduce representability of other regions or specifics sectors. Second, we cannot calculate the influence and weight of each mentioned effect (flexibility, information, governance costs etc.) on the performance of the interaction. We also assume that each effect occurs independently of the others. Thus, we have only been able to explain which factor is more influential than others through understanding the context dependency of the data. This limitation also open the door for future research focus on the effects of some specific moderators on the performance of the interaction between both strategies. Finally, the influence of both types of diversification on firm performance may differ depending on which type of diversification was implemented first. For future research, it might be interesting to test whether these results are the same in companies that face geographic diversification first and subsequently diversify into products, a pattern followed by many firms in emerging countries.

Appendix A. Summarize of Structural Threshold Regression model for our model.

These four pages summarize the model described in Kourtellos et al. (2015). We use the structural threshold regression model (STR), which is a threshold regression that allows for endogeneity in the threshold variable as well as in the slope regressors. We consider the balanced panel data where i and t are indexes for individual –firms- and time –years- respectively:

$$y_{it} = \beta_1' x_{it} I(q_{it} \leq \theta) + \beta_2' x_{it} I(q_{it} > \theta) + \eta_i + e_{it} \quad (1)$$

$$q_{it} = \pi' z_{it} + \eta_i + v_{it} \quad (2)$$

Where y_{it} is the dependent variable –performance-, q_{it} is an observed threshold variable that splits the sample into two regimes. In this article, q_{it} is product or geographic diversification. z_{it} is a vector of instruments plus the exogenous variables included in x_{it}. The idiosyncratic error is denoted by e_{it} and η_i is the individual effects term. Finally, θ is an unknown threshold parameter which determine the indicator $I(\cdot)$ with values are one and cero if θ is under of above the threshold variable q_{it} respectively. The individual effects is modeled as fixed to include unobserved firm characteristics in the models controlling for heterogeneity between firms.
For obtaining the consistent coefficient estimators, individual effects η_i must cancel out before using STR. Thus, we eliminate individual effect η_i removing individual-specific mean (Hansen, 1999). We can rewrite the equation (1) and (2) as:

$$y_{it}^* = \beta_1' x_{it}^* I(q_{it}^* \leq \theta) + \beta_2' x_{it}^* I(q_{it}^* > \theta) + e_{it}^* \quad (3)$$

$$q_{it}^* = \pi' z_{it}^* + v_{it}^* \quad (4)$$

Where $y_{it}^* = y_{it} - \bar{y}_i$; $x_{it}^* = x_{it} - \bar{x}_i$; $e_{it}^* = e_{it} - \bar{e}_i$; $q_{it}^* = q_{it} - \bar{q}_i$; $z_{it}^* = z_{it} - \bar{z}_i$; $v_{it}^* = v_{it} - \bar{v}_i$ being $\bar{y}_i$, $\bar{x}_i$, $\bar{e}_i$, $\bar{q}_i$, $\bar{z}_i$ and $\bar{v}_i$ the firm individual mean for each of these variables.

The indicators with respect to the threshold variables q_{it}^* is defined as:

$$I(q_{it}^* \leq \theta) \begin{cases} 1 \text{ iff } q_{it}^* \leq \theta \iff v_{it}^* \leq \theta - z_{it}^{*\prime}\pi : \text{Regime 1} \\ 0 \text{ iff } q_{it}^* > \theta \iff v_{it}^* > \theta - z_{it}^{*\prime}\pi : \text{Regime 2} \end{cases}$$

And $I(q_{it}^* > \theta) = 1 - I(q_{it}^* \leq \theta)$.

One of the advantages of this model is that individual observations can be divided into classed based on the value of an observed variable. Instead of choose the threshold value by ourselves, the model estimates it using appropriated econometric techniques. As Kourtellos et al. (2015) discuss, equation (2) is analogous to a selection equation that appears in the literature on

limited dependent variable models (Heckman, 1979a), but treating the sample split as an unknown parameter to estimate. They proceed to account for the "selection" bias by making the following assumptions.

$E[e_{it}^*|z_{it}^*] = 0$

$E[v_{it}^*|z_{it}^*] = 0$

$E[e_{it}^*|z_{it}^*, v_{it}^*] = E[e_{it}^*|v_{it}^*]$

$E[e_{it}^*|v_{it}^*] = kv_{it}^*$ Linear conditional expectation between the errors of the structural and the reduced form equations.

