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The Twilight Years of the Spanish *Cajas*: Governance, Risk Behavior and Growth on the Eve of the Crisis

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Table of Contents

List of Tables

List of Figures

List of Appendixes

Introduction

The Spanish financial system has been severely affected by the 2007–2008 crisis. In particular, the Spanish savings banks (*Cajas de Ahorros*, or *Cajas*), an ownerless type of bank that used to constitute half of the financial system, have practically disappeared by the end of 2012. Certainly this collapse has been preceded by large failures in other countries' financial systems (Ahrens et al., 2011; Erkens et al., 2012), but we are convinced that some important and novel lessons can still be extracted from the differential elements present in the Spanish case. First of all, and in spite of their lack of owners, Spanish savings banks were apparently in great financial condition and growing steadily before the last financial crisis. In fact, their governance structure allowed them to gain market share, since the 80's, from commercial banks, which were big and internationally competitive organizations subject to the usual market mechanisms for corporate control. Second, although market competition was in place, it seems that it was not enough to discipline the *Cajas' behaviour* in those boom years. In fact, the presence of an intense competition encouraged many of the *Cajas* (interestingly, with some important exceptions) to get involved in very expansive policies and questionable investments, demanding resources much beyond their own internal possibilities. Somehow, many savings banks competed and started to behave like large commercial banks, disregarding their limitations to raise new capital from the markets. As a result, from the original 45 Savings banks existing in 2008, only 12 of them remained by the end of 2012 (see the Appendix 1 to chapter 3). On top of that, they have been transformed into commercial banks and their final number will be even lower, through mergers, with some additional moves still to come.

What was special about the *Cajas*? What did it happen to them during the crisis? And why?

The main goal of this Thesis is to achieve a better understanding of the particular nature of the *Cajas*, analyzing their behaviour and performance, and compare this with their most direct competitors (i.e., the Spanish commercial banks) using a long enough period that includes both a boom period and the years of the crisis. We believe that such approach will help us to answer the questions mentioned above, adding new elements to a debate that has been really extensive but not exhausted. Nonetheless, a debate on the *Cajas* fall has rarely gone beyond the political and public media spheres, where simple arguments such as the politicization have been pointed out as the unique source of the problem. The lack of

academic work analyzing this relevant topic in an in-depth manner is noticeable. Thus, the purpose of this Thesis is to analyze the *Cajas* under several although related (and quite differentiated) angles in order to grasp the underlying nature of their large financial distress and later disappearance. We consider that this differentiated approach to a complex problem will allow us a broader and more innovative interpretation of the different events and behaviours involved. We provide next a description of some of the theoretical elements present in this thesis.

1. Spanish banks and *Cajas*: governance, risk-behaviour, and the crisis context

Examining the radically different fate experienced by many *Cajas* respect their main rivals, the Spanish commercial banks, following the recent crisis in Spain, the analysis and the comparison of their behaviour, before and during the crisis, emerges as a crucial question. Moreover, it would be interesting to know if those different behaviours responded to different governance features and organizational forms, including the differences observed among the *Cajas* themselves.

When we study the Spanish financial system, we find, on the one hand, that most commercial banks in Spain are privately owned, being profit-maximizing and shareholder-oriented organizations. In addition, many of them showed a concentrated ownership structure (for instance, Azofra and Santamaría (2011) find evidence that 96% of Spanish commercial banks have an ultimate controlling owner). On the other hand, we find a different type of organization, the *Cajas*, that could be considered as non-for-profit commercial institutions in the sense of Hansmann (1996). They are private credit institutions with a foundational nature, a lack of formal owners (i.e., shareholders), and where their principal governing bodies are made up of representatives of various stakeholders (i.e., depositors, employees, local and/or regional public authorities, and founding entities, which can be government-related, civic or religious institutions). These stakeholders have different, although sometimes interrelated, goals. More specifically, these goals have been described as follows: the universal access to financial services, promote competition and prevent monopoly abuse, make a contribution to social welfare and wealth distribution, make a contribution to regional development, and also contribute to profit maximization (García-Cestona and Surroca, 2008). Not only that, the *Cajas* should invest part of their profits in social and cultural programs (around 25% of their net profits) while retaining the rest as reserves. All these features suggest the presence of a highly differentiated kind of organization from the commercial banks in the Spanish financial sector. Many banks with these organizational features successfully competed, at least

during the boom years, but then fell into financial distress, in many cases, during the recent period of crisis. Therefore, it seems that some governance features could have played a role in this differentiated performance.

There has been a strong debate in the field of corporate governance, since Berle and Means (1932) focused on the fact that owners' and managers' interests may diverge given the separation between a diffuse ownership and the control of the company. The subsequent conflict of interests can be alleviated, and thus the firm value increased through ownership concentration, either by achieving better incentive alignment or by improving monitoring. During many years, this debate has been unanimously framed by the agency theory, where corporate governance is typically defined as *"the different ways through which the financial suppliers of the corporations make sure they receive a return on their investment"* (Shleifer and Vishny, 1997). In a background of information asymmetries, adverse selection problems (e.g., selecting the best managers for a company) and moral hazard problems (e.g., risky decisions taken by managers that may seriously affect owners' wealth) may arise. Under a control perspective, the governance of the company must offer different mechanisms (e.g., the board) to alleviate the inefficiencies arisen as a consequence of conflict of interest between owners and managers (Jensen and Meckling, 1976). For instance, while owners may be interested to maximize the firm value, managers could be interested in carrying out non-efficient growth policies if these policies are directly related to their compensation. In summary, agency problems explain in a theoretical framework why there are different corporate governance modes (and so, different risk-taking behaviour and investment performance) opening the door to diverse types of organizational forms (Fama and Jensen, 1983).

How appropriate are the current Corporate Governance models when we apply them to the understanding of financial institutions? In addition, how are we dealing with risk management in these organizations and in particular in a context of crisis? Financial institutions are not an exception and they suffer from the previously described agency conflicts (Fama and Jensen, 1983). But there are also some reasons for which banking sector governance issues will differ from unregulated, non-financial firms as it has been already pointed out (Adams and Mehran, 2003; Mehran et al., 2011). In first place, the banking business of banks is rather opaque and complex, and subject to some dramatic shifts. Secondly, a higher number of stakeholders become involved (i.e., investors, depositors, regulators, among others), making more complex the governance of these organizations.

It is precisely the prominence of these parties with a stake, or groups of interest, or *"any group or individual who can affect or is affected by the achievement of an organization's purpose"* (Freeman, 1984), both in the shareholder-oriented banks (e.g., Spanish commercial banks) in general, or in the stakeholder-oriented banks (e.g., *Cajas*), what motivates the analysis through alternative theories. For instance, while agency theory motivates an analysis for which the different governance mechanisms contributes on the general objective of maximizing the shareholder value (i.e., it is a shareholder-oriented theory), the *stakeholder theory* (Freeman, 1984; Clarkson, 1995) questions the mentioned firm value maximization as the firm's objective function of the firm, and they propose to replace it by the joint stakeholders' welfare maximization. The presence of externalities (e.g., the managerial decisions effects on specific stakeholders welfare) implies that the pursuit of particular interests by the firm does not necessarily implies collective efficiency.

Tirole (2001) points out that the shareholder-oriented approach provides a too-narrow view for an economic analysis of corporate governance (for instance, it is assumed that natural stakeholders such as employees, suppliers, customers and others, are protected by very powerful contracts or laws that force controlling investors to perfectly internalize their welfare). Nevertheless, he also mentions that, unfortunately, there is little formal analysis of the economics of the stakeholder approach to articulate the basic ideas of this approach. In addition, Jensen (2002) makes a strong criticism to the stakeholder theory, arguing that it is impossible to maximize more than one objective at the same time, because the presence of multiple objectives (e.g., to maximize current profits, market share, future growth in profits, and anything else one pleases) leads to a lack of objectives definition (i.e., confusion and lack of purpose), thus leaving the managers without a way to make a well-reasoned decision. As a result, a firm that adopts stakeholder theory will be handicapped in the competition for survival because, as a basis for action, stakeholder theory somehow politicizes the corporation, and it leaves its managers empowered to exercise, eventually, their own preferences at the time of making use of the firm's resources.

In matters of risk management in the banking industry, the current answer seems to be that we had a poor view in the past and a worse solution to this. So risk should be high in the agenda. In the past, we tend to think that risk was taken care by the regulators but after this last crisis, we can say that they have worked too little and many times too late. Describing the already complex reality of Spanish commercial banks and *Cajas* governance in relation to the risk-taking behaviour of such entities, García-Marco and Robles-Fernández (2003, 2008) point out that the usual owner–manager agency conflict coexists with another moral hazard problem. That is, shareholders and managers can take advantage

of the presence of depositors and expropriate some of the rents through incurring in riskier activities than the chosen ones if they should respond 100% of the consequences. This causes a twofold effect on the *"bank-risk taking behaviour"*, and the overall effect is not easily predictable.

This added *moral hazard hypothesis* states that similarly to non-financial institutions, the limited liability generates an incentive to the shareholders to expropriate part of the wealth from depositors while increasing the risk held by the bank. Furthermore, the existence of deposit insurance raises the entities' incentives to take risk above the optimal level, either in their assets or in their liabilities portfolios, while it can diminish the regulators' incentives to control and to reduce the risk excess in financial institutions. And the entities' incentives to take risk diminishes with a more diffuse ownership structure (e.g., in the case of *Cajas* compared to commercial banks, or in commercial banks with lower levels of concentration). This moral hazard approach developed by Merton (1977) was widely applied to explain the American Savings and Loan (S&L) crisis in the eighties (Kane, 1989; White, 1991; Akerlof and Romer, 1993; among many others).

However, it is very important to understand in detail the different and specific underlying organizational forms involved when doing comparative analyses. Precisely, we believe this is a great weakness of cross-country comparisons at the time of connecting governance and risk-performance issues. Different frameworks can lead to very different outcomes for the same approach. And it is not a surprise that, as noted by Ferri et al. (2012), *"curiously, previous cross-country studies have often been rather contradictory"*.

Not only that, it is also important to be cautious when translating the conclusions from a country-specific study to another one. Among other studies comparing American mutual institutions with stock banks, Esty (1997) concludes that stock banks exhibit greater incentives to take risk, and that the transformation of the organizational form of American S&L from mutual into stock ownership, ironically a conversion promoted by the Congress and the regulators to save the industry, was associated with increased risk taking, thus concluding that the regulatory changes were not based on a consideration of agency conflicts.

However, and as it was already pointed out by García-Marco and Robles-Fernández (2003, 2008), those evidences from American S&Ls are not directly applicable to the Spanish case (i.e., commercial banks vs *Cajas*). The *Cajas* and the S&Ls were different in a

number of reasons. First, the *Cajas* have a diffused range of objectives according to the different stakeholders with a representation in their governance mechanisms (i.e., governing bodies), often with conflicting interests. Second, they cannot be merged or acquired by commercial banks, only by other *Cajas*, generating an immunization to market corporate control. Therefore, under an agency conflict perspective, the absence of active shareholders (because of a dispersed ownership structure) that could control the firm, and the lack of corporate control, suggests potential inefficiencies, and the undertaking of higher risk as a consequence of the absence of control over managers and employees.

Some empirical evidence from countries other than US support the hypothesis of a more pronounced principal-agent problem in the case of stakeholder banks. For instance, Gorton and Schmid (1999) conclude that Austrian cooperative banks, assumed as organizational forms with an exogenous ownership structure, reduce their performance as the number of cooperative members increases, corresponding to a greater separation of ownership and control. They find that agency costs (measured by efficiency wages) are increasing in the degree of separation or dispersion of the ownership structure. Regarding the Spanish case, Crespí, García-Cestona and Salas (2004) report the use of mergers as the main control mechanism for *Cajas*, while showing weaker internal mechanisms of control than commercial banks, which efficiently use the CEO turnover and board turnover to discipline managers. However, the results in Spain are not conclusive. Once they include risk measures, García-Marco and Robles-Fernández (2008) find that commercial banks are more risk-inclined than *Cajas*, supporting the moral hazard hypothesis described above. But this result is the opposite to a greater owner-manager agency conflict predicted for *Cajas*, with an organizational form that favours this problem and that, during the period (1993-2000), were in continuous territorial expansion (outside of their original Autonomous Community in which they traditionally operated) compared to commercial banks. Morever, when focusing on commercial banks, and contrary to the moral hazard hypothesis, the authors find that the degree of shareholder concentration has a negative impact on the level of risk-taking, arguing that a higher shareholder concentration implies a stricter control over managers under an agency problem approach, even when protected by deposit insurance. Finally, they conclude that size matters (in the sense of a less propensity to risk-taking), probably because a higher ability by the larger banks to diversify their risks (through geographical and business diversification) and also to gather information for their investments (Saunders et al., 1990).

Although, under several differentiated perspectives, the literature has extensively exposed and argued about the differences between Spanish commercial banks and *Cajas* during the "good" years, it is precisely the financial crisis originated in 2007–2008 and the

subsequent distress of many of the *Cajas* that generates an additional motivation for this Thesis. There is the possibility that a hidden *Cajas* agency problem (aggravated by a potential lack of human capital in crucial roles) during the "happy" boom years in Spain could have been unmasked during the crisis years. For instance, the evidence noted by Illueca et al. (2013) about the negative effect of the 1988 Spanish banking deregulation (i.e., the removal of branching barriers on the *Cajas*) in connection with the specific governance nature (and the politicization) of *Cajas* over their *ex ante* risk-taking and their *ex post* loan defaults, could help to explain the existence of a differentiated behaviour between commercial banks and *Cajas* (e.g., with less knowledge about the new territories in which they rapidly expanded, and taking, probably, residual high risks). In addition *Cajas* mostly oriented their efforts to taking large real-state risk shares; funding several nonviable political projects due to political influence in governing bodies. This particular behaviour of many *Cajas* created a deferred problem of distress (probably masked during the boom period and finally coming to the surface during the financial crisis).

The literature is also addressing the different banks' governance issues exposed by the recent global financial crisis. Mehran et al. (2011) makes a good general review of this topic. Regarding the empirical studies, see for instance Beltratti and Stulz (2010), Fahlenbrach and Stulz (2011) or Aebi et al. (2012). The three papers conclude by different ways that there is a strong relationship between the banks' governance structure before the crisis (i.e., in 2006, the last complete year before the financial crisis) and their performance during the crisis. Erkens et al. (2012) develop a cross-country comparative study to analyse the corporate governance effects on the performance of financial firms during the 2007–2008 crisis period. However, these studies must be taken with care since, additionally to the weaknesses pointed out before, they cover several countries and large geographic areas, while taking into account only the largest and/or the listed banks, introducing a bias that may offer an incomplete picture of the sector. For instance, in the case of Erkens et al. (2012) only 9 Spanish listed banks are covered, thus the sample (formed by just 8 listed banks and 1 listed insurance company) hardly represents the whole sector. In any case, there are very few papers addressing the relation between governance issues and performance for the specific case of stakeholder-oriented banks in the current crisis context, and precisely one of the main objectives (and contributions) of this Thesis is to provide new empirical evidences for the current debate.

When searching for literature close to our debate (commercial banks and *Cajas*), we find very few empirical evidence: Hau and Thum (2009) for the German case, and Cuñat and Garicano (2010), and García-Meca and Sánchez-Ballesta (2012) for the Spanish case. Hau and Thum (2009) compare the performance of private and state-owned German banks

in the 2007-2008 financial crisis, and relate this performance to qualitative measures of board competence (i.e., educational background; finance experience; and management experience). They find that measures of management and financial experience of the board members are systematically higher in privately owned banks compared to state-owned banks, and that a poorer quality in board competence is related to higher losses in the financial crisis.