$v_{it}^* \sim N(0,1)$

Using this assumption is possible to calculate inverse Mill ratio terms as:

$\lambda_1(\theta - z_{it}^{*\prime}\pi) = -\frac{\phi(\theta - z_{it}^{*\prime}\pi)}{\Phi(\theta - z_{it}^{*\prime}\pi)}$ and $\lambda_2(\theta - z_{it}^{*\prime}\pi) = \frac{\phi(\theta - z_{it}^{*\prime}\pi)}{1 - \Phi(\theta - z_{it}^{*\prime}\pi)}$ being $\phi(\cdot)$ and $\Phi(\cdot)$ the normal pdf and cdf, respectively. We denote $\lambda_{1it}(\theta) = \lambda_1(\theta - z_{it}^{*\prime}\pi_0)$ and $\lambda_{2it}(\theta) = \lambda_2(\theta - z_{it}^{*\prime}\pi_0)$ when π is know or we can consider it as true (π_0). The Mill ratio bias correction term is required to restore conditional mean zero assumption of the error. Thus, to overcome the problem that the model cannot be analyzed regime-by-regime, we explore the relationship between the constrained and unconstrained sum of squared errors, forming the Mill ratio.

Due to the model allows for the endogeneity of product and geographic diversification when they are including as regressor in equation (3), the reduced form model for x_{it}^* is given by:

$$x_{it}^* = \Pi' z_{it}^* + v_{xit}^* \tag{5}$$

Where $E[v_{xit}^*|z_{it}^*] = 0$ with $v_{xit}^* \perp I(v_{it}^* \leq \theta - z_{it}^{*\prime}\pi_0)|z_{it}^*$. Assuming Π_0 as true values the conditional expectation: $x_{it}^* = g_{xit}^* = E[x_{it}^*|z_{it}^*] = \Pi_0' z_{it}^*$

Thus, the STR that allows for endogeneity in both, the threshold and slope variables, and the presence of regime-specific heteroscedasticity, can be written as follows:

$$y_{it}^* = \beta_1' g_{xit}^* I(q_{it}^* \leq \theta) + \beta_2' g_{xit}^* I(q_{it}^* > \theta) + k\Lambda_{it}(\theta) + u_{it}^* \tag{6}$$

Where $\Lambda_{it}(\theta) = \lambda_{1it}(\theta)I(q_{it}^* \leq \theta) + \lambda_{2it}(\theta)I(q_{it}^* > \theta)$; $u_{it}^* = \beta_1' v_{it}^* I(q_{it}^* \leq \theta) + \beta_2' v_{it}^* I(q_{it}^* > \theta) + \varepsilon_{it}^*$ and $\varepsilon_{it}^* = \varepsilon_{1it}^* I(q_{it}^* \leq \theta) + \varepsilon_{2it}^* I(q_{it}^* > \theta)$,with $E[u_{it}^*|z_{it}^*] = 0$

Model estimation.

After removing the individual effect, we estimate the reduced form parameter π and Π by OLS in equations 4 and 5, obtaining the consistent fitted values of q_{it}^*, $x_{it}^* = g_{xit}^*$ and v_{it}^*, respectively. For any θ, we define the predicted inverse Mill ratio term as:

$$\hat{\Lambda}_{it}(\theta) = \hat{\lambda}_{1it}(\theta)I(q_{it}^* \leq \theta) + \hat{\lambda}_{2it}(\theta)I(q_{it}^* > \theta)$$

$$\hat{\lambda}_{1it}(\theta) = \lambda_1(\theta - z_{it}^{*\prime}\hat{\pi})$$

$$\hat{\lambda}_{2it}(\theta) = \lambda_2(\theta - z_{it}^{*\prime}\hat{\pi})$$

Then, we estimate the threshold parameter theta $(\hat{\theta})$ by minimizing a concentrated least square criterion (S_n^{CLS}), using the predicted values of the endogenous regressors $(\hat{g}_{xit}^*)$ and the Mill inverse ratio $(\widehat{\Lambda}_{it})$ as follow:

$$S_n^{CLS}(\theta) = (y_{it}^* - \hat{\beta}_1'\hat{g}_{xit}^* I(q_{it}^* \leq \theta) - \hat{\beta}_2'\hat{g}_{xit}^* I(q_{it}^* > \theta) - \hat{k}\widehat{\Lambda}_{it}(\theta))^2$$

$$\hat{\theta} = \arg \min_{\theta \in [\underline{\theta}, \bar{\theta}]} S_n^{CLS}(\theta) \qquad (7)$$

Where $\hat{g}_{xit}^*$ includes the exogenous variables and the endogenous ones calculated with $\widehat{\Pi}$. STR technique produces consistent $\hat{\theta}$ from equation 7. To avoid select one regime with too few observation, we restrict the search to values of theta that have at least 10% of the observation in each regime.

The confidence intervals for the threshold parameter is the likelihood ratio test statistic inverted (*LRn*). This approach follows Hansen (2000) who argues that under certain conditions *LRn* yields an asymptotically valid confidence region. Concretely, *LRn* is defined as:

$$LR_n = n\frac{S_n^{CLS}(\theta) - S_n^{CLS}(\hat{\theta})}{S_n^{CLS}(\hat{\theta})}$$

The confidence intervals are asymptotically valid under the assumption that the threshold effects diminishes as the sample size increases. This suggests that the confidential interval may be wider than the desired level for large values of the threshold effect and large degrees of endogeneity of the threshold variable. Follow (Kourtellos et al. (2015)) I use a regime specific heteroskedastic correction using an Epanechnikov kernel with automatic bandwidth to correct the size of the confidential interval.

Once I obtain the threshold estimate $(\hat{\theta})$ by two-stage concentrated least squares method that involves an inverse Mills ratio bias correction term in each regime, we proceed with estimation of the slope parameters betas by GMM, which produce consistent and asymptotically efficient regressors.

In sum, for getting consistent estimators, we follow STR technique, and first, we remove individual-specific mean eliminating individual effect. Second, we use LS to estimate π and Π in equation 4 and 5. Third, we estimate the threshold parameter theta by minimizing a two-step concentrated least squared criterion with the estimates from second stage. Fourth, when $\hat{\theta}$ is acquitted by concentrated least square, we use it to split data set and use GMM to estimate coefficient parameters ($\widehat{\beta_1'}$ and $\widehat{\beta_2'}$) and include inverse Mills ratio bias correction term.

Appendix B Database information.

This appendix describes further information about the database used in chapter 1 and 2. We defined "segment" using the definition from the International Financial Reporting Standard IFRS 8 "Operating Segments". It defines the segments or segments of operations, as "*components of a company, for which separate financial information is available, and it is regularly evaluated by the highest decision-making authority of the company*". These segments should be used to: decide how to allocate resources and evaluate their performance.

According to this standard, companies must provide financial and descriptive information on their operating or business segments, and must include the financial statements of each segment (consolidated and non-consolidated financial statements). In this way, in the Annual Accounts (AA) of each company, we can find the segments in which the company is organized. Thus, follow the same criteria to define segments led me reduce the bias and gather reliable data which makes it a unique base and of great gross value.

Furthermore, for Spanish companies, there are not database that reports business and geographical segments of the companies according to IFRS8. Currently, platforms like ORBIS or its subsidiary for data in Spain (SABI), have just started to incorporate some of this information; The THOMSON ONE platform is one of the most complete, as is Bloomberg or Compustat, but such data hardly cover Spanish IBEX35 companies. Something similar happens to the Factiva platform, whose data reported by segments do not agree with those reported in the companies' AA.

2. Company selection method

With the objective in mind of selecting Spanish companies, independently in decision making, with free access to their annual accounts, we have followed the following selection steps:

First, we selected all companies belonging to the Continuous Market in the period 2006-2011. This information has been obtained from the annual reports prepared by the Spanish National Securities Market Commission (CNMV) on all the companies of the Continuous Market. This group of companies is obliged to make public the AA, whose validity and truthfulness is judged by the investors. This sample is used to calculate Beta risk needed for Economic Value Added measure used in Chapter 1. Table B.1 summarizes the companies selected in this first phase, and the period listed in the Spanish Stock Market.