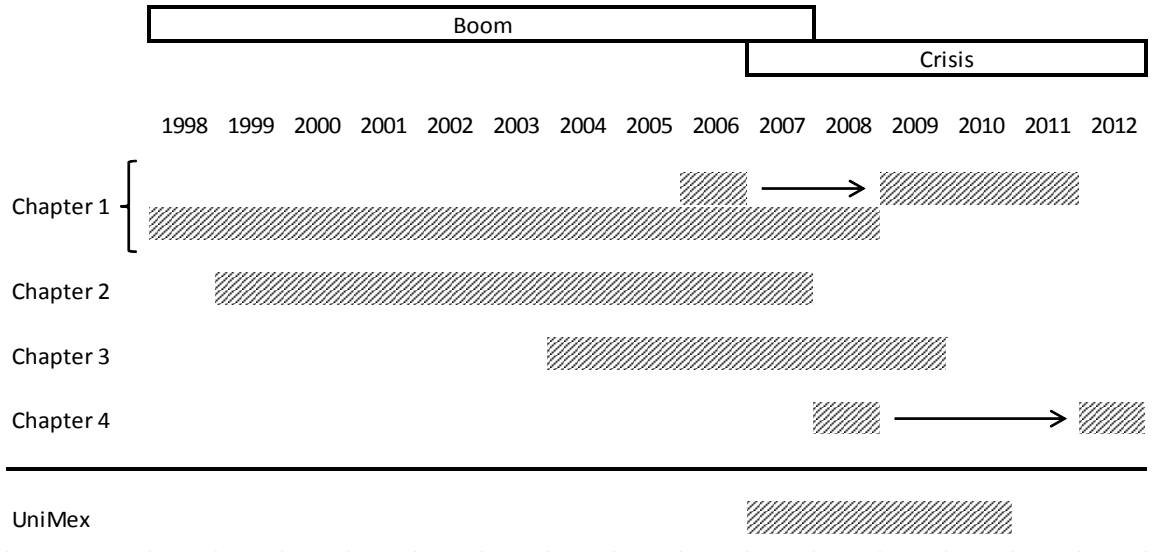
Cuñat and Garicano (2010) find a significant effect of the human capital of the *Cajas'* chairmen on the measures of loan book composition (i.e., the size of the portfolios of real estate and individual loans) and performance (i.e., the amount of non-performing loans in the crisis; the decrease in ratings) during the financial crisis. They conclude that being the chairman a political appointee, or having neither a postgraduate education nor previous banking experience, implies a worse performance of the entity. Finally, although García-Meca and Sánchez-Ballesta (2012) only measure the human capital of the chairmen through the dichotomy of having or not previous banking experience, they find similar results to those from Cuñat and Garicano (2010). In addition, neither Cuñat and Garicano (2010), nor García-Meca and Sánchez-Ballesta (2012) find any significant effect of the governance bodies politicization over the *Cajas'* distress during the financial crisis. In our view, in matters of risk there is plenty of room for improvements in the banking industry. Risk governance has been largely neglected. It seems reasonable to expect that a more dedicated board is needed. And therefore, the human capital of the controlling members becomes an important issue. Although Corporate Governance was emphasizing the presence of independent board members, in the case of banks the needs come from the presence of experts in the field, able to calibrate the risk adopted by the managers. It is in this sense that our use of more detailed data concerning the chairman may help, also comparing its effects side by side with the presence of politicization (or lack of independence) in the boards.

2. Thesis overview

The Thesis is structured in four chapters and has a dual-purpose nature: there are two papers centered in the financial institutions economics (i.e., chapters 2 and 3), and the other two papers are centered more in methodological advances (i.e., chapters 1 and 4). The four papers deal with Spanish banks in recent periods. Chapter 1 uses a new methodology to point out a number of facts and behaviour patterns of the banks that need further explanation. Chapters 2 and 3 build on these issued and provide some answers making use of standard econometric techniques. While chapter 2 explores the reasons behind different

behaviour at the time of securitization, chapter 3 explores the impact that human capital or politicization can exert on bank performance, including risk. The scheme and period of study of the four chapters is synthesized in the Figure 1, which covers a total period of 15 years from the story of *Cajas*, a period that includes a boom and a crisis. Finally, and as an Appendix to this Thesis, there is a short the paper "Evaluating the success of educational policy in Mexican Higher Education". Although its purpose is not directly related to the Thesis, it was developed during the doctoral period, and it contains advances in some of the methodologies employed for the Thesis (i.e., multidimensional scaling).

Figure 1. Structure of the Thesis



In the first chapter, we use multivariate statistical analysis to explore the path to distress and we try to answer the question of up to what point the structural differences that led some *Cajas* on the road to failure could have been revealed before the crisis by means of multivariate statistical methods (factor analysis, multidimensional scaling (MDS), property fitting, cluster analysis, and Logit regression). The *Cajas* have also been intensively involved in the building boom of the 2000s, either financing new developments or granting mortgages. The share of real estate loans in the *Cajas'* books in 2006, just before the onset of the financial crisis, ranged from just over 10% to almost 50%. The bursting of the financial bubble had important consequences for all the *Cajas*, and resulted in new legislation that impacted on all of them in such a way that they have virtually disappeared, notwithstanding the fact that there were important differences amongst these institutions. The question arises of up to what point the *Cajas'* special governance arrangements influenced the success of their operations, their approach to risk and

investment, and their policies, and to what extent this is reflected in statistical information that is generally available. In particular, after showing the heterogeneity of the results, with some successful *Cajas* and some distressed ones, we address the following questions. First, was it possible, using information prior to the financial crisis, to anticipate which institutions would find themselves in difficulties? Second, were the financial difficulties of *Cajas* that came under the 'Fund for Orderly Bank Restructuring' (*Fondo de Reestructuración Ordenada Bancaria*, FROB) support (had to be rescued) related to the structure of their governing bodies, in particular to the presence of politicians on the board?

The first chapter has several contributions. Our methodology allows us to reliably visualize the results in the form of statistical maps. Doing so, they become accessible even to people who do not have a strong statistical background. Furthermore, these statistical maps allow us to trace the evolution of the different *Cajas*, both successful and distressed ones, so one can see the determinants that explain the fate of each *Caja*. Traditional bankruptcy prediction techniques do not allow us to trace such evolutions. Additionally, for the first time, Data Envelopment Analysis (DEA) efficiency scores (i.e., under two main approaches to banking efficiency modelling: the production model and the intermediation model) have been added to the MDS analysis, allowing to interpret in a better way the results. Finally, since not all the dimensions may be relevant in the context of the paper, a stepwise method is proposed to explore different dimensional specifications and to find the one which gives the best results.

Nevertheless, the first chapter has two important limitations: the first one is that while *Cajas* sector is analyzed, commercial banks are not, so we cannot compare them directly. The second limitation is that panel data are not fully exploited, except when we individually drew the path of each entity in the multidimensional space. These limitations are solved in the next two chapters, although in two different ways. On the one hand, the second chapter seeks to understand the behaviour of *Cajas*, distinguishing them from banks, by analyzing further the asset securitization process of both types of institutions. Securitization influences many sides within the entities: the assets, the funding, the activity, the growth, the performance, among many other areas. On the other hand, the third chapter overcomes this limitation through the analysis of human capital and the banks' governance.

Securitization has been one of the key exponents of the intense financial innovation carried out in recent years and it has played an essential role, both during the boom period and in the crisis of the financial system. In spite of the potential benefits of securitization as a powerful funding tool, there has been, in general, little detailed analysis about the real

risks concerning the generated securities, or the existing conflicts of interest in some parts of the process. In particular, those conflicts affecting credit rating agencies and the risk behaviour of the banks have not been addressed. Only after the impact of the recent crisis, the European Union (EU) authorities, among others, have shown their intention to regulate and supervise more carefully. And additional measures have also been taken by the different national authorities. The second chapter goal is to explain which are the factors underlying the decision of securitizing assets in Spanish banks for the boom period 1999–2007, distinguishing also between savings banks (*Cajas*) and the rest of Spanish banks (commercial banks and credit cooperatives). In addition, we also analyze the significant determinants behind the volume of securitized assets, since the collected data allows us to go deeper in the analyses. While shareholders and customers were the owners of commercial banks and credit cooperatives, *Cajas* had a peculiar governance system. They had no formal owners and were closer to the commercial non-profit organizations described by Hansmann (1996), with four groups of stakeholders (employees, customers, politicians and founders) taking part in their government bodies. In this framework, asset securitization seems to play a key role explaining both the sector's credit growth until 2007 and the deep crisis afterwards.

We contribute to the existing literature about Spanish banks securitization in two ways. Firstly, through our emphasis in the *Cajas*, banks with specific corporate governance and risk features, and its comparison with the rest of Spanish financial institutions, we would like to go deeper in the analysis, highlighting the role of some determinants, more specifically regulatory capital and risk transfer factors, that have important implications for future supervisory policies. Secondly, we perform the analyses through different dynamic panel data models concluding the robustness of our previous models and even enhancing the influence of some factors (i.e., risk), not found as significant in previous works dealing with Spanish banks.

Limiting ourselves to understand the behaviour of *Cajas* through one of their funding mechanisms (i.e., asset securitization), does not allow us to have a complete picture of the underlying dynamics of these banks. To face this issue, we try to go a step further in the third chapter. We exploit the panel data distinguishing between the boom and the crisis periods to understand their "governance problem" and check how it affected their performance, comparing now *Cajas* and commercial banks performances.

While most of the *Cajas* have already disappeared by the end of 2012, almost all the Spanish commercial banks have withstood the crisis in a successful way. Our aim in the

third chapter is to assess if such different fates experienced by both types of banks which shared equally almost the entire Spanish market are related to their governance practices and the human capital of their chairmen. We test if there are differences in terms of the *Cajas'* performance with respect to banks and among themselves. Some authors have pointed out that neither the formal governance institutions (i.e., the composition of the different governance bodies) nor the real governance (i.e., the role played by politicians) can explain these banks' results.

In chapter 3 we offer a number of contributions. First, we cover a wide spectrum of performance definition with measures like ROA, ROA volatility, Z-score (with both "full sample" and "year-window" variants) and Impaired Loans/Gross Loans. Second, we make use of an extended dataset, since it contains 42 *Cajas* (compared to the avarage of 30 *Cajas* analysed in previous studies) for the period 2004–2009, covering thus the periods of boom and subsequent crisis. Third, we make use of a more detailed description of the chairmen's human capital. In particular, we consider previous banking experience, formal education, and political background to get a better grasp of these important issues. History seems to matter and the use of a better organizational capital of the former chairmen, and the stakeholder composition can help us to get clearer results. Fourth, we make a more accurate use of bank-specific control variables and their interactions. Our results may be relevant to banking regulators and future supervisory policies, and not only for Spain but also for other countries where non-shareholder-oriented institutions hold important shares. In this work, we find significant differences in banks' performance during the boom and the crisis periods, as well as differences between commercial banks and *Cajas*. Governance features (such as board composition, ownership and politicization) and human capital also play a role in the case of *Cajas*. For instance, until now no previous literature has found an effect of the level of politicization over *Cajas'* performance.

Finally, the fourth chapter plays a complementary role to the previous ones. As a faithful and objective chronicler, it reveals the strategic structure and changes in the sector from the point of view of the physical implementation and the influence of their players, both before and after the crisis. These pictures, "before" and "after" the crisis, describe the sector, with weak entities being knocked down and previously strong ones becoming stronger.

The concept of rivalry has been traditionally based on industrial analysis, or even on the study of strategic groups. However, although such analyses are relevant, they are based on aggregated measures that can miss relevant information about the nature of interfirm

rivalry (Fuentelsaz and Gómez, 2008). Chen (1996), who gives a literature review on this subject, proposed a rivalry index that captures in detail the asymmetric relationship between pairs of firms belonging to the same activity sector. His idea, reflected in the concepts of market commonality and resource similarity, relies on the fact that a company does not compete with the same intensity with all its rivals, and that the competitive relation between pairs of companies is not symmetric, since the competitive pressure exerted by company A on company B could be different than the pressure exerted by company B on company A.

Although Chen's approach and other rivalry indices have attracted much attention for the analysis of different economic sectors, even for banking (Fuentelsaz and Gómez, 2008), there is still no single methodology that integrates and visualises interfirm asymmetric competitive relationships in a single framework, since all previous studies take a single-company perspective: the usual approach is to produce as many competitive maps as companies are in the dataset, and assess the differences between two or more competitive maps in order to assess the asymmetry in the market (DeSarbo and Grewal, 2007). However, such comparisons among multiple maps become difficult when the number of players is high. The fourth chapter proposes, for the first time and as a contribution to the literature, a new approach to the analysis of rivalry data. We rely on the multidimensional unfolding (MDU) techniques to support our work, a methodology which allows us to visualise through a statistical map the asymmetric nature of such rivalry. Our aim is to assess changes in the rivalry structure of the Spanish banking sector before and after its restructuring as a consequence of the financial crisis whose start can be traced to the year 2008.

We base our work on Chen's concept of market commonality. Competition between banks can take place in many ways, but here we concentrate on branch presence in the high street, something that has been very prominent in Spain after the de-regulation of the *Cajas* (Serra Ramoneda, 2011). The number of branches of the *Cajas* expanded continuously between 1985 and 2008 only to suffer a strong decline after this date. We consider two years: 2008, the last year before the financial crisis, and 2012, the last year for which we have complete data. Then we raise the following questions. First, is it possible to visualize, using information from the branch networks of Spanish financial institutions —at municipality level— the whole asymmetric competitive structure of the sector? Second, is it possible to visualise the changes of this competitive structure between the years 2008 and 2012, their effects, and their implications? Answering these questions in a unique framework is something that, as far as we know, it has not been done before.

Chapter 1

Spanish savings banks in the credit crunch: could distress have been predicted before the crisis? A multivariate statistical analysis

1. Introduction

Statistical information is collected in order to inform decision-making, particularly in complex circumstances. The recent financial crisis that has shaken the international community had some unpredictable aspects but, at least in Spain, it was well documented and the information was generally available. Here, we concentrate in what has proven to be a significant player in the Spanish financial markets, and whose distress has had important economic consequences, the *Cajas de Ahorros*. Furthermore, we can use this statistical analysis to obtain a first-hand view of the sector and the evolution of the Savings banks before and after the financial crisis. We think that this analysis will prove to be quite useful later on when we carry out a subsequent analysis using econometric tools.

Multivariate statistical analysis has long been used to study corporate failure; Altman (1968), Deakin (1972), Ohlson (1980), Zavgren (1983), Jones (1987), Shumway (2001), and Jones and Hensher (2004). For a complete review of bankruptcy prediction in the context of financial institutions see Kumar and Ravi (2007), Fethi and Pasiouras (2009) and Demyanyk and Hasan (2010). However, the theoretical basis on which most models have been built has long been questioned. There are statistical issues pertaining to sampling procedures, issues associated with the statistical properties of the data, issues relating to matching, explanatory variable selection complexities, and issues relating to the time component of the data. In this paper we use, and we join, different multivariate statistical methods to explore the path to distress, while we try to answer the question of up to what point the structural differences that led some *Cajas* on the road to failure could have been revealed before the crisis by means of multivariate statistical analysis. While overcoming the limitations of much previous work, we use a technical approach based on the visualization of the main characteristics of the data, making it possible to combine statistical analysis with judgment.

Spanish savings banks (*Cajas de Ahorros*) have their roots in the nineteenth century and earlier, when they started as credit cooperatives, charitable institutions, or even mutual aid funds. After some changes, the modern *Cajas* could be considered as non-for-profit commercial institutions in the sense of Hansmann, 1996.

The *Cajas* did not have owners or shareholders and this had important consequences: until the 2008 financial crisis they could not be acquired, neither merge with a commercial bank, although they could merge or be acquired by another *Caja*.

The regulatory framework under which the *Cajas* operate, has always played an important role, and has always treated them as different from commercial banks, despite the fact that they accounted for half of the Spanish financial system. Only the Norwegian savings banks, among the European countries, enjoyed similar relevance. The financial success of the *Cajas* in the years of expansion, a period that starts in the early 1980s, has been accompanied by changes in the regulatory legislation. The main changes started as a consequence of the Spanish banking crisis of the 1970s, when the Bank of Spain took a more active interest in the solvency of financial institutions (Salas Fumás et al. 2009). The *Cajas* were then permitted to engage in all the functions that commercial banks carried out.

The *Cajas* have also been intensively involved in the building boom of the 2000s, either financing new developments or granting mortgages. The share of real estate loans in the *Cajas'* books in 2006, just before the onset of the financial crisis, ranged from just over 10% to almost 50%. The bursting of the financial bubble had important consequences for all the *Cajas*, and resulted in new legislation that impacted on all of them in such a way that they have virtually disappeared, notwithstanding the fact that there were important differences amongst these institutions.

The question arises of up to what point the *Cajas'* special governance arrangements influenced the success of their operations, their approach to risk and investment, and their policies, and to what extent this is reflected in statistical information that is generally available. In particular, after showing the heterogeneity of the results, with some successful *Cajas* and some distressed ones, we address the following questions. First, was it possible, using information prior to the financial crisis, to anticipate which institutions would find themselves in difficulties? Second, were the financial difficulties of *Cajas* that came under the 'Fund for Orderly Bank Restructuring' (Fondo de Reestructuración Ordenada Bancaria,

FROB) support (i.e., they had to be rescued) related to the structure of their governing bodies, in particular to the presence of politicians on the board?