Second, we discarded companies dedicated mainly to the financial sector (such as banks), since they have a different accounting and objectives to the rest of companies. We inspected description of activity reported by the company (Section K of NACE code 2009 rev.2, 64- 66).

Third, once selected the companies that make up the Spanish Continuous Market for all the years of the period 2006-2011, we obtained the Consolidated Annual Accounts (AA) of each firm and year. To find this information, both the corporate web pages of each of the companies or the website of the CNMV which contains a directory with relevant information of listed companies, were used.

Fourth, we ruled out companies with more than 25% of their own funds controlled by another company or corporation for the Year 2010 and 2011. This information is available in the AA, the Annual Reports and other external information bases such as the SABI and the Bloomberg Database- In this way, we gather a group of companies with autonomy in making decisions about their product and geographical segments. Table B.2 summarizes the excluded companies in the second, third and fourth steps of the selection process.

Finally, to validate the process, we randomly chose 10 out of the 100 companies finally selected, confirming that the requirements and conditions required in the previous 4 selection points were met. Table B.3 lists the companies included in the sample.

3. Database elaboration

I extracted all the available information about its business and geographic segments collected in its Consolidated AA based on the International Financial Reporting Standard IFRS 8 "Operating Segments". We built a panel database with was merged with extra information available in Bloomberg, CNMV and SABI.

The IFRS8 requires that the information available in the Annual Report or Annual Account is the same as which is reported to the company's decision-making bodies. This causes that the reporting of information by segment is different between companies. Although companies do not have incentives to disclose all the information by segment, they all indicate segment sales for each year. However, very few are those report a complete balance sheet or a breakdown of profit and loss statement. Table B.4 shows the variables obtained for each segments of activity, and for the overall company, as well as the availability of them. The information was taken from the consolidated annual report of each of the companies in the sample and year (2006 to 2011) including, the balance sheet, profit and loss, flow and investment statements for the overall firm and each of the segment reported.

Note that the net amount of turnover in the segments only reflects the company's sales to external customers, therefore it does not include sales or inter-segment sales (vertical integration). In the same way, the variable investment in the segments reflects the annual investment flows in assets of the company, generally fixed assets. As I said before, companies decide which items are relevant in their business segments. The table shows that although most companies give information on the main balance sheet items, such as total assets and total liabilities, as well as sales and results of the company; Very few report more detailed items. Only 28% of the companies disaggregate the accounts of assets or liabilities and less than 20% ventures to analyze the flow statements of the different segments of activity.

Table B.1. Listed firms in the Spanish Stock Market in the period 2006-2011

Name	Ticker	Bloomberg	Year					
			2006	2007	2008	2009	2010	2011
ABENGOA	ABG	ABG SM	x	x	x	x	x	x
ABERTIS A	ABE	ABE SM	x	x	x	x	x	x
ACCIONA	ANA	ANA SM	x	x	x	x	x	x
ACERINOX	ACX	ACX SM	x	x	x	x	x	x
ACS	ACS	ACS SM	x	x	x	x	x	x
ADOLFO DGUEZ	ADZ	ADZ SM	x	x	x	x	x	x
ADVEO	ADV	ADV SM	x	x	x	x	x	x
ALMIRALL	ALM	ALM SM		20/06/2007	x	x	x	x
ALTADIS		ALT SM	x	x	22/02/2008			
AMADEUS	AMS	AMS SM					29/04/2010	x
AMPER	AMP	AMP SM	x	x	x	x	x	x
ANTENA 3 TV	A3TV	A3TV SM	x	x	x	x	x	x
ARCELOR		LOR SM	x	12/11/2007				
ARCELORMITT.	MTS	MTS SM	x	x	x	x	x	27/01/2011
AZKOYEN	AZK	AZK SM	x	x	x	x	x	x
B.POPULAR	POP	POP SM	x	x	x	x	x	x
B.SABADELL	SAB	SAB SM	x	x	x	x	x	x
B.VALENCIA	BVA	BVA SM	x	x	x	x	x	x
BANCA CIVICA	BCIV	BCIV SM						22/07/2011
BANCO DE ANDALUCÍA		AND SM	x	x	x	07/08/2009		
BANCO DE CASTILLA		CAS SM	x	x	19/12/2008			
BANCO DE CRÉDITO BALEAR		CBL SM	x	x	19/12/2008			
BANCO DE GALICIA		GAL SM	x	x	19/12/2008			
BANCO DE VASCONIA		VAS SM	x	x	19/12/2008			
BANCO GUIPUZCUANO		GUI SM	x	x	x	x	25/11/2010	
BANESTO	BTO	BTO SM	x	x	x	x	x	x
BANKIA	BKIA	BKIA SM						20/07/2011
BANKINTER	BKT	BKT SM	x	x	x	x	x	x
BARON DE LEY	BDL	BDL SM	x	x	x	x	x	x
BAVIERA	CBAV	CBAV SM		03/04/2007	x	x	x	x
BBVA	BBVA	BBVA SM	x	x	x	x	x	x
BIOSEARCH	BIO	BIO SM	x	x	x	x	x	x
BME	BME	BME SM	14/07/2006	x	x	x	x	x

BO.RIOJANAS	RIO	RIO SM	x	x	x	x	x	x
C.A.F.	CAF	CAF SM	x	x	x	x	x	x
C.V.N.E.	CUN	CUN SM	x	x	x	x	x	x
CAIXABANK	CABK	CABK SM		10/10/2007	x	x	x	x
CAM	CAM	CAM SM			24/07/2008	x	x	x
CAMPOFRIO	CFG	CFG SM	x	x	x	x	x	x
CEM.PORT.VAL	CPL	CPL SM	x	x	x	x	x	x
CIE AUTOMOT.	CIE	CIE SM	x	x	x	x	x	x
CLEOP	CLEO	CLEO SM	21/02/2006	x	x	x	x	x
CODERE	CDR	CDR SM		19/10/2007	x	x	x	x
CORP.FI.ALBA	ALB	ALB SM	x	x	x	x	x	x
CORTEFIEL		CTF SM	24/03/2006					
D.FELGUERA	MDF	MDF SM	x	x	x	x	x	x
DEOLEO, S.A.	OLE	OLE SM	x	x	x	x	x	x
DERMOESTETI.	DERM	DERM SM	x	x	x	x	x	x
DIA	DIA	DIA SM						05/07/2011
DINAMIA	DIN	DIN SM	x	x	x	x	x	x
DISTRIBUCIÓN INTEGRAL LOGÍSTICA		LOG SM	x	x	13/06/2008			
DOGI	DGI	DGI SM	x	x	x	x	x	x
EADS	EAD	EAD SM	x	x	x	x	x	x
EBRO FOODS	EBRO	EBRO SM	x	x	x	x	x	x
ELECNOR	ENO	ENO SM	x	x	x	x	x	x
ENAGAS	ENG	ENG SM	x	x	x	x	x	x
ENCE	ENC	ENC SM	x	x	x	x	x	x
ENDESA	ELE	ELE SM	x	x	x	x	x	x
ERCROS	ECR	ECR SM	x	x	x	x	x	x
EUROPA & C	PAC	PAC SM	x	x	x	x	x	x
EXIDE TECHNOLOGIES		TUD SM	x	x	x	x	05/08/2010	
EZENTIS	EZE	EZE SM	x	x	x	x	x	x
FAES	FAE	FAE SM	x	x	x	x	x	x
FCC	FCC	FCC SM	x	x	x	x	x	x
FEDERICO PATERNINA		PAT SM	x	x	x	x	07/01/2010	
FERGO AISA	AISA	AISA SM	x	x	x	x	x	x
FERROVIAL	FER	FER SM	x	x	x	x	x	x
FERSA	FRS	FRS SM	14/11/2006	x	x	x	x	x
FLUIDRA	FDR	FDR SM		31/10/2007	x	x	x	x
FUNESPAÑA	FUN	FUN SM	x	x	x	x	x	x