After this introduction, we include a section describing the institutional features of the Spanish savings banks, and we discuss the data and the choice of financial ratios. The next section deals with the statistical methodology and the results, including the case of four *Cajas*. The paper ends with a discussion and conclusions.

2. Institutional features of the Spanish savings banks

Spanish legislation gave the *Cajas*, in 1977, a special status in accordance with their role of non-for-profit enterprises without formal owners that competed in the market against traditional financial institutions. In a more standard approach, we can characterize the *Cajas* as non-for-profit commercial institutions (Hansmann 1996). Their mission includes ensuring universal access to financial services, thus avoiding financial exclusion; to grant credit to small businesses and to individuals who would have been considered not to be a profitable venture for commercial banks; to contribute to regional development; and to contribute to the general well-being through charitable actions in favour of the community they serve. Any profits made must either be reinvested or used to promote general welfare. Examples of the type of charitable actions that they perform are financing centres for the elderly; financing grants for advanced study; and financing local museums and cultural activities. Until recently, their board directors perceived no salaries.

The regulatory framework established in 1977 was substantially modified by the 1985 'Ley de Órganos Rectores de las *Cajas* (*Cajas* Governing Bodies Act)' Act. The 1985 Act regulated the presence of the various stakeholders in the governing bodies of the *Cajas*; increased the presence of public authorities, and allowed executive chairmen (with executive salaries). Furthermore, the differences that existed between *Cajas* and commercial banks were removed, allowing free competition between the two types of institutions. Before the 1980s, the *Cajas* were restricted in their geographical coverage, something that is often reflected in their name. Although *Cajas* were not controlled by formal owners, they have a general assembly and a board which are made up of representatives from the different stakeholder groups: founding entities, depositors, employees, and public authorities. This last group generally means political party appointments, both local and/or regional. These peculiar arrangements have served them

well: the *Cajas* have been successful in capturing the savings of the small investor, and they have lent to small businesses.

A 1988 Royal Decree permitted the *Cajas* to operate anywhere in the country, thus further enhancing competition in the Spanish financial sector. The 2002 'Ley de Medidas de Reforma del Sistema Financiero (Measures for the reform of the financial system Act)', set a 50% limit to public bodies' representation on the boards of the *Cajas* to conform to the European law for private banks. And later, the 'Ley Financiera (Financial Act)'26/2003 introduced some additional information requirements for *Cajas* – and not for banks – in order to increase transparency.

As a result of these regulatory changes, the *Cajas* have entered the same financial markets as commercial banks, and compete nationally with them and among themselves. In order to do this, they have multiplied their presence by opening branches all over the country, and have expanded beyond their traditional business products. For example, the number of branches that the *Cajas* had in Spain increased from 9386 in 1979 to 22,649 in 2010. In contrast, during the same period, the number of branches that commercial banks had, only increased from 12,238 to 15,227, reducing in fact this number since 2007 (Banco de España 2011a). In this they successfully competed with commercial banks. According to the Report on Banking Supervision in Spain for the year 2010 (Banco de España 2011a), published annually by the Bank of Spain, the *Cajas* accounted for about one half of the Spanish credit market during the decade 2001–2010.We have included the evolution of the main descriptive statistics in the Appendix 1.

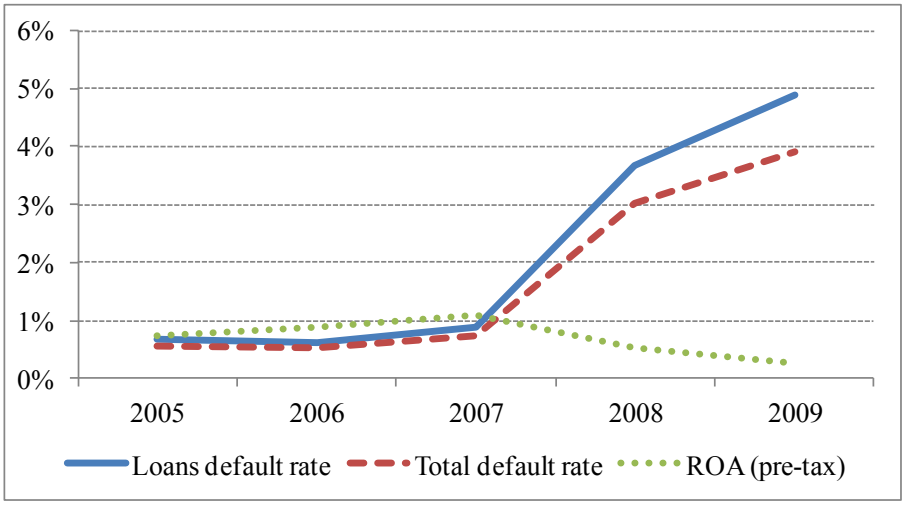
One could argue that, since the boards of the *Cajas* are not under the control of professionals in finance, they lack technical expertise; but it is also possible to argue that, since the boards of the *Cajas* are controlled by their stakeholders, the decisions taken are in the best interest of depositors, borrowers, and the local community. It can also be argued that, since there is no shareholder control, there is much room for abuse and corrupt practices. These are questions that touch agency theory issues (Hansmann 1996; Shleifer and Vishny 1997; Zingales 1998; Rajan and Zingales, 2000; Tirole 2001). For example, Hansmann (1996) argues that the sharing of control between the agent and the principal may result in inefficiencies, particularly when there are differences between the interests and preferences of the various bodies that share the control. However, this view is disputed by the partisans of 'shared capitalism' of which the main example is the German codetermination, with representatives of the workers in the board of directors (Salas Fumás

et al. 2009). These issues will be explored within the context of the 2008 credit crunch, and its impact on the *Cajas*.

The onset of the financial crisis can be traced to the second half of 2007 (Fiordelisi, Marques-Ibañez, and Molyneux 2011), but it was not until 2008 and, particularly during 2009, that the *Cajas* were affected by it, in the form of a sharp increase in bad debts and a decline in profitability. As can be seen from Figure 1, 2007 marks a turning point, with increasing default rates and decreasing return on assets.

The 2007 financial crisis put some *Cajas* under great financial difficulties. The Spanish government was forced to intervene to avoid some of them failing (Banco de España 2010). It did so by creating a FROB in 2009; Royal Decree 26 June 2009. The FROB complemented the existing system of Deposit Guarantee Funds and provided the context in which *Cajas* mergers took place. Two types of integration processes between *Cajas* were put in place. The first one was the usual situation of a financially sound *Caja* taking over a *Caja* in difficulties. The second process was similar to a merger, with the peculiarity that merged *Cajas* maintained their identity and a substantial degree of autonomy within the emerging conglomerate. This second process received the name of Institutional Protection System or IPS. But, as in any merger, it is often the case that a strong institution takes the lead in order not to allow a weak institution to go further in the path to distress. The restructuring plan included a wide range of financial support measures.

Figure 1 – Evolution of some relevant financial variables for the Spanish *Cajas*



Source: CECA (Spanish Confederation of Savings Banks)

However, and as a result of the concentration processes, the IPS mechanism has lost relevance. In 2010, a further legislative reform, Royal Decree 11/2010, required the *Cajas* to transfer their financial activity to a newly created banking entity. This made it possible, de facto, for commercial Banks to take over *Cajas*. To remain as *Cajas*, they were required to keep at least 50% of the voting rights in the newly created bank, otherwise they had to become foundations concentrating on their charitable work (Banco de España 2011b).

The *Cajas* have come under the umbrella of the FROB in two waves, the first one in 2010, and the second one in 2011. Our main goal is to analyze the question of whether the *Cajas* that needed financial support had structural weaknesses that were present before the financial crisis, or whether their financial difficulties could be attributed to bad management, perhaps because of an inappropriate management control structure.

To assess if there were structural weaknesses before 2007, we collected data for all the *Cajas* in Spain for the year 2006 from the BankScope database. This information was transformed into a set of financial ratios. A picture of the relative financial position of the *Cajas* was obtained using multivariate statistical methods: factor analysis, multidimensional scaling (MDS), property fitting, and Logit regression. We found that the *Cajas* that had come under the provisions of the FROB had indeed structural weaknesses that became evident as a consequence of the financial crisis. We explored the evolution of individual institutions through the financial ratios space before and after the crisis.

3. The data

3.1 *Data source*

We used the Fitch IBCA/Bureau van Dijk's BankScope database to obtain information about all the *Cajas*. Bankscope contains balance sheet and profit and loss account items for financial institutions and it is a widely used database in European studies. The main body of the analysis was based on financial ratios obtained from the 2006 accounts. We also used financial ratios for the period 1999–2008 in order to study in detail the changes that had taken place. Although the paths of all the *Cajas* were studied, we report on four institutions, two successful ones and two that had to be rescued. The period 1999–2008 was chosen because it covers 8 years before the onset of the crisis, and 2 years after the crisis. Two

Cajas were excluded due to lack of data: Caixa Ontinyent, and Caixa Pollensa. This lack of information is probably due to their very small size. The final data set included 43 entities.

Missing values were relatively scarce: in some variables there was a maximum of three missing values. In order not to lose any *Caja* in subsequent analyses, we decided to estimate the missing values. Two frequently used imputation methods are mean substitution and cold deck imputation (Winkler 2004). Mean substitution involves replacing all the missing values in each field with the field's mean; and in cold deck imputation the missing values are replaced with external constants, one for each field. These methods are easy to implement but very unlikely to maintain the statistical properties of the database. We settled for the *k*-nearest neighbour imputation with *k* equal to three. This method, while maintaining the statistical structure of the data, does not make any statistical assumptions, and does not involve developing a model for each variable with missing data. In this method, a pool of donors (i.e., complete records) is found for each recipient (i.e., incomplete record), and the value for missing cells in recipients is calculated from the values of the donors.

3.2 *The financial ratios*

The analysis was based on financial ratios calculated from items in the Balance Sheet and in the Profit and Loss account. There is a wide literature on financial ratios; for a complete review of bankruptcy prediction in the context of financial institutions see Kumar and Ravi (2007), Fethi and Pasiouras (2009) and Demyanyk and Hasan (2010). The ratios we have used attempt to capture information about capital adequacy, performance, liquidity, risk or assets quality, size, and growth. We also used two measures of data envelopment analysis (DEA) efficiency. The list of ratios is given in Table 1.

Capital adequacy is normally measured by means of the capital ratio, as established by the Basel Accords (issued by the Basel Committee on Banking Supervision). Spanish regulation for the analyzed period set this ratio at a minimum value of 8%. Ayuso, Pérez, and Saurina (2004) argued that, in order to analyze a financial entity, one should not take into account the capital ratio, but the extent to which it differs from the minimum legally required, and defined the K-Buffer ratio as (Regulatory Capital–Minimum Requirements)/Minimum Requirements. The K-Buffer ratio has been calculated and included in the data set.

Table 1 – Financial ratios used

Tier 1 Ratio	R1	CAPITAL ADEQUACY or SOLVENCY
Capital Ratio	R2	
K-Buffer	R3	
Equity / Total Assets	R4	
Equity / Net Loans	R5	
Net Interest Margin	R6	PERFORMANCE
Net Interest Revenue / Average Assets	R7	
ROA	R8	
ROE	R9	
CIR (Cost-to-Income Ratio)	R10	
Interbank Ratio	R11	LIQUIDITY
Net Loans / Tot Assets	R12	
Net Loans/(Deposits + Short Term Funding)	R13	
Liquid Assets / (Deposits + Short Term Funding)	R14	
Loan Loss Reserve / Gross Loans	R15	RISK or ASSETS QUALITY
Impaired Loans / Gross Loans	R16	
Loan Loss Reserve / Impaired Loans	R17	
Impaired Loans / Equity	R18	
Total Assets	R19	SIZE and GROWTH
TA Growth	R20	
Gross Loans	R21	
GL Growth	R22	

The data set also included two measures of efficiency calculated for every *Caja* using DEA. There has been much work in the recent years on the subject of DEA efficiency in relation to financial institutions; see, for example, Berger and Humphrey (1997) for an extensive literature review up to 1996. There are two main approaches to banking efficiency modelling: the production model and the intermediation model. Under the intermediation model, a financial institution uses capital and staff, and collects deposits in order to generate profits and interest. Under the production model, a bank is a place that deals with transactions, in which case deposits are an output to be dealt with. Serrano Cinca, Mar Molinero, and Fuertes-Callén (2011) review the literature on banking efficiency modelling, and show how the different specifications are related. Our production specification contained as inputs labour and physical capital, and as outputs deposits, interest, and non-interest income, and net loans (gross loans less reserves for non-performing loans). The intermediation specification contained labour, physical capital, and deposits as inputs, and interest and non-interest income and net loans as outputs.

3.3 *The identification of failed and successful* Cajas

The aim of the research is to establish if distress was related to weaknesses that were already present before 2006, and this required classifying the *Cajas* into two groups: the ones that, in 2011, had survived the crisis, and the ones that had to be rescued. Given that the *Cajas* did not actually fail, but either received the support of the FROB, or merged with other institutions, the classification task was not straightforward. We relied on the newsletters of the FROB and on the information issued by the Bank of Spain (*Nota Informativa Junio 2010*).

Table 2 – Restructuring process in the *Cajas*

Institutions involved	Number	Type	FROB 2010 (MM€)	FROB 2011 (MM€)	Financial Groups
Mergers approved by the Banco de España, with FROB aid	**28**		**11.381**	**7.551**	
1 Catalunya / Tarragona / Manresa	3	Merger	1.250	1.718	CatalunyaBank
2 Sabadell / Terrassa / Manlleu	3	Merger	380	568	Unnim
3 **Duero** / España	2	Merger	525		Banco Ceiss
4 **Cajastur**+CCM / Cantabria / Extremadura / CAM	5	IPS	1.493	2.800	Liberbank
5 Caixanova / Galicia	2	Merger	1.162	2.465	NCG Banco
6 **Madrid** / Bancaja / Laietana / Ins. Canarias / Ávila / Segovia / Rioja	7	IPS	4.464		Bankia
7 **Murcia** / Penedès / Sa Nostra / Granada	4	IPS	915		BMN
8 **BBK**+CajaSur	2	Merger	1.192		BBK
Mergers approved by the Banco de España, without financial aid	**12**				
9 **Navarra / General de Canarias / Municipal de Burgos**	3	IPS			Banca Cívica
10 **Unicaja** / Jaén	2	Merger			Unicaja
11 **La Caixa** / Girona	2	Merger			Caixabank
12 **Cajasol** / Guadalajara	2	Merger			Cajasol
13 **CAI / CC Burgos / Badajoz**	3	IPS			Caja 3
TOTAL RESTRUCTURING SAVINGS BANKS	**40**				
REST OF SAVINGS BANKS	**5**				
14 **Ibercaja**	1				Ibercaja
15 **Kutxa**	1				Kutxa
16 **Caja Vital**	1				Caja Vital
17 **Caixa Ontinyent**	1				Caixa Ontinyent
18 **Caixa Pollensa**	1				Caixa Pollensa
TOTAL SAVINGS BANKS	**45**				

(*) In bold and underlined are marked the leaders of each process

Source: Bank of Spain

Table 2 summarizes the way in which the *Cajas* were restructured. The type of restructuring –merger or IPS – that took place is also shown, as is the amount of FROB funding made available to the *Cajas* that needed it. In the case of mergers and IPSs, it was necessary to identify which *Caja* was the 'leader' and which *Cajas* were the distressed ones that had to be rescued. We have highlighted the names of the *Cajas* that we identified as successful. To identify the successful *Cajas*: first, we considered as successful those *Cajas* that did not merge and did not receive any FROB support; second, in the case of an IPS with no FROB support, all the *Cajas* were considered as successful, since all the *Cajas* in the IPS continue to have a separate identity within the conglomerate; third, in the case of a merger with no FROB support, we identified the most financially sound institution as the leader; fourth, in the case of *Cajas* that received FROB support, we identified as a leader the most successful institution, normally the largest one in the group. The situation of a small number of *Cajas* was particularly dramatic; amongst these we can mention CCM (Caja de Castilla La Mancha), CajaSur, and CAM (Caja de Ahorros del Mediterraneo).

4. Methodology and empirical findings

4.1 *Analysis*

Our data set was thus, a matrix of 43 *Cajas* (cases) by 24 variables (22 ratios and 2 efficiency measures). The first step was to engage in data reduction. For this, we used principal components analysis, both rotated and unrotated, as a first step to factor analysis, in order to explore the dimensionality of the data. Eight components were associated with eigenvalues greater than unity, if the Kaiser criterion is followed, and nine had eigenvalues greater than 0.7 under the more general Jolliffe (1972) criterion. As shown in Table 3, these factors accounted for over 90% of the variance in the data. The first four factors accounted for 64% of the variance.

Communalities were high, only one variable had a communality of 0.66, indicating that all variables contribute to later analyses. We also engaged in preliminary interpretation of the factors, and we found that the first factor is associated with capital adequacy and solvency. The second one was found to be related to risk and asset quality. The third factor had to do with performance and size. Finally, the fourth factor is also related to another measure of performance. The fifth factor was mainly related to efficiency.

Table 3 – Explained variance analysis with Principal Components Analysis

Component	Eigenvalue	Cumulative % of Variance
1	6,02	25,09
2	4,58	44,16
3	2,43	54,27
4	2,26	63,70
5	1,89	71,58
6	1,66	78,50
7	1,31	83,94
8	0,86	87,54
9	0,73	90,59

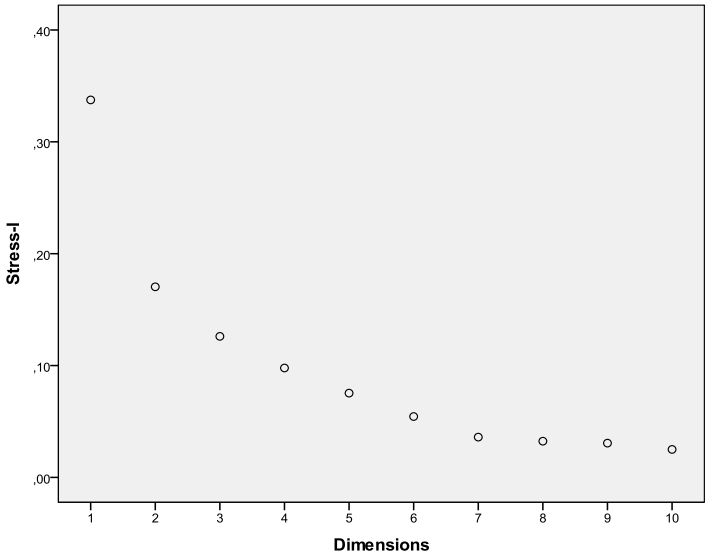
The assumption of normality was rejected for most ratios, in line with the findings of research in this area (Ezzamel, Mar Molinero, and Beecher 1987). This suggests that a non-parametric approach to modelling is desirable. An appropriate non-parametric alternative to factor analysis is ordinal MDS. MDS is a distance-based multivariate statistical technique. A set of distances is calculated between pairs of *Cajas*. This distance is based on the financial ratio structure of the *Cajas*. When two *Cajas* have very similar ratio structures they are placed next to each other in the space; and when two *Cajas* have different ratio structures, they are placed far apart. The distance between ratio structures was based on a Euclidean metric between standardized ratios. MDS is more general than factor analysis, being based on relations of order, but both are equivalent when the data are multivariate normal and correlations are used as measures of distance (Chatfield and Collins 1992). Besides, MDS is robust to the presence of extreme values, a common problem with business data.

Taking into account the results of principal components analysis, we produced a configuration in 10 dimensions. As it is common practice in MDS, we assessed the dimensionality of the data using the Stress1 statistic (Kruskal and Wish 1978). The configuration in 10 dimensions returned a Stress1 value of 0.025, which is considered as excellent under Kruskal's (1964) verbal classification. To find out how the value of Stress1 depends on the number of dimensions, we estimated configurations in 1, 2, 3, 4, 5, 6, 7, 8 and 9 dimensions. The results are given in Table 4 and plotted in Figure 2.

Table 4 –Stress$_1$ and dimensionality

Dimensions	*Stress 1*
1	0,33747
2	0,17038
3	0,12608
4	0,09781
5	0,07533
6	0,05442
7	0,03600
8	0,03235
9	0,03063
10	0,02500

Figure 2 – Elbow diagram



Although there is no clear 'elbow' in the graph, we can see that the eighth dimension, and later dimensions, contributes very little to reducing the stress, indicating that a configuration in seven dimensions is appropriate. Nevertheless, the 10-dimensional solution was kept, and dimensions 8–10 were treated as 'residual variation'. Each *Caja* is thus a point in a 10-dimensional space. The location of a *Caja* in this space is given by a set of 10 coordinates, related to the 10 dimensions of the solution. As it is the case with factor analysis, the axes of reference are chosen in such a way that the coordinates form an orthogonal set.

If it is the case that distressed *Cajas* have different financial structures from successful *Cajas*, the points associated with distressed *Cajas* will be located in a different area of the space than the points associated with successful *Cajas*. This would have been easy to appreciate if the map had been produced in two dimensions, but cannot be seen in a 10-dimensional map. In order to find out if there are regions of the space that are associated with successful *Cajas*, and regions of the space that are associated with distressed *Cajas*, we used bivariate Logit analysis. The dependent variable in Logit took the value 1 if the *Caja* had been successful and the value 0 if the *Caja* had to be rescued. As independent variables, we used the coordinates of the *Caja* in the 10-dimensional space. The Logit model did not include non-linearities or interactions. Not all the dimensions may be relevant in this context, but as the coordinates are orthogonal, the presence or absence of a dimension does not change the beta coefficients of the remaining variables in the solution. With this idea in mind, we engaged in a specification search as follows. We used three measures of quality of fit that are common in Logit analysis: log likelihood, Negelkerke $R2$, and the percentage of *Cajas* correctly classified by the model. We explored different specifications, and found that the best results were obtained when dimensions 1, 5, and 8 were used as explanatory variables –Negelkerke $R2$ reached a value of 0.77, and only four *Cajas* were misclassified. See Table 5 for full details.

Table 5 – Specification search

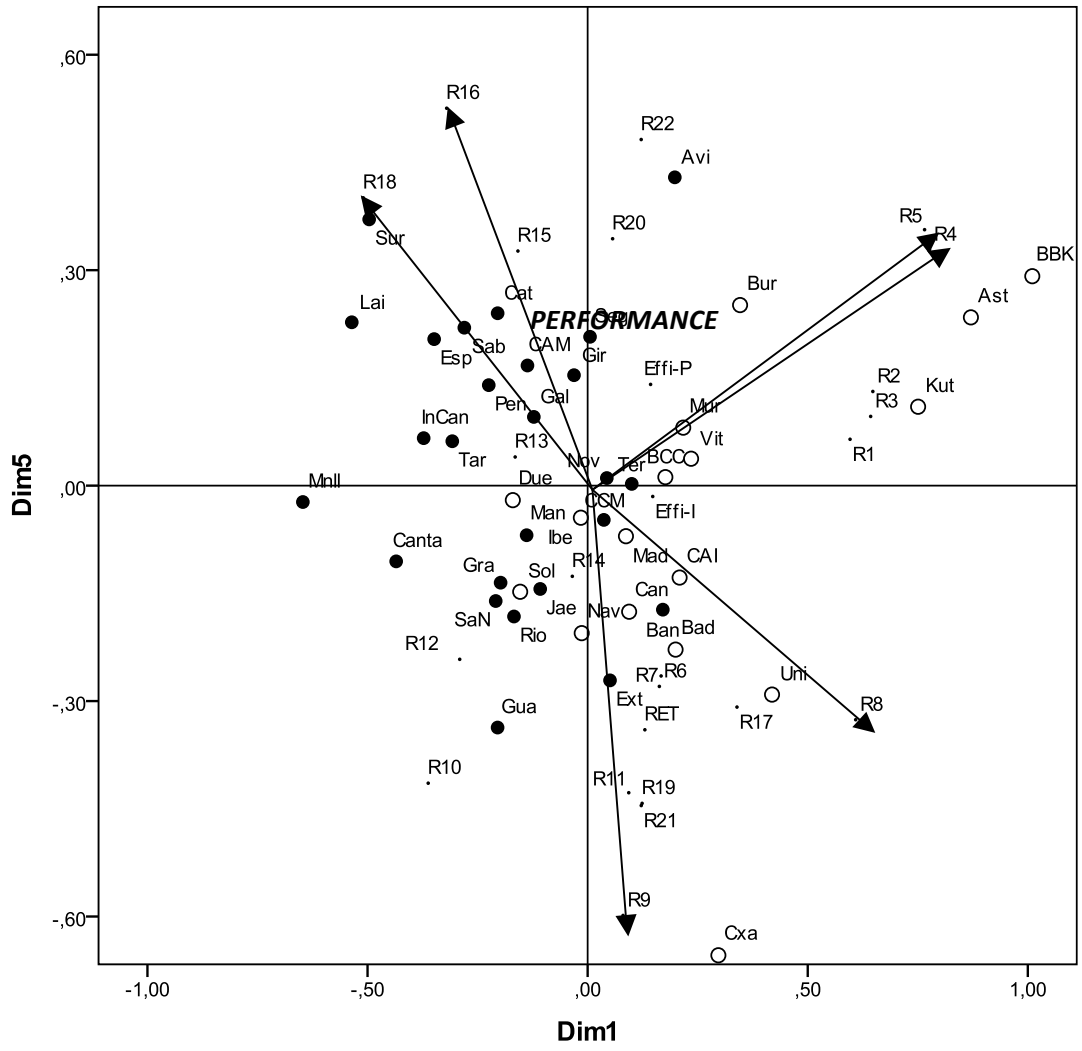
Model Coefficients (Significance)				-2 Log likelihood	R-square	Misclassified observations
Dim1 (***)				33,45	0,58	7
Dim2				57,32	0,01	17
Dim3				57,14	0,02	16
Dim4				57,38	0,01	18
Dim5				55,69	0,06	15
Dim6				57,54	0,01	17
Dim7				55,64	0,06	15
Dim8 (*)				54,37	0,10	14
Dim9				57,61	0,00	17
Dim10				57,48	0,01	17
Dim1 (***)	Dim5 [0,12]			30,56	0,63	6
Dim1 (***)	Dim7 (**)			26,72	0,70	6
Dim1 (***)	Dim8 (**)			28,42	0,67	5
Dim1 (***)	Dim5 [0,15]	Dim7 (**)		24,33	0,73	6
Dim1 (***)	**Dim5 (**)**	**Dim8 (**)**		**21,49**	**0,77**	**4**
Dim1 (***)	Dim7 (*)	Dim8		24,99	0,72	4
Dim1 (**)	Dim5 (*)	Dim7	Dim8 (*)	20,37	0,79	5

RISK

CAPITAL ADEQUACY

It is not possible to visualize a 10-dimensional set of points, and we are forced to work with projections on two dimensions. Figure 3 shows the projection of the 10-dimensional configuration onto dimensions 1 and 5, and Figure 4 shows the projection of the 10-dimensional configuration onto dimensions 1 and 8.

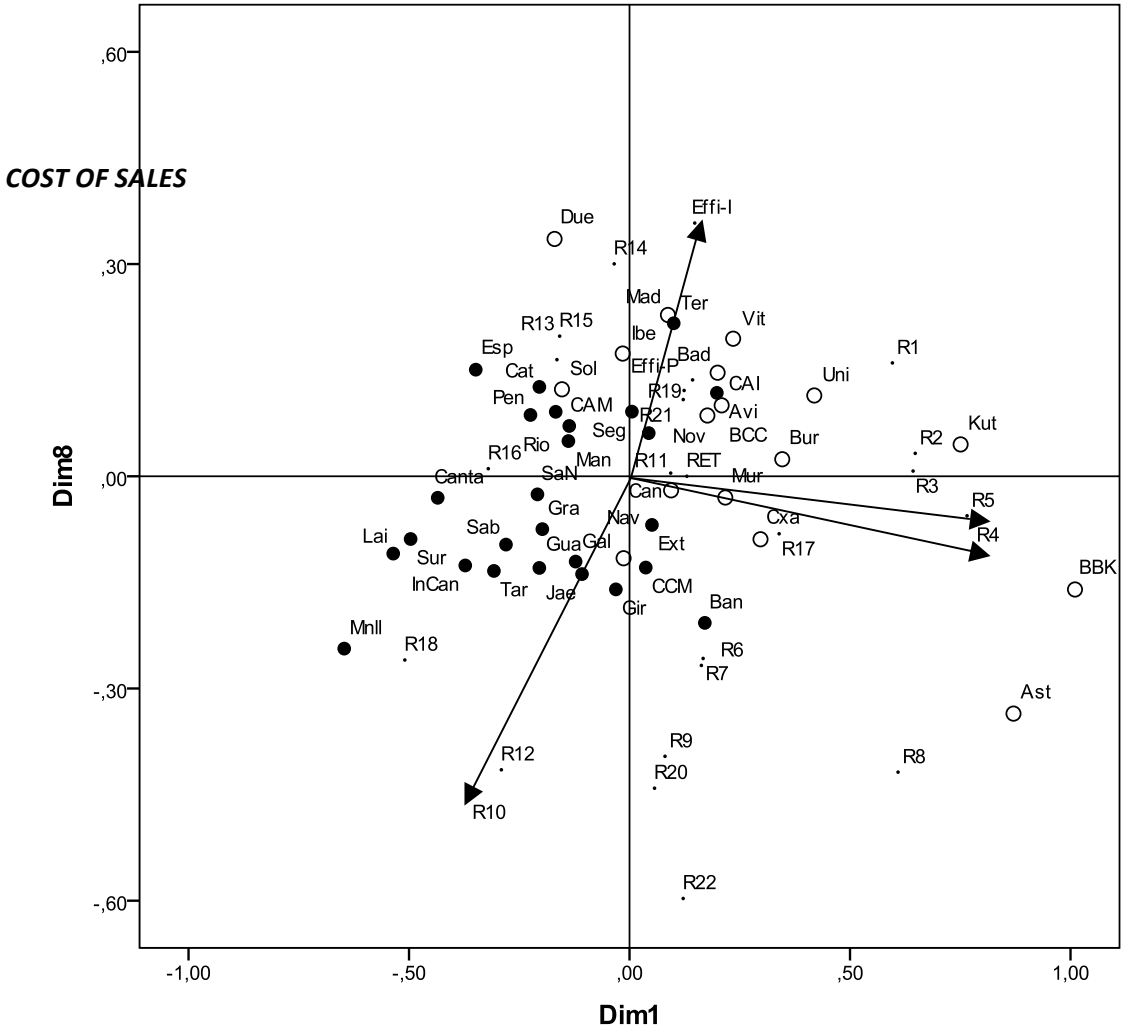
Figure 3 – Multidimensional Scaling configuration in Dimensions 1 and 5



The next step in our methodology is to interpret the configuration. This we did with Property Fitting (ProFit), a regression-based technique that comes under the general umbrella of Biplots (Gower and Hand 1996; Mar Molinero and Mingers 2007).With ProFit we explore if a particular characteristic of the data grows in a given direction. This results in a series of vectors through the configuration which serve to interpret it, much in the same

way in which North–South and East–West directions serve to interpret geographical maps. Using ProFit we have plotted vectors that show the directions in which particular financial ratios grow. For example, in Figure 4 ratio R5 growths from left to right, suggesting that entities Kut (Kutxa) and BBK are associated with high values of this ratio. Not all ratios have been completely represented in order not to clutter the representation. When the vector is not drawn, we have plotted the end point only; the missing vector can be reproduced by joining the centre of coordinates with the end point of the vector. The directional cosines for the variables in the study, together with the coefficients of determination that were obtained in their estimation can be seen from Table 6.

Figure 4 – Multidimensional Scaling configuration in Dimensions 1 and 8



It can be seen from Figure 3 that ratios R1, R2, and R3 are at an acute angle with Dimension 1, indicating that this dimension is associated with capital adequacy or solvency. In the same figure, we can see that Dimension 5 is associated with performance (R9) and risk (R16). The preponderant role of the intermediation efficiency ratio (Effi-I) and its opposite, the cost to income ratio (R10) in the discrimination between healthy and distressed entities can be observed in both Figures 3 and 4. These figures produce, therefore, a visual representation of the role capital adequacy, solvency, risk, performance, and intermediation efficiency in the distress of the *Cajas*.