GAM	GALQ	GALQ SM	13/06/2006	x	x	x	x	x
GAMESA	GAM	GAM SM	x	x	x	x	x	x
GAS NATURAL	GAS	GAS SM	x	x	x	x	x	x
GE.INVERSION	CGI	CGI SM	x	x	x	x	x	x
GR.C.OCCIDEN	GCO	GCO SM	x	x*	x	x	x	x
GRIFOLS	GRF	GRF SM	17/05/2006	x	x	x	x	x
GRUPO TAVEX	TVX	TVX SM	x	x	x	x	x	x
HULLAS DEL CORTO CORTÉS		HCC SM	x	x	13/06/2008			
IAG	IAG	IAG SM	x	x	x	x	x	24/01/2011
IBERDROLA	IBE	IBE SM	x	x	x	x	x	x
IBERIA	IB	IBLA SM	x	x	x	x	x	21/01/2011
IBERPAPEL	IBG	IBG SM	x	x	x	x	x	x
INDITEX	ITX	ITX SM	x	x	x	x	x	x
INDO	IDO	IDO SM	x	x	x	x	x	x
INDRA A	IDR	IDR SM	x	x	x	x	x	x
INM.COLONIAL	COL	COL SM	x	x	x	x	x	x
INM.DEL SUR	ISUR	ISUR SM			30/06/2008	x	x	x
INMOBILIARIA URBIS		URB SM	x	08/06/2007				
INYPSA	INY	INY SM	x	x	x	x	x	x
ITIRENE INFRAESTRUCTURAS	EUR SM	ITI SM	x	x	x	18/09/2009		
JAZZTEL	JAZ	JAZ SM	x	x	x	x	x	x
LA SEDA BAR.	SED	SED SM	x	x	x	x	x	x
LINGOTES	LGT	LGT SM	x	x	x	x	x	x
MAPFRE	MAP	MAP SM	x	x	x	x	x	x
MARTINSA-FAD	MTF	MTF SM		17/12/2007	x	x	x	x
MECALUX	MLX	MLX SM	x	x	x	x	07/07/2010	
MEDIASET	TL5	TL5 SM	x	x	x	x	x	x
MELIA HOTELS	MEL	MEL SM	x	x	x	x	x	x
METROVACESA	MVC	MVC SM	x	x	x	x	x	x
MIQUEL COSTA	MCM	MCM SM	x	x	x	x	x	x
MONTEBALITO	MTB	MTB SM	x	x	x	x	x	x
NATRA	NAT	NAT SM	x	x	x	x	x	x
NATRACEUTICA	NTC	NTC SM	x	x	x	x	x	x
NH HOTELES	NHH	NHH SM	x	x	x	x	x	x
NICOL.CORREA	NEA	NEA SM	x	x	x	x	x	x
NYESA	NYE	NYE SM	x	x	x	x	x	x
OHL	OHL	OHL SM	x	x	x	x	x	x

PESCANOVA	PVA	PVA SM	x	x	x	x	x	x
PRIM	PRM	PRM SM	x	x	x	x	x	x
PRISA	PRS	PRS SM	x	x	x	x	x	x
PRISA CONV.B	PRS/P	PRS/P SM					29/11/2010	x
PROSEGUR	PSG	PSG SM	x	x	x	x	x	x
QUABIT	QBT	QBT SM	29/05/2006	x	x	x	x	x
R.E.C.	REE	REE SM	x	x	x	x	x	x
REALIA	RLIA	RLIA SM		06/06/2007	x	x	x	x
RENO M.S/A	RDM	RDM SM	x	x	15/04/2008			
RENTA 4	R4	R4 SM		14/11/2007	x	x	x	x
RENTA CORP.	REN	REN SM	05/04/2006	x	x	x	x	x
REPSOL	REP	REP SM	x	x	x	x	x	x
REYAL URBIS	REY	REY SM		11/06/2007	x	x	x	x
ROVI	ROVI	ROVI SM		05/12/2007	x	x	x	x
SACYR VALLE.	SYV	SYV SM	x	x	x	x	x	x
SAN JOSE	GSJ	GSJ SM				20/07/2009	x	x
SANTANDER	SAN	SAN SM	x	x	x	x	x	x
SERVICE P.S.	SPS	SPS SM	x	x	x	x	x	x
SNIACE	SNC	SNC SM	x	x	x	x	x	x
SOCIEDAD GENERAL DE AGUAS DE BARCELONA		AGS SM	x	x	x	x	31/05/2010	
SOLARIA	SLR	SLR SM		19/06/2007	x	x	x	x
SOTOGRANDE	STG	STG SM	x	x	x	x	x	x
TABLEROS DE FIBRAS		TFI SM	x	31/05/2007				
TECNICAS REU	TRE	TRE SM	21/06/2006	x	x	x	x	x
TECNOCOM	TEC	TEC SM	x	x	x	x	x	x
TELEFONICA	TEF	TEF SM	x	x	x	x	x	x
TESTA INM.	TST	TST SM	x	x	x	x	x	x
TRANSPORTES AZKAR		TAZ SM	01/02/2006					
TUBACEX	TUB	TUB SM	x	x	x	x	x	x
TUBOS REUNI.	TRG	TRG SM	x	x	x	x	x	x
UNIÓN FENOSA		UNF SM	x	x	x	04/09/2009		
URALITA	URA	URA SM	x	x	x	x	x	x
URBAS	UBS	UBS SM	x	x	x	x	x	x
VERTICE 360	VER	VER SM		19/12/2007	x	x	x	x
VIDRALA	VID	VID SM	x	x	x	x	x	x
VISCOFAN	VIS	VIS SM	x	x	x	x	x	x
VOCENTO	VOC	VOC SM	08/11/2006	x	x	x	x	x