Table 6 – Results of ProFit analysis

Var.	*Name*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Dim5*	*Dim6*	*Dim7*	*Dim8*	*Dim9*	*Dim10*	*Adjusted R-square*
R1	Tier 1 Ratio	0,60	-0,22	-0,13	-0,02	0,06	0,00	-0,46	0,16	-0,44	0,38	0,90
R2	Capital Ratio	0,65	-0,22	-0,10	-0,09	0,13	-0,31	-0,10	0,03	-0,63	-0,05	0,90
R3	K-Buffer	0,64	-0,19	-0,07	-0,12	0,10	-0,29	-0,17	0,01	-0,62	-0,16	0,89
R4	Equity / Total Assets	0,78	-0,21	0,10	-0,04	0,33	0,05	-0,24	-0,10	0,39	0,12	0,96
R5	Equity / Net Loans	0,77	-0,17	0,08	0,14	0,36	0,00	-0,18	-0,06	0,43	0,09	0,97
R6	Net Interest Margin	0,16	-0,64	-0,14	-0,26	-0,28	0,05	0,51	-0,27	0,24	-0,07	0,93
R7	Net Int Rev / Avg Assets	0,17	-0,64	-0,14	-0,29	-0,27	0,08	0,53	-0,26	0,19	-0,05	0,93
R8	ROAA	0,61	0,17	-0,21	0,03	-0,33	0,37	0,04	-0,42	0,23	0,29	0,91
R9	ROAE	0,08	0,36	-0,30	0,05	-0,60	0,41	0,26	-0,40	-0,14	0,05	0,88
R10	CIR	-0,36	-0,34	0,22	0,42	-0,41	-0,28	-0,26	-0,45	-0,06	-0,05	0,78
R11	Interbank Ratio	0,09	-0,32	-0,29	-0,06	-0,43	-0,71	0,04	0,00	-0,20	-0,26	0,48
R12	Net Loans / Tot Assets	-0,29	-0,10	0,03	-0,74	-0,24	0,13	-0,21	-0,41	-0,26	0,04	0,83
R13	Net Loans / (Dep + ST Funding)	-0,16	0,39	-0,13	-0,71	0,04	-0,46	-0,10	0,16	0,20	-0,10	0,88
R14	Liquid Assets / (Dep + ST Funding)	-0,03	0,05	-0,18	0,58	-0,13	-0,56	0,38	0,30	-0,26	-0,06	0,83
R15	Loan Loss Reserve / Gross Loans	-0,16	-0,38	-0,40	0,11	0,33	0,23	0,56	0,20	0,32	-0,22	0,77
R16	Impaired Loans / Gross Loans	-0,32	-0,32	-0,67	0,01	0,53	0,19	-0,07	0,01	0,14	-0,03	0,92
R17	Loan Loss Res / Impaired Loans	0,34	0,21	0,49	0,02	-0,31	-0,02	0,13	-0,08	0,49	-0,50	0,85
R18	Impaired Loans / Equity	-0,51	-0,26	-0,59	-0,01	0,40	0,07	-0,16	-0,26	0,10	-0,24	0,95
R19	Total Assets	0,12	0,55	-0,56	0,32	-0,44	0,04	-0,11	0,12	0,17	-0,04	0,91
R20	TA Growth	0,06	0,22	0,02	-0,08	0,34	-0,44	0,52	-0,44	-0,17	0,37	0,90
R21	Gross Loans	0,12	0,57	-0,59	0,26	-0,45	0,06	-0,09	0,11	0,14	-0,08	0,90
R22	GL Growth	0,12	0,49	0,09	0,00	0,48	0,06	0,36	-0,60	0,09	-0,07	0,80
Effi-P	Production model of efficiency	0,14	0,15	-0,12	-0,10	0,14	0,58	0,17	0,14	-0,67	-0,30	0,67
Effi-I	Intermediation model of efficiency	0,15	0,25	-0,43	-0,69	-0,02	-0,34	0,03	0,36	0,09	-0,10	0,90
RET	Boardmember Retribution	0,13	0,53	-0,46	0,44	-0,34	-0,15	-0,26	0,00	0,26	0,18	0,60

The role of capital adequacy and performance ratios becomes evident in Figure 4, since the vectors pertaining to ratios R5, R8, R1, R2, R3, and R9 point in the direction where the institutions that survived the crisis are to be found. In Figure 4, we can see the crucial role of the intermediation efficiency ratio. We conclude that the entities that had to be rescued were already characterized in 2006 (before the onset of the crisis) by low capital adequacy ratios, low performance ratios, and low intermediation efficiency.

Summarizing, we can see in Figures 3 and 4 that the institutions that have better stood the financial crisis did not only start with higher solvency ratios, but that their

financial/economic structure allowed for higher profitability and lower risk (better asset quality). Their higher profitability must have had a positive impact on their higher solvency ratios, since it has allowed for higher contribution to the core capital. In the same way, higher asset quality also had a positive impact on solvency, as lower bad debt provisions need to be made. Finally, the successful *Cajas* were also more efficient, as reflected in their cost-to-income ratio, a variable that behaves in the opposite direction as the intermediation efficiency ratio.

We conclude that in order to identify, in 2006, which institutions were to successfully manage the financial crisis, we had to go beyond the solvency framework and take into account risk and profitability issues. An MDS representation would have made it possible to identify such institutions.

4.2 *Corporate governance*

The *Cajas* are not-for-profit financial institutions with peculiar governing arrangements within the Spanish framework, which is characterized by a banking-oriented financial system with concentrated ownership structures (Azofra and Santamaría 2011). The *Cajas* have no explicit owners and are not subject to the control of shareholders, unlike their competitors, the commercial banks (Crespí, García-Cestona, and Salas 2004). The strategic decisions of the *Cajas* are taken by their governing bodies, made up of stakeholders, including political party appointments. There has been much debate on the role of political appointees in government of the *Cajas*, and whether they have contributed to their success or failure. Cuñat and Garicano (2010) have analyzed the lending performance of the *Cajas*, including non-performing loans, before the 2007 financial crisis. They related differences in the composition of governing bodies to the success of the entities and found, amongst other things, that neither the composition of the Board of Directors nor the importance of the political presence was related to the performance of their credit portfolios.

In this study, we have also taken up the issue of Governing Bodies membership. For every *Caja*, we have collected information on the percentage of politicians in the governing body. This variable has been treated as a 'property' in the property fitting technique. This involves running a regression in which the percentage of politicians is taken as a dependent variable, and the dimensions of the *Cajas* in the 10-dimensional representation are taken as explanatory variables. If the value of $R2$ is low, say below 0.5, it appears that the configuration does not bring much light on the role of politicians into *Cajas'* distress. As it

can be seen from Table 7, values of $R2$ are low: 0.30 for 'Politicians in the General Assembly' and 0.29 for 'Politicians in the Board of Directors', thus confirming the results observed by Cuñat and Garicano (2010). The analysis was repeated with the Herfindahl–Hirschman index of stakeholder concentration (Hirschman 1964), with the ratio of Board Compensation/Total Assets, and with the ratio of Board Compensation/Operating Income. The coefficients of determination took very low values, ranging from 0.10 to 0.15. However, we found that Compensation per Board member was well explained by the map. The results are summarized in Table 7.

Table 7 – Relation of some Corporate Governance issues with *Cajas'* success

Corp. Gov. Issue	***Variable***	***n***	***Adjusted R-square***
Political weight	Politicians in Assembly	43	0,30
	Politicians in Board	43	0,29
Stakeholder concentration	Herfindahl–Hirschman Index Assembly	43	0,10
	Herfindahl–Hirschman Index Board	43	0,15
Board compensation	Board compensation / Total Assets	43	0,14
	Board compensation / Operative Income	43	0,11
	Compensation per boardmember	43	0,60

To further understand these results, we have looked at individual cases in more depth. In the one hand, we observed that BBK, Kutxa, andVital, the institutions that reach the maximum proportion of public administration representatives allowed by the legislation (50%), are also successful *Cajas* in the sense that they have not suffered any financial difficulties. The same remark can be said about Unicaja and Cajastur. On the other hand, some institutions with a low participation of public administration representatives (around 20%), such as Caixa Penedes, Caixa Laietana, or Caja Sur, needed to be rescued with public funds or had to merge with other *Cajas* in order to survive. Furthermore, we can also find *Cajas* with a high participation of public administration representatives in their governing bodies – such as Bancaja, CAM, and Caixa Galicia – that suffered financial distress, and institutions with low participation of public administration representatives – La Caixa, CAI – that are examples of successful institutions. This heterogeneity is consistent with the low $R2$ values observed in the ProFit analysis.

We have to conclude that there is no clear relationship between political influence in the *Cajas*' governing bodies, as measured through the percentage of public administration representatives in the board, and later financial distress. Nevertheless, we did find that board members compensation was well explained by the MDS map. This is consistent with the view that the directors of the *Cajas*, whilst not being motivated by profit, have growth and size as an objective, and use their power within the governing bodies to reward themselves by their 'success' (Serra Ramoneda 2011). However, it is important to note that a higher compensation may in fact reflect bank specific characteristics or directors' experience. Furthermore, this paper does not analyze causality governance issues, but it rather describes the relationship among variables.

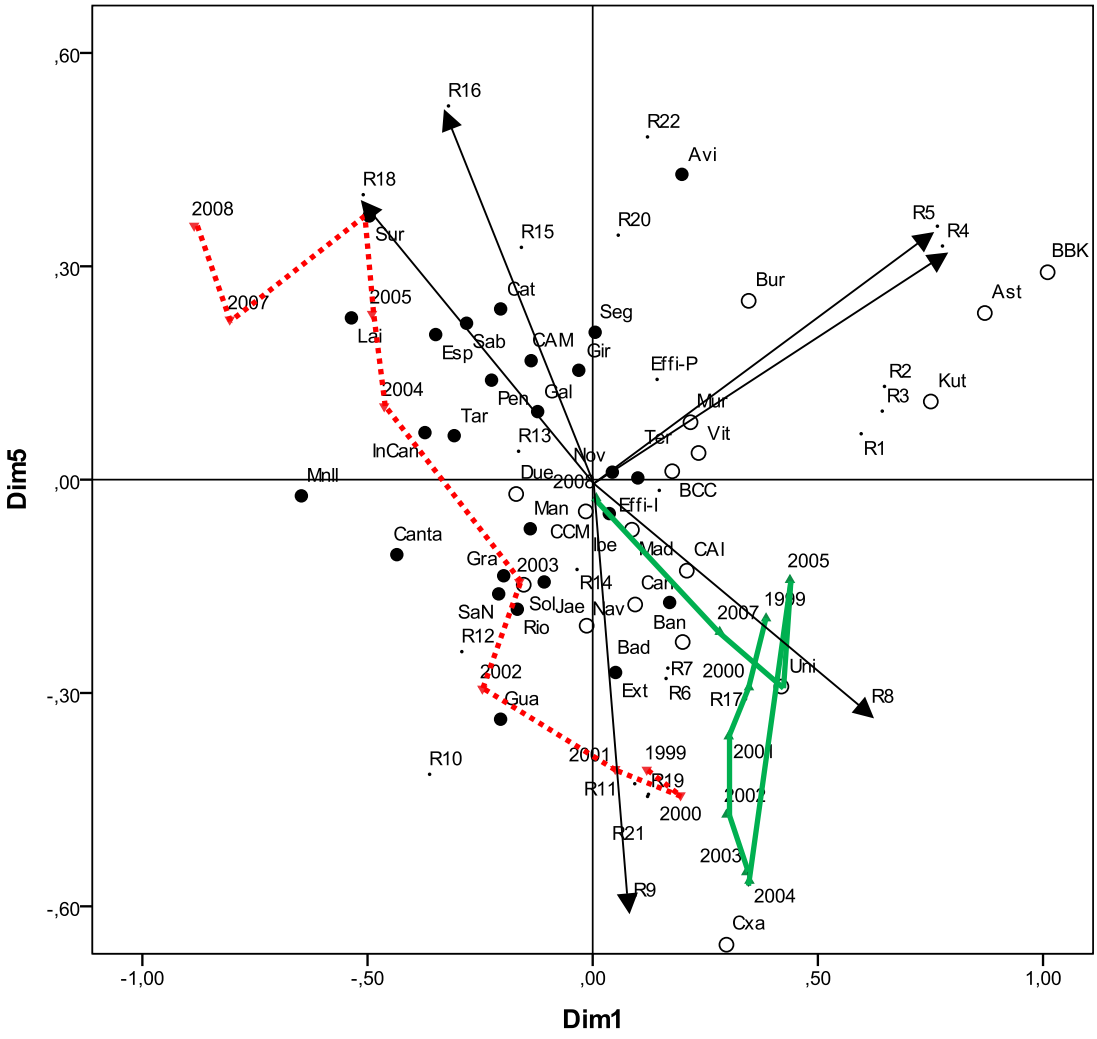
4.3 *Four case studies*

The MDS representation has been constructed with the 2006 data, and we have seen that it gives a visual representation of the financial situation of the *Cajas* just before the onset of the financial crisis. It also shows that there were structural differences between the *Cajas* that had to be rescued and the ones that survived the crisis. However, this analysis is based on a snapshot of the financial situation at a particular moment. We would also like to explore the dynamics of the process; i.e., the path followed by a particular *Caja* over the years and how this is related to its financial situation in 2011. This same situation is faced in the prediction of company failure, where the usual approach is to collect data from a sample of failed companies and continuing companies for a given year, to build a model, and to use this model to assess the financial health of a company not included in the sample on the basis of its financial ratios. The data used to build the model having been, in general, collected earlier than the data available for the company whose health is being assessed. The assumption being that the results of the model remain valid at least for some years.We show here how the life story of a *Caja* over time can be traced using the results we have derived from the 2006 data set.

Although the analysis was done for all the institutions in the data set, we report only on four case studies: two successful *Cajas* and two *Cajas* that had to be rescued. We are interested in the path that they followed toward success or distress. The methodology we use is the same one that was employed by Mar Molinero and Serrano Cinca (2001). For a given *Caja*, say Unicaja, we collect information from the period 1999–2009; 2009 being the latest year for which we had information in the database. The configuration built with 2006 data was kept unchanged. On this configuration we projected Unicaja as 11 points, each point corresponding to a particular year. We did this one year at a time. The result can

be seen from Figure 5, which also shows the path followed by a distressed *Caja*, CajaSur. The path followed by two additional *Cajas* can be seen from Figure 6. We have only represented the configuration in Dimensions 1 and 5, as these two dimensions are revealing enough.

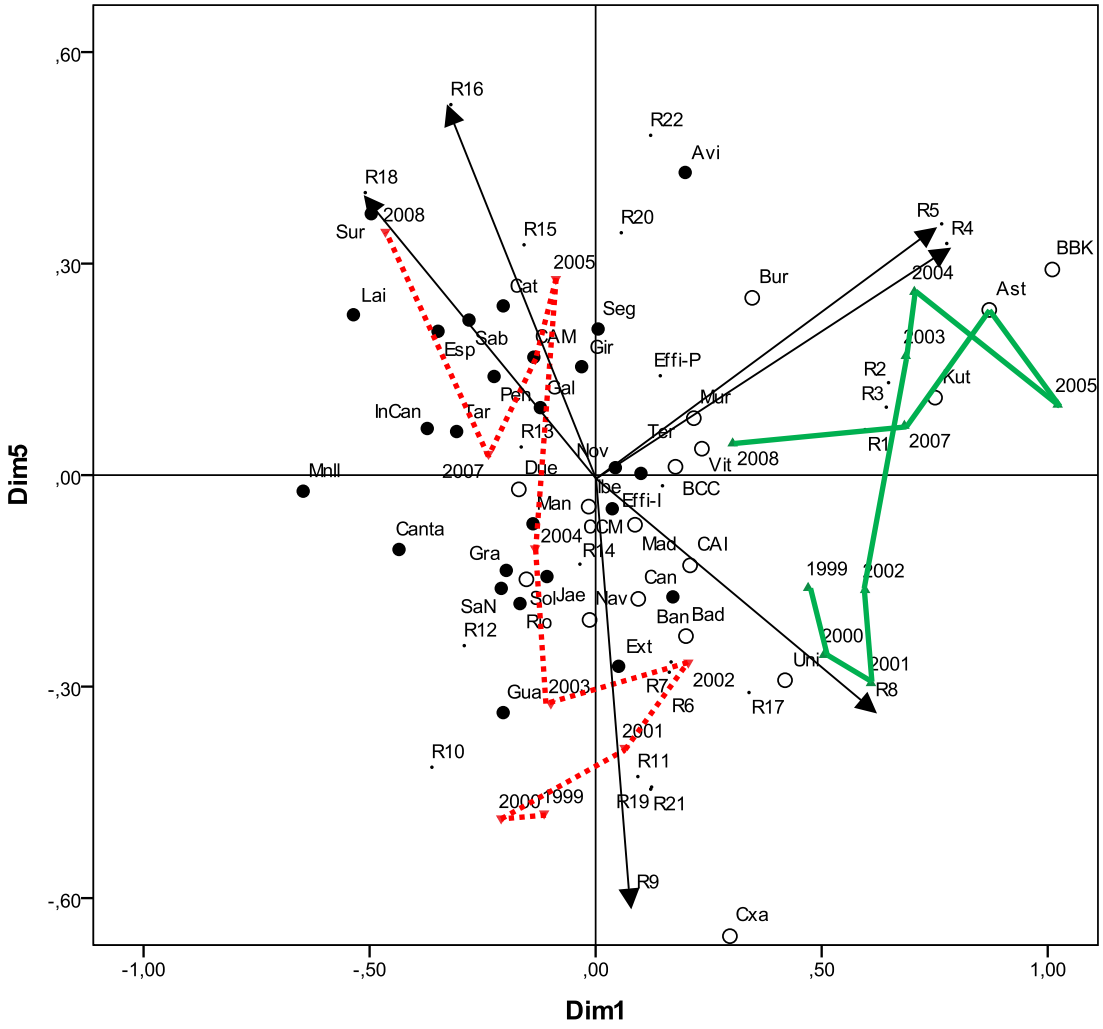
Figure 5 – Time Evolution of Unicaja (continuous line) and CajaSur (dotted line)



We can see from Figure 5 that Unicaja (continuous line) had in 1999 a high return on assets ratio (R8), a high value of return on equity (R9) and also a high value of the ratio loan loss reserve/impaired loans. The value risk ratios R16 (impaired loans/gross loans) and R18 (impaired loans/equity) were low. This situation remained until 2008 when performance ratios (R8 and R9) and risk ratios (R16 and R18) deteriorated bringing Unicaja in what would have been a marginal situation between success and failure in 2006.

In this same figure, we see the evolution of CajaSur (dotted line). CajaSur started in 1999 with excellent values of the performance ratios (R8 and R9) and risk ratios (R16 and R18). It is worth noticing that in 2006, the CajaSur financial situation had already been steadily deteriorating from year to year, so its distress problems should not have been a surprise. In 2010, CajaSur was taken over by a successful *Caja*, BBK.

Figure 6 – Evolution of Cajastur (continuous line) and CAM (dotted line)



In Figure 6, we trace the evolution of the financial ratios of Cajastur (continuous line).We see that in 1999 this *Caja* had high values of performance ratios (R8 and R9) and only average values of solvency ratios (R4 and R5). From 2001 to 2004, solvency ratios increased at the expense of performance ratios. The financial crisis caught this *Caja* well prepared. The point associated with Cajastur moved toward the center of the configuration

but stayed on healthy *Cajas* region. A very different story emerges when looking at the path followed by CAM (dotted line in Figure 6). In 1999, CAM started with high values of performance ratios and low values of risk ratios, but these ratios continuously deteriorated over time. In 2011, having gone through several unsuccessful attempts to keep CAM with the *Cajas* sector, it was finally taken over by a commercial bank (Banc de Sabadell).

Here, we only have shown the time paths followed by four institutions over the statistical maps, but this procedure was applied to all the institutions with similar results. In particular, all the *Cajas* that had to be rescued moved over time in the same direction, and this movement was already present before the crucial year 2008. This confirms our view that multivariate statistical analysis could have been an important tool for the definition of public financial policy.

5. Conclusion

The Spanish saving banks or '*Cajas de Ahorros*' have a long and successful history within the Spanish financial system spanning over a century. They have suffered much during the 2007 credit crunch. This was unprecedented, as no *Caja* had ever been rescued by the Deposit Guarantee Fund. The question that we addressed in this research is whether there were underlying financial weaknesses in the system that had remained hidden and were brought forward as a result of the credit crunch. We were also interested to find out if past financial information could be used to trace the path that *Cajas* had followed in the way to success or distress. We have used multivariate statistics to show that this was indeed the case.

While having a strong theoretical basis, a multivariate statistical methodology visualizes the results in the form of maps, making the results accessible to the person who does not have a strong statistical background. The statistical maps have revealed that the *Cajas* that had to be rescued had low values of capital adequacy ratios, low performance ratios, high risk ratios, high cost of sales ratios, and low intermediation efficiency in the DEA sense. We have also used the statistical maps to trace the time evolution of two successful *Cajas* and two *Cajas* that had to be rescued.

The changes in financial regulation that allowed the *Cajas* to compete with commercial banks made it possible for these institutions to expand beyond their traditional local environment and to take up business that, in the past, would have been left to commercial banks. By opening new branches and taking on more risky business, the *Cajas* increased their assets and, by so doing, the denominator of their solvency coefficient. But the *Cajas* had to keep their solvency coefficient above the limit set by the financial regulator, something that they could only do in a limited way, as they have no shareholders and can only increase their capital (numerator or the coefficient) through the way of retained profits. The result was deterioration in their solvency ratios, something that left those with 'ambitions' in a very delicate position when the credit crunch arrived. The *Cajas* could have remained within their traditional regions and ignored the temptation to expand. Some of them did just this, but most managers saw growth and size as an opportunity to increase their power, their status in society, and their income, as argued by Serra Ramoneda (2011). This interpretation of events is consistent with the findings of our research.

A separate question is whether the peculiar Corporate Governance arrangements of the *Cajas* had influenced their success or failure. We were particularly interested in the presence of political appointees in Boards of Directors. The analysis did not reveal any association with distress, as measured through the financial ratios.

The separate status of the *Cajas* was given a definite blow with the Royal Decree 11/2010, which forced most *Cajas* to transfer their financial activity to a commercial bank, something that produced further changes in the *Cajas* sector. The financial world that emerged in Spain after that was very different from the one existing before 2007. Only a few *Cajas* survived in their initial form. Most had to abandon their non-for-profit orientation and operate as banks with, perhaps, a substantial reduction in their charitable activities. Perhaps the world of local financial entities that supported the community, contributed to avoid social exclusion, and had as an important mission general welfare was too romantic and not in keeping with the ways of the twenty-first century, but it was a nice one and many individuals will miss the 'ancien régime'.

Appendix 1. Evolution of the main descriptive statistics of *Cajas* and Spanish commercial banks (1985 – 2010)

Source: Own elaboration from Bank of Spain data

Figure A.1 – Assets (% over total credit institutions)

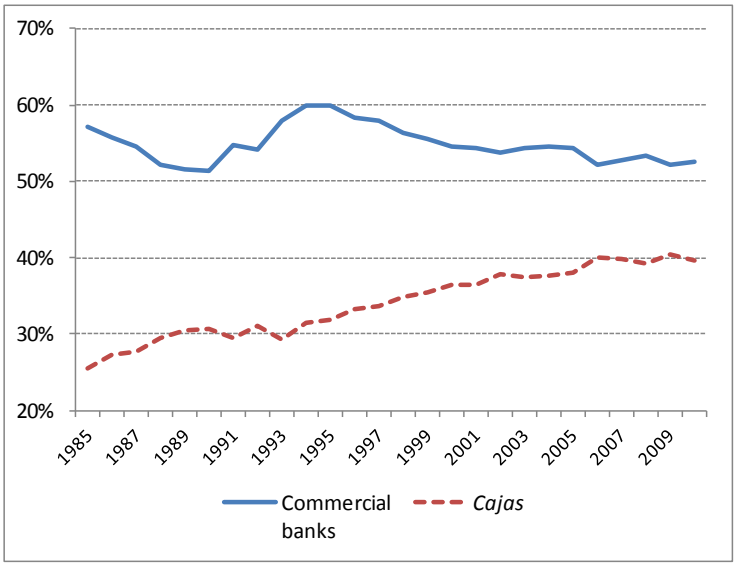


Figure A.2 – Loans (% over total credit institutions)

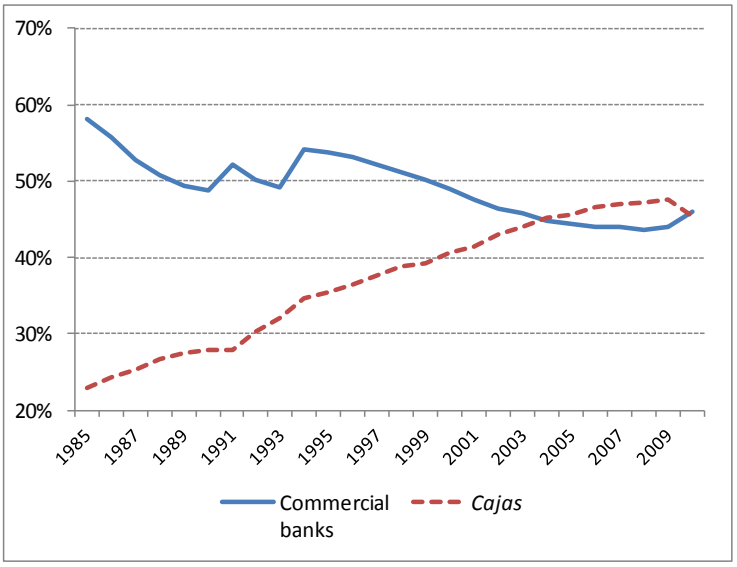


Figure A.3 – Deposits (% over total credit institutions)

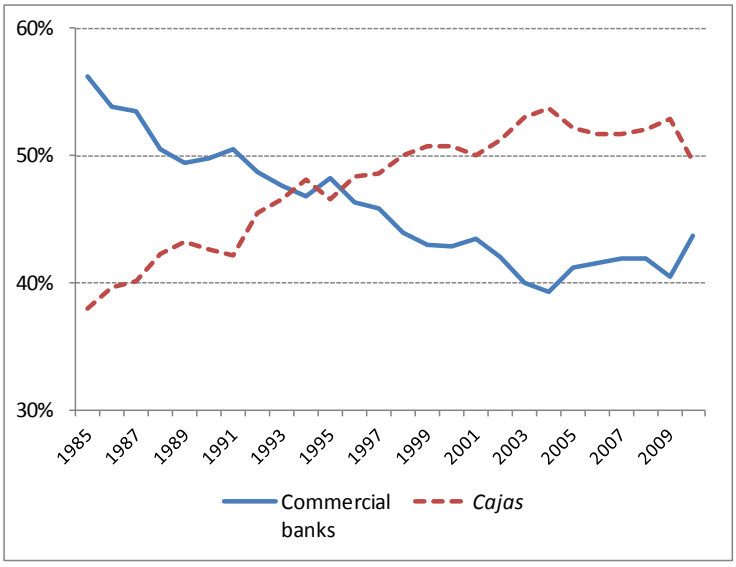


Figure A.4 – Number of employees

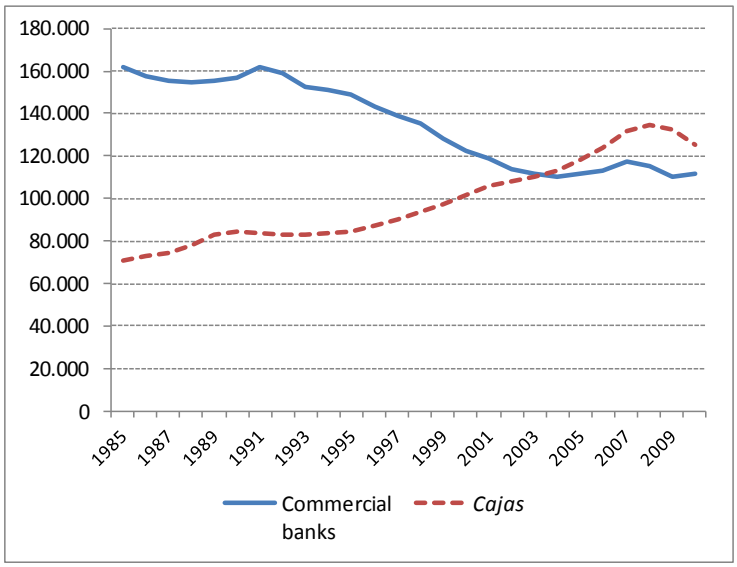
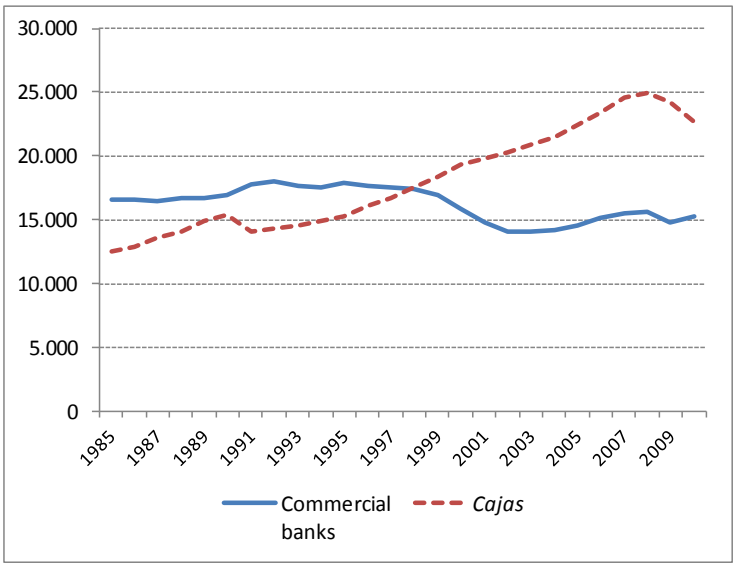


Figure A.5 – Number of branches



Chapter 2

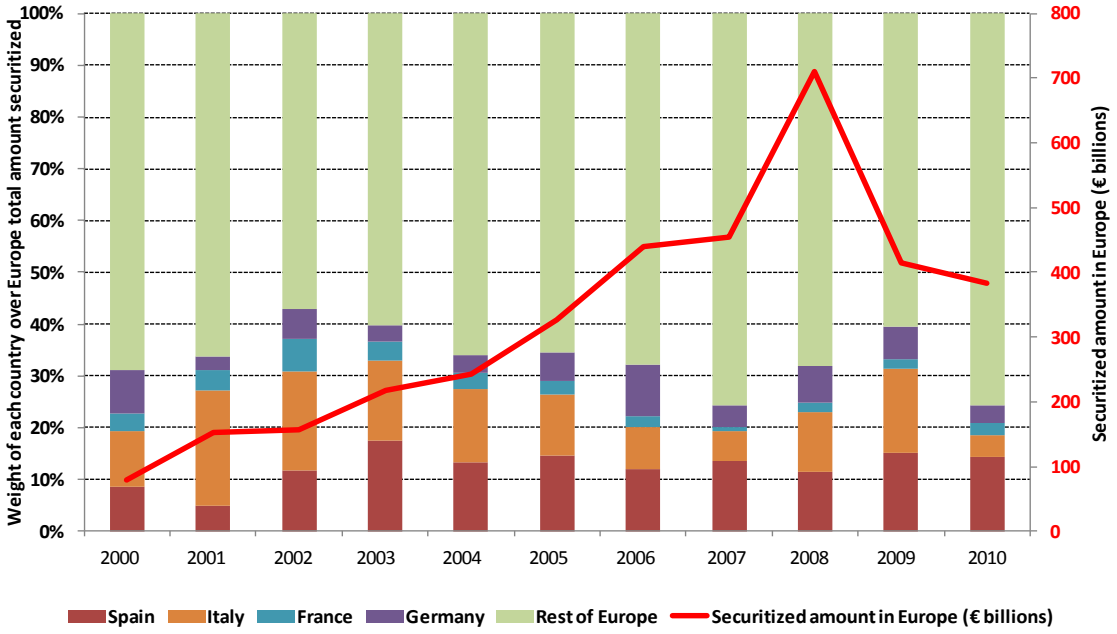
Why did Spanish banks securitize differently? Asset securitization, ownership and risk

1. Introduction

Securitization has been one of the key exponents of the intense financial innovation carried out in recent years and it has played an essential role, both during the boom period and in the crisis of the financial system. In spite of the potential benefits of securitization as a powerful funding tool, there has been, in general, little detailed analysis about the real risks concerning the generated securities, or the existing conflicts of interest in some parts of the process. In particular, those conflicts affecting credit rating agencies and the risk behaviour of the banks have not been addressed. Only after the impact of the recent crisis, the European Union (EU) authorities, among others, have shown their intention to regulate and supervise more carefully. And additional measures have also been taken by the different national authorities. In this paper we analyze the determinants of bank asset securitization during the pre-crisis period, 1999-2007.