VUELING	VLG	VLG SM	01/12/2006	x	x	x	x	x
ZARDOYA OTIS	ZOT	ZOT SM	x	x	x	x	x	x
ZELTIA	ZEL	ZEL SM	x	x	x	x	x	x

Source: Own elaboration with the data collected from Bloomberg and the Annual Reports of the CNMV. The dates indicate the day the company started or finish public offering in the Spanish Continuous Market, the X indicates that the company was listed the entire year. Companies without access: Parquesol infrastructures; Flame EMT; Tele pizza; Itirene infrastructures; Mittal; Fedesa real estate.

Table B.2. Companies excluded and reason.

Company name	Reason
ENDESA	Not Spanish or independent throughout the period.
MEDIASET	Not Spanish or independent throughout the period.
JAZZTEL	Not Spanish or independent throughout the period.
MAPFRE	Financial-insurance sector.
GRUPO CATALANA OCCIDENTE	Financial-insurance sector.
COMPAÑÍA FINANCIERA ALBA	Financial sector.
BOLSA Y MERCADO DE ESPAÑA	Financial sector.
MECALUX. SA	No access in 2011
IBERIA	No independent throughout the period.
FERGO AISA	Bankruptcy in 2010
*Banks**	Financial sector.
Investment services. **	Financial sector.

*: Banca Cívica, Bankia, Bankinter, BBVA, Banco de Andalucía, Banco de Castilla, Banco de Crédito Balear, Banco de Galicia, Banco Guipuzcoano, Banco Popular, Banco Sabadell, Banco Santander, Banco Valencia, Banco Vasconia, Banesto, Caixabank. **: Renta 4, Renta Corporación, Reno M.S/A y GE.Inversión