The volume of securitized assets worldwide has grown exponentially during the last decade, especially during those years previous to the financial turbulences. Europe has been no exception (Figure 1 shows the total securitization issuance per year in European countries). More specifically, securitization in Europe can be divided in two periods: one period that reaches the second quarter of 2007 (until the first financial turbulences) and that presents permanent high growth ratios (the total amount issued from 2000 to 2007 increased almost six-fold); and another period, just after mid 2007, characterized for irregular total issuance amounts. During this last period, and due to the crisis, it has been increasingly harder for banks to sell bonds in capital markets. Nevertheless, most of them have followed a strategy of holding bonds and discount them as eligible collateral in the ECB (European Central Bank) money auctions. Figure 1 also shows the relevance of Spain as one of the most active European countries in this securitization activity during the expansive years.

Figure 1. Securitization. Total European issuance and percentages of the most active countries



Source: ESF Securitization Data Reports and own elaboration

The Spanish National Securities Market Commission (CNMV, or *Comisión Nacional del Mercado de Valores*) is the agency in charge of supervising and inspecting the Spanish Stock Markets along with the activities of all the participants in those markets. This agency has pioneered the implementation of specific regulations designed to increase the regular public reporting requirements of securitization funds. This is also one of the sources for our data. Since 1992 (with the Law 19/1992 of securitization vehicles) the Spanish financial institutions were authorized to securitize mortgages, but it was not until 1998 (with the Royal Decree 926/1998) that those institutions could securitize assets other than mortgages. In line with this fact, the securitization activity carried out by Spanish banks before 1999 remained marginal.

As mentioned above, our goal is to explain which are the factors underlying the decision of securitizing assets in Spanish banks, distinguishing also between savings banks (*Cajas*) and the rest of Spanish banks (commercial banks and credit cooperatives). In addition, we also analyze the significant determinants behind the volume of securitized assets, since the collected data allows us to go deeper in the analyses.

More specifically, this paper analyzes the specific determinants of asset securitization in Spanish banks for the period 1999-2007, that is, which are the specific factors that induced those entities to securitize their assets in a boom period. Furthermore, we compare the *Cajas* results with those obtained from the analysis of the rest of Spanish financial institutions, mostly commercial banks and credit cooperatives. According to the Report on Banking Supervision in Spain for the year 2010 (Banco de España 2011), published annually by the Bank of Spain, the *Cajas* accounted for about one half of the Spanish credit market during the decade 2001–2010 (commercial banks have been holding around 45% of the sector, while credit cooperatives have been maintaining a residual 10%). While shareholders and customers were the owners of commercial banks and credit cooperatives, *Cajas* had a peculiar governance system. They had no formal owners and were closer to the commercial nonprofit organizations described by Hansmann (1996), with four groups of stakeholders (employees, customers, politicians and founders) taking part in their government bodies.

In this framework, asset securitization seems to play a key role explaining both the sector's credit growth until 2007 and the deep crisis afterwards. This fact, all together with the recent turbulences in financial markets and the subsequent restructuring of *Cajas* (leading to their disappearance in many cases) motivate this work. Most *Cajas* have been transformed or merged during the last four years. The 2007 financial crisis has put some of these institutions under great financial difficulties and the Spanish government has been forced to intervene to avoid further damages to its financial system. In fact, there have been several restructuring plans that included a wide range of financial support measures, and most of the *Cajas* have eventually disappeared.

There have been some previous works carrying out international comparisons within the financial sector. One important problem with the economic literature that covers several countries and large geographic areas is that most papers only take into account the largest and listed banks, introducing a bias that may offer an incomplete picture of reality. Other times this reality is oversimplified due to the inclusion of heterogeneous countries, or the joint analysis of many different types of financial firms. Through our emphasis in the *Cajas*, banks with specific corporate governance and risk features, and its comparison with the rest of Spanish financial institutions, we would like to go deeper in the analysis, highlighting the role of some determinants, more specifically regulatory capital and risk transfer factors, that have important implications for future supervisory policies.

Concerning the methodology, we use multivariate techniques to carry out the analysis and, in particular, we run logit and tobit estimations to analyze the determinants behind the decision to securitize and the total amount securitized. We conclude that *Cajas* with greater credit risk exposure and lower liquidity are more likely to securitize, and they do it in greater amounts during the boom (pre-crisis) period. At the same time, we do not find a significant role of the variable capital in terms of securitizing. In contrast with the results for *Cajas*, more risky, less liquid and less profitable commercial banks are more likely to securitize and for a larger amount. Furthermore, size becomes a significant determinant of securitization in all Spanish institutions.

Our analysis focuses on asset securitization only, unlike previous research concerning securitization in Spain. Doing this, our approach allows us to carry out a comparative analysis between the *Cajas* and the rest of Spanish banks, both in terms of the securitization decision itself and the volume involved, which is absent in previous analysis. In fact, liabilities securitization could be considered as an improper form of securitization, since it does not affect the transfer of rights and risks related to assets and, therefore, by no means implies a mechanism for managing credit risk. Additionally, and in order to compare our results with other international studies, we have also collected and analyzed the total volume of asset securitization for a given bank. For all these goals, asset securitization becomes the relevant type of securitization.

The paper is organized as follows. Section 2 presents the literature review. Sections 3 and 4 describe the methodology employed, analyzing the theoretical framework and the hypotheses along with a description of the data sources and the sample used in the empirical analyses. We also propose the model containing the determinants of securitization. Section 5 presents the results of the econometric analyses and some robustness checks. Finally, section 6 discusses the empirical findings and the conclusions.

2. Literature review

The economic literature on securitization can be divided in three main streams: theoretical studies, empirical studies about ex-ante characteristics or determinants of securitization, and empirical studies about ex-post effects of securitization.

Concerning the theoretical studies, Agostino and Mazzuca (2008) underline the presence of information asymmetries as the great motivator of the growth and implementation of securitization all around the world. In particular, while banks had liquidity transformation (Diamond and Dybvig, 1983) and delegated monitoring (Diamond, 1984) as two of their key functions, securitization can be an additional source of funding for entities which are less likely to achieve an adequate level of portfolio diversification and in which investors or depositors would not invest *a priori*. But securitization may also be used to bypass the constraints derived from the existence of both credit-rationed and non credit-rationed markets, under a framework of information asymmetries and costs. In an interesting paper, Wolfe (2000) argues about the potential changes in the operational structure of deposit-taking for those financial institutions that securitize assets. This author also concludes that banks enhance their return on capital through securitization, due to the possibility of increasing their business volume of loans without having to increase their liabilities or their capital levels. More recently, Affinito and Tagliaferri (2010) argue that since banks are no longer the primary holders of illiquid assets, securitizing banks have less incentives to monitor their borrowers, and this significant change in their activity raises the issue of what induces (or used to induce) banks to revise one of their basic business activities, the monitoring of borrowers.

Table 1. Summary of previous empirical studies about securitization determinants

					Analyzed factors				***Significant factors***				
Authors	***Year***	***Sample***	***Period***	***Country***	***C***	***R***	***L***	***P***	***C***	***R***	***L***	***P***	***(*)***
Calomiris and Mason	2004	Banks / Credit cards	1996	USA	x	x	x		x				
Minton et al	2004	Private listed financial institutions	1993-2002	USA		x		x	*(1)*	x		x	
Martín-Oliver and Saurina	2007	Banks, *Cajas* , cooperatives / ABS	1999-2006	Spain	x	x	x		*(2)*		x		
Uzun and Webb	2007	Banks	2001-2005	USA	x				*(3)*				
Bannier and Hänsel	2008	Great banks / CDO	1997-2004	EU	x	x	x	x	*(4)*	x	x	x	
Agostino and Mazzuca	2008	Banks	1999-2006	Italy	x		x	x			x		
Cardone-Riportella et al	2010	Banks, *Cajas* , cooperatives / ABS + CDO	2000-2007	Spain	x	x	x	x			x	x	
Panetta and Pozzolo	2010	Banks	1991-2007	World	x	x	x	x	x	x	x	x	
Affinito and Tagliaferri	2010	Banks	2000-2006	Italy	x	x	x	x	x	x	x	x	

(*) Considered factors: Capital (C), Risk (R), Liquidity (L) and Performance (P)

(1) Leverage (Capital-Asset Ratio) is considered as Risk factor, not Capital factor

(2) Only in the case of SME securitizations

(3) Depending on the type of securitized assets, the effects can be positive, negative (reverse effect), or without significative effects

(4) Reverse effect

About the second stream, few papers have analyzed the determinants of securitization or their ex-ante characteristics in empirical terms. Table 1 summarizes the main empirical studies about securitization determinants and their findings. To facilitate the analysis, we have also included the differences in the data bases and in the determinants invoked in each paper.

Although most of the early papers focused in one, two or, at most, three main groups of determinants (Calomiris and Mason, 2004; Minton et al., 2004; Martín-Oliver and Saurina, 2007; Uzun and Webb, 2007; Agostino and Mazzuca, 2008), there seems to be a recent consensus (Bannier and Hänsel, 2008; Cardone-Riportella et al., 2010; Panetta and Pozzolo, 2010; Affinito and Tagliaferri, 2010) in distinguishing four types of determinants to obtain a better view of the problem. These determinants are: the search of additional liquidity, the transfer of credit risk, the need of further capital or an improvement on performance.

Finally, and concerning the empirical studies about the ex-post effects of securitization, several authors analyze whether securitization influences its issuer and to what extent, even checking in some cases the effect for the overall financial system. More specifically, Affinito and Tagliaferri (2010) point out that some of these studies provide evidence that the option of transferring credit risk reduced the incentives of banks to screen and monitor loans, lowering the lending standards. Furthermore, Agostino and Mazzuca (2008) summarize some studies about the effects of securitization on the capital and the risk of the issuer bank, the effects on bank loan supply and the monetary policy, and the effects on performance. In addition, there are some studies (mainly done by central banks or international organizations) which remark the potential negative effects over the whole financial system. For example, Allen and Carletti (2006), Hänsel and Krahnen (2007), Uhde and Michalak (2010), Nijskens and Wagner (2011) and Uhde et al. (2012) also include the financial stability issue in their studies.

Being the literature of securitization effects so extensive, and the literature on its determinants so scarce (the only economic regions analyzed up to date are the US and the EU, specially Italy and Spain, as shown in Table 1), it is not so surprising that the analysis of the determinants of Spanish securitization comes from only two papers (Martín-Oliver and Saurina, 2007; and Cardone-Riportella et al., 2010). In the first paper, the authors conclude that the only factor that drives Spanish financial institutions to securitize is the search for new sources of bank financing (*Liquidity*), while the second adds the improvement of efficiency ratios (*Performance*) as a key determinant. Our analysis differs

from previous studies in some additional features. Unlike Cardone-Riportella et al. (2010) and Martín-Oliver and Saurina (2007), we only focus on asset securitization, as we consider liabilities securitization as an improper form of securitization, since it does not imply the transfer of rights and risks related to assets, Catarineu and Pérez (2008). Furthermore, we consider the bank type as an important element. While commercial banks can issue capital and are subject to the usual control market mechanisms, the Spanish *Cajas* have severe limitations to increase their capital and, furthermore, they are not subject to the market for corporate control. Thus, we run separate regressions for *Cajas* and the rest of Spanish banks to check the relevance of other determinants and, in particular, risk transfer, finding in fact a significant effect. Recent studies about Italian banks (e.g., Affinito and Tagliaferri, 2010) call into question previous results where risk transfer did not matter (e.g., Agostino and Mazzuca, 2008), and we believe the Spanish case also follows this pattern, especially for a certain type of banks. Next, we detail our framework and the hypotheses.

3. Theoretical framework and hypotheses

We detail now two specific features of our study that provide a better understanding of all the significant determinants of the securitization phenomenon: the distinction of *Cajas* from the rest of banks and the focus on asset securitization.

On the one hand, we distinguish between *Cajas* and the rest of financial institutions. Due to the special nature of *Cajas*, a banking form that during the last decades had reached nearly half of the Spanish credit market, we highlight three reasons behind the significant role of factors like the regulatory capital requirements (*Capital*) and the exposure to risk and its transfer (*Risk*). First, and unlike commercial banks, the *Cajas* have severe limitations to expand their capital. They cannot issue shares, and they depend exclusively on their capacity to generate reserves (burdened at the same time by their obligation to distribute part of their benefits in the form of social dividend and charity). They were allowed to issue preferred shares and subordinated debt, but always closely supervised and limited by the regulator, *el Banco de España*. Consequently, this severe limitation is an argument in favor of a greater securitization activity in the *Cajas* compared to commercial banks. Second, *Cajas* face a historical problem of risk concentration due to both a strong geographic concentration of their branches (with the exception of the largest entities), and a low diversification of their business activities (extremely concentrated in loans and, more specifically, in real estate loans). These features are in deep contrast with the case of Spanish commercial banks, which are corporations and better diversified in their products and location. Finally, and due to their specific corporate governance approach, *Cajas* show

great differences among themselves in terms of risk taking (García-Meca and Sánchez-Ballesta, 2012), and they behave differently from banks in terms of the use of governance mechanisms. For example, Crespi et al. (2004), report the use of mergers as the main control mechanism for *Cajas*, in contrast with the use of CEO turnover and board turnover to discipline managers in commercial banks. In addition, Cuñat and Garicano (2010) find a significant impact of the *Cajas* human capital on the risk measures of loan book composition and performance, differentiating between good and bad performers, results that have been confirmed recently by Sagarra et al. (2013).

Considering that both *Cajas* and commercial banks, each accounted for about one half of the Spanish market, we perform a univariate analysis of differences in firm-specific characteristics (detailed in Section 4.2.2) between *Cajas* and commercial banks. The results are showed in Appendix 1. Since both non-normality and unequal variances are present in the samples, we have considered avoiding the traditional one-way analysis of variance ANOVA's F test, and the most common non-parametric tests, such as the Kruskal-Wallis analysis. In this particular case, we use the non-parametric Wilcoxon-Mann-Whitney test, which surpasses the mentioned problems. Analyzing the firm-characteristics between both kinds of institutions, the results suggest that there is a statistically significant difference between the underlying distributions of the most characteristics between *Cajas* and commercial banks (e.g., commercial banks were, in general, bigger and less capitalized than *Cajas*, but they were also less risky), the only exception being a risk ratio (*Impaired Loans / Gross Loans*), and two performance ratios (*ROE* and *CIR*). These results reinforce our previous arguments in favour of focusing on the *Cajas* in our further analyses.

On the other hand, we analyze assets securitization and discard liabilities securitization (structured mostly as collateralized debt obligations, CDOs, backed by liabilities issued by banks, such as mortgage-covered bonds called *cédulas hipotecarias*, treasury bonds or subordinated debt). Liabilities securitization is much smaller in terms of the total amount issued (approximately 20%, depending on the year) and, furthermore, asset securitization clearly captures the behaviour of Spanish banks in terms of the evolution of their credit activity in recent years. We also take into account the role and evolution of the four, previously mentioned, determinants. Banks cannot use liabilities securitization to transfer the risk associated to their assets and, consequently, one cannot expect that the transfer of credit risk, or the improvement of solvency, become the reason behind liabilities securitization. As confirmed by Cardone-Riportella et al. (2010), the only reason to securitize liabilities seems to be the banks' need of additional liquidity. Even more, Catarineu and Pérez (2008) point out that liabilities securitization could be considered an improper form of securitization, since it does not concern the transfer of rights and risks

related to assets, and therefore, by no means implies a mechanism for managing credit risk. In practice, these securities have become an alternative for the placement of those liabilities directly in the market, providing an alternative that achieves a more attractive cost. Securitization, through the subordination of the issued securities, may achieve the highest credit rating (AAA) for almost the entire issue, exceeding in many cases the credit rating of the issuing bank. For all these reasons, we have discarded liabilities securitization from our analysis.

Once we have justified our use of asset securitization, we focus on its determinants. As we pointed out earlier, there seems to be a recent consensus in the literature about four potential drivers of securitization in financial institutions: the level of capital requirements, the exposure and transfer of risk, the search for new sources of bank financing, and the improvement of efficiency ratios. Next, we analyze these four determinants in order to construct a formal theoretical framework while enumerating our hypotheses.