Table B.3. Companies included in the database

Nº	Nombre	Nº	Nombre
1	ACS, ACTIVIDADES DE CONSTRUCCION Y SERVICIOS, SA	26	DURO FELGUERA, SA
2	ABERTIS INFRAESTRUCTURAS, SA	27	EBRO FOODS, SA
3	ABENGOA SA	28	SOCIEDAD ANONIMA DAMM
4	ACCIONA, SA	29	ELECNOR SA
5	ACERINOX, SA	30	ENAGAS SA
6	ADOLFO DOMINGUEZ SA	31	ERCROS, SA
7	AMPER SA	32	FAES FARMA, SA
8	ALMIRALL SA	33	FERGO AISA SA
9	AMADEUS IT HOLDING SA	34	FERROVIAL SA
10	ANTENA 3 DE TELEVISION SA	35	FOMENTO DE CONSTRUCCIONES Y CONTRATAS SA
11	BARON DE LEY, SA	36	GAMESA CORPORACION TECNOLOGICA SOCIEDAD ANONIMA
12	AZKOYEN, SA	37	GAS NATURAL SDG SA
13	CEMENTOS MOLINS SA	38	GENERAL DE ALQUILER DE MAQUINARIA SA
14	CEMENTOS PORTLAND VALDERRIVAS, SA	39	GRIFOLS SA
15	CIE AUTOMOTIVE, SA	40	ENCE ENERGIA Y CELULOSA SA.
16	CLINICA BAVIERA, SA	41	GRUPO TAVEX SA
17	CODERE, SA	42	IBERDROLA, SOCIEDAD ANONIMA
18	COMPANYIA D'AIGUES DE SABADELL, SA	43	INTERNATIONAL CONSOLIDATED AIRLINES GROUP SA
19	COMPAÑIA LEVANTINA DE EDIFICACION Y OBRAS PUBLICAS SA	44	INDRA SISTEMAS, SOCIEDAD ANONIMA
20	COMPAÑIA LOGISTICA DE HIDROCARBUROS CLH SA	45	INDUSTRIA DE DISEÑO TEXTIL SA
21	COMPAÑIA VINICOLA DEL NORTE DE ESPAÑA, SA	46	INMOBILIARIA COLONIAL, SA
22	CONSTRUCCIONES Y AUXILIAR DE FERROCARRILES, SA	47	INMOBILIARIA DEL SUR SA
23	CORPORACION DERMOESTETICA SA	48	INYPSA INFORMES Y PROYECTOS SA

24	DEOLEO SA	49	LA SEDA DE BARCELONA SA
25	DOGI INTERNATIONAL FABRICS, SA	50	LABORATORIOS FARMACEUTICOS ROVI, SA

Nº	Nombre	Nº	Nombre
51	LINGOTES ESPECIALES, SOCIEDAD ANONIMA	76	VERTICE TRESCIENTOS SESENTA GRADOS, SA
52	LIWE ESPAÑOLA, SA	77	MINERALES Y PRODUCTOS DERIVADOS, SA
53	TELEFONICA, SA	78	FLUIDRA, SA
54	REPSOL SA.	79	NATRA SOCIEDAD ANONIMA
55	TECNICAS REUNIDAS, SOCIEDAD ANONIMA	80	MARTINSA-FADESA, SA
56	OBRASCON HUARTE LAIN SA	81	TECNOCOM TELECOMUNICACIONES Y ENERGIA SA
57	REYAL URBIS, SA	82	GRUPO EZENTIS, SA
58	PROSEGUR COMPAÑIA DE SEGURIDAD, SA	83	SERVICE POINT SOLUTIONS, SOCIEDAD ANONIMA
59	PESCANOVA SA	84	SA HULLERA VASCO LEONESA
60	MELIA HOTELS INTERNATIONAL SA.	85	ZELTIA, SA
61	VIDRALA, SA	86	INDO INTERNACIONAL, SA
62	RED ELECTRICA CORPORACION SA	87	FUNESPAÑA, SOCIEDAD ANONIMA
63	METROVACESA SA	88	CAMPOFRIO FOOD GROUP, SOCIEDAD ANONIMA

64	SOLARIA ENERGIA Y MEDIO AMBIENTE, SA
65	PAPELES Y CARTONES DE EUROPA, SA
66	VISCOFAN SA
67	PROMOTORA DE INFORMACIONES SA
68	SACYR VALLEHERMOSO SA
69	NH HOTELES, SA
70	URALITA, SA
71	VOCENTO, SOCIEDAD ANONIMA
72	MIQUEL Y COSTAS & MIQUEL, SA
73	QUABIT INMOBILIARIA, SA
74	PRIM, SA
75	SNIACE, SA
89	TUBOS REUNIDOS, SA
90	NICOLAS CORREA, SA
91	FERSA ENERGIAS RENOVABLES SA
92	ALZA REAL ESTATE, SA
93	LIBERTAS 7 SOCIEDAD ANONIMA
94	URBAS GRUPO FINANCIERO SA.
95	NYESA VALORES CORPORACION, SA
96	GRUPO NOSTRUM RNL, SA
97	IBERPAPEL GESTION, SA
98	ADVEO GROUP INTERNATIONAL SA.
99	TUBACEX, SA
100	GRUPO EMPRESARIAL SAN JOSE, SA

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