The presence of capital requirements (*Capital*) as a securitization driver has been studied extensively in the past. Banks with capital ratios closer to the regulatory minimum requirements would be more inclined to securitize their assets to improve this ratio. Issuing capital (e.g., new shares in the case of banks, but not in *Cajas*, preferred shares, or subordinated debt) implies, typically, a higher cost than the issue of debt. In addition, the existence of limitations on capital issues imposed by the regulator may induce financial institutions to reduce their lending activity rather than increasing their capital. Some authors have also pointed out the risk of a regulatory capital arbitrage, in the sense of reducing the regulatory capital requirements as an opportunistic and malicious behaviour, specifically during the period in which Basel I was active (the implementation of Basel II, especially since 2008, should have decreased the effect of this regulatory capital arbitrage). Pennacchi (1988) already considered bank regulation as one of the main incentives to securitize, and a large number of later studies have claimed the existence of this regulatory capital arbitrage or, at least, the view the capital requirements become a strong determinant of securitization (Duffie and Garleanu, 2001; Calomiris and Mason, 2004; Ambrose et al., 2005; DeMarzo, 2005; Uzun and Webb, 2007; Kashyap et al., 2008; Panetta and Pozzolo, 2010; Affinito and Tagliaferri, 2010, among others). Nevertheless, one can also find some opposing views. Bannier and Hänsel (2008) find a “reverse effect” of regulatory capital, that is, the more solvent banks should be more inclined to securitize, and so there is not existence of regulatory capital arbitrage. A plausible explanation to this result is that those banks with highest capital ratios can securitize more (and thus increase their non-capital liabilities) because they do not need to raise further capital. In any case, the "reverse effect" constitutes a minority view. After these reasons and knowing also that *Cajas* are seriously

limited in their access to new capital, we formulate the following hypothesis concerning capital requirements:

H1. Banks with lower capital ratios show a higher probability to securitize.

Financial institutions may also securitize because of their exposure to risk, (*Risk*). Once again, there is not a unique here and one can find opposed theories to explain the link between risk and securitization. As summarized by Affinito and Tagliaferri (2010), those banks with higher risk on their assets will securitize more in order to transfer and reduce those risks, or their related expected losses. More specifically, loan securitization may be used as a tool to transfer risk. Nevertheless, the same authors also mention the practice of securitizing high-quality loans while retaining the loans with low-quality for different reasons (e.g., strong differences between economic capital linked to market discipline and regulated capital; asymmetric information and bank reputation, among others). Most recent studies highlight the importance of risk as a determinant of securitization (Minton et al., 2004; Bannier and Hänsel, 2008; Panetta and Pozzolo, 2010; Affinito and Tagliaferri, 2010). Concerning the Spanish case, Martín-Oliver and Saurina (2007), Catarineu and Pérez (2008), and Cardone-Riportella et al. (2010), have discussed the existence of two approaches in the problem of the risk related to securitization activity. More specifically, these authors show the existence of a *buy-and-hold* model for the case of Spain. This is in contrast with the *originate-to-distribute* model, typical of other regions such as the US. There, securitization has an effect on the lender's incentives to properly screen and monitor borrowers, resulting in an excessive reliance on the wholesale market to fund lending growth, and the promotion of risk transfer. In the *buy-and-hold* model, bank loans are kept in the bank balance sheet until maturity and, therefore, we cannot talk of an effective risk transfer. But one can argue against those premises. Although motivated by information asymmetries, the bank usually takes a first-loss position in the default risks of the underlying loan portfolio, raising the question about the effective extent of risk transfer in securitizations. For example, Franke and Krahnen (2007) use an European collateralized debt obligation (CDO) dataset to find how the risk of extreme unexpected losses, that is, the bad tail risk, is transferred from banks to investors. Furthermore, Hänsel and Krahnen (2007) findings suggest that credit securitization goes hand in hand with an increase in the risk appetite of the issuing bank.

In addition, we must take into account the agency problem, especially in the case of *Cajas* with their dispersed ownership structure (see the Introduction of this Thesis). Due to the lack of formal owners and their low product diversification, *Cajas* are more exposed to

abuses in terms of managerial incentives and risk behaviour. Their managers and employees mainly cared about growth, going beyond their traditional geographical borders. Later on, they were subject to an increasingly more competitive market, pushing them to carry out higher investments (and raise additional capital outside), without considering the risk of extreme unexpected losses (due to the real state bubble), the loss of commitments from their traditional stakeholders and the arrival of the crisis. Those entities with bigger needs will securitize more. With all this, we proceed to formulate the following hypothesis concerning risk:

H2. Riskier entities show a higher probability to securitize.

In terms of *Liquidity*, the search for new sources of bank financing has also been pointed out as one of the most important factors to securitize. In fact, and according to several authors (Martín-Oliver and Saurina, 2007; Agostino and Mazzuca, 2008) this is the only determinant behind securitization, and in almost every study this factor has been found as a statistically significant determinant of securitization. All these results seem obvious if we think that the principal purpose of asset securitization is to transform illiquid assets into liquid ones. Furthermore, this tool has been implemented by financial institutions in an exponential form, not only during the last years of the boom period (i.e., real estate market boom), but also during the crisis. After 2007 it has been increasingly harder for many banks to sell the originated bonds in capital markets. In fact, most of them have followed the strategy of holding the bonds and discounting them as eligible collateral in the European Central Bank (ECB) money auctions, organized to overcome the paralysis of the financial markets. We then expect the following relationship from liquidity:

H3. Banks with higher liquidity needs will show a higher probability to securitize.

Finally, the most recent determinant invoked in the empirical literature (like in Minton et al., 2004; DeMarzo, 2005; Bannier and Hänsel, 2008; Duffie, 2008; Agostino and Mazzuca, 2008; Cardone-Riportella et al., 2010; Panetta and Pozzolo, 2010; Affinito and Tagliaferri, 2010; among others) has been the need to improve efficiency ratios or profit opportunities (*Performance*). However, the results in most empirical studies are not conclusive. As suggested by Bannier and Hänsel et al. (2008), and according to the risk-appetite argument, banks with a superior performance should be active in loan securitization. In any case, Affinito and Tagliaferri (2010) mention the re-distribution done by financial institutions of their sold loans towards more profitable business opportunities,

or the securitization of loans designed specifically for an intermediation profit rather than for long-run warehousing, as reasons for weak performers to securitize. When comparing the behaviour of commercial banks with that of *Cajas*, we could expect, under an agency problem approach, that commercial banks are more concerned with the economic performance, while *Cajas* have a weaker focus on profitability due to their more dispersed ownership structure and wide mission. Thus, in terms of Spanish banks, and in line with the previous arguments, we expect the following result concerning performance:

H4. Worst performers have a higher probability to securitize.

Table 2. Asset securitization among Spanish banks (sample composition)

		1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
Cajas	**Securitizing entities**	17	20	12	22	15	13	16	16	20	**151**
		37%	*43%*	*26%*	*48%*	*33%*	*28%*	*35%*	*35%*	*43%*	
	Non-securitizing entities	29	26	34	24	31	33	30	30	26	**263**
		63%	*57%*	*74%*	*52%*	*67%*	*72%*	*65%*	*65%*	*57%*	
	Total entities	46	46	46	46	46	46	46	46	46	**414**
Commercial banks	**Securitizing entities**	6	8	7	8	10	10	10	12	11	**82**
		33%	*44%*	*39%*	*44%*	*56%*	*56%*	*56%*	*67%*	*61%*	
	Non-securitizing entities	12	10	11	10	8	8	8	6	7	**80**
		67%	*56%*	*61%*	*56%*	*44%*	*44%*	*44%*	*33%*	*39%*	
	Total entities	18	18	18	18	18	18	18	18	18	**162**
Credit cooperatives	**Securitizing entities**	2	3	3	4	4	4	5	6	5	**36**
		29%	*43%*	*43%*	*57%*	*57%*	*57%*	*71%*	*86%*	*71%*	
	Non-securitizing entities	5	4	4	3	3	3	2	1	2	**27**
		71%	*57%*	*57%*	*43%*	*43%*	*43%*	*29%*	*14%*	*29%*	
	Total entities	7	7	7	7	7	7	7	7	7	**63**
TOTAL	**Securitizing entities**	**25**	**31**	**22**	**34**	**29**	**27**	**31**	**34**	**36**	**269**
		35%	*44%*	*31%*	*48%*	*41%*	*38%*	*44%*	*48%*	*51%*	
	Non-securitizing entities	**46**	**40**	**49**	**37**	**42**	**44**	**40**	**37**	**35**	**370**
		65%	*56%*	*69%*	*52%*	*59%*	*62%*	*56%*	*52%*	*49%*	
	Total entities	**71**	**71**	**71**	**71**	**71**	**71**	**71**	**71**	**71**	**639**

4. Empirical analysis

4.1. Data source and sample

Our empirical analyses use a sample comprising all Spanish banks (i.e., *Cajas*, commercial banks and credit cooperatives) present in the Bankscope database for the period 1999-2007. This database is the source for all our explanatory variables. Since there are some missing year observations in some firm-characteristics variables, mainly for the smallest institutions, the analyses have avoided those observations. The precise data on asset securitization activity, that is, the information on the dependent variables, have been obtained from the information sent to the stock-market authorities, *Comisión Nacional del Mercado de Valores,* CNMV, by financial firms. Such information is compulsory for every securitization issue. Table 2 shows our sample composition in terms of the asset securitization activity among Spanish banks.

4.2. Variables

The combination of both Bankscope and the CNMV sources of information allows us to analyze the determinants of asset securitization activity in Spanish banks. Next we describe and detail each one of the variables present in our analysis.

4.2.1. Dependent variables

We want to study the factors behind the decision of securitizing assets in Spanish financial institutions. In addition, volume seems to matter and, in order to expand previous results we also consider the determinants of the securitized amount. For the first part of the analysis (securitize or not) the dependent variable is a dichotomous one, taking the value *1* in case the entity has securitized for a specific year, and the value *0* if not. For the second part (the volume of securitization), the value of the total amount of securitized assets in a given year becomes the dependent variable.

4.2.2. Explanatory variables

As it was mentioned earlier, the decision of asset securitization may respond to four different reasons. Next we describe the relevant variables for each one of the four possible explanations behind asset securitization.

In terms of capital requirements ***(Capital)***, we use the following alternatives:

- *Capital Ratio*. It is the ratio which defines the level of solvency of the entity as established by the Basel Accord, that is, the capital requirements for the credit and market risk weighted assets. More specifically, the Spanish regulation for the analyzed period required a minimum ratio of 8%.

- *K-Buffer*. Ayuso, Pérez and Saurina (2004) define it as the following ratio *(Regulatory Capital – Minimum Requirements) / Minimum Requirements*. As it was already pointed out by Martín-Oliver and Saurina (2007), the potential econometric problem that may arise when we use the Capital Ratio explanatory variable is that, by definition, this measure has a lower bound around 8%, provided all banks maintain the level of capital established by the Basel Accord. Therefore, the Capital Ratio variable may miss the actual capital buffer of a bank.

- *Equity / Total Assets*. This ratio measures the protection of assets for a given level of capital and reserves. It measures the classic solvency level.

Following our hypotheses, we expect these three variables to show a negative influence on a bank's propensity to securitize its assets.

Concerning the second factor, the exposure and transfer of risk ***(Risk)***, we consider the following variables:

- *Loan Loss Reserve / Gross Loans*. This is a ratio that measures the entity's loan portfolio coverage given the current reserves of the bank. This ratio indicates the quality of the loan portfolio.

- *Impaired Loans / Gross Loans*. This ratio measures the total amount of impaired loans over the total loans of the entity, and shows the loan portfolio quality in terms of the worst and more doubtful loans.

- *Loan Loss Provisions / Net Interest Revenue*. This is a ratio that measures the credit risk provision relative to the net interest income, indicating the subjacent effect of credit risk in both the numerator and the denominator. Bannier and Hänsel (2008) point out that banks may have a risk-appetite to raise their revenues, and so they securitize to free capital for new risky businesses which could report the bank higher revenues. Furthermore, banks with high levels of risk and, therefore, a high probability of financial distress, may engage in securitization processes to fund the activity of lending instead of doing it through additional debt and equity issues.

In accordance with our hypotheses, these three variables are expected to exert a positive influence on banks' propensity to securitize assets.

Next we consider variables to measure the search of new sources of bank financing ***(Liquidity)***. We have considered the following:

- *Interbank Ratio*. This ratio measures the money lent to other financial entities over the money borrowed from other financial entities (i.e., a bank with a ratio below 100 is a net borrower, and will be more inclined to securitize than another bank with a ratio over 100).

- *Net Loans / (Dep + ST Funding)*. This ratio measures the relation between loans and deposits, as the two main items for assets and liabilities. In other words, this is a direct proxy of the liquidity level of the bank.

- *Liquid Assets / (Dep + ST Funding)*. Quite similar to the previous ratio, but including now in the numerator only the most liquid assets of a bank (i.e., trading assets and loans and advances with a maturity of less than three months).

While the second and the third variables are expected to show a negative influence on a bank's propensity to securitize (due to a major level of liquidity showed by higher ratios), one would expect the first variable to exhibit a positive effect on securitization. A greater need of liquidity derived from a larger proportion of loans, or from higher levels of loan growth will exert a positive effect on banks' propensity to issue additional securities.

Finally, we consider several variables to capture the fourth determinant, the improvement of the efficiency ratios of the bank, ***(Performance)***:

- *ROA (Return on Assets)*. This variable is defined as the ratio of bank profits to its total assets. It is a measure of the level of returns generated by those assets, and it is the most widely used ratio to compare the performance among financial institutions.

- *ROE (Return On Equity)*. This variable is defined as the ratio of bank profits to its equity. Since a high ratio may be influenced by an over-leveraged situation of the entity (i.e., because of low levels of equity), the results on this variable are treated with caution. There is a potential contradiction: a high ratio of ROE could indicate a lower propensity to securitize, but this high ratio may be influenced by low levels of equity (over-leveraging) that would imply a higher propensity to securitize (i.e., we also control for Equity/Total Assets).

- *CIR (Cost-to-Income Ratio)*. This ratio measures the costs of running the bank, and includes personnel expenses plus other operating expenses (e.g., amortizations), over the income before provisions. The lower the value of this ratio, the more efficient the bank performance becomes. Due to the fact that different markets typically operate with different profit margin structures, this ratio facilitates the comparisons among banks under similar market conditions. This is our case; all the banks in the sample compete within the same market, the Spanish financial market.

Summarizing, we do expect the ROA and ROE variables to present a negative effect on asset securitization, while the CIR variable may present a positive effect.

4.2.3. Control variables

Finally we include some other bank-specific features as control variables in order to check the obtained results.

- *Size (Ln TA)*. Since larger banks have more resources and larger asset portfolios to run the securitization activity, one would expect this variable to exert a positive influence on a bank's propensity to securitize its assets.

- *Bank type*. Two dummy variables are introduced here to identify *Cajas* and credit cooperatives, respectively.

- *Year*. This variable is introduced as a dummy (one for each different year).

Table 3. Hypotheses and explanatory variables expected effects over the securitization activity

	Hypothesis effect	Explanatory variables	Effect over assets securitization activity
H1 Capital	-	Capital Ratio	-
		K-Buffer	-
		Equity / Total Assets	-
H2 Risk	+	Loan Loss Reserve / Gross Loans	+
		Impaired Loans / Gross Loans	+
		Loan Loss Provisions / Net Interest Revenue	+
H3 Liquidity	-	Interbank Ratio	-
		Net Loans / (Dep + ST Funding)	+
		Liquid Assets / (Dep + ST Funding)	-
H4 Performance	-	Return On Assets (ROA)	-
		Return On Equity (ROE)	-
		Cost-to-Income Ratio (CIR)	+
		Size (Ln TA)	+

Table 4. Univariate analysis of differences in firm-specific characteristics between securitizing and non-securitizing entities

	Securitizing entities							Non-securitizing entities							Wilcoxon-Mann-Whitney test
	Obs.	Mean	Std. Dev.	Range	p. 5%	Median	p. 95%	Obs.	Mean	Std. Dev.	Range	p. 5%	Median	p. 95%	
Capital Ratio	208	11.79	2.35	16.80	9.10	11.40	15.50	198	12.45	2.53	19.80	9.5	12.10	17.50	0.0003***
K-Buffer	208	0.47	0.29	2.10	0.14	0.43	0.94	198	0.56	0.32	2.48	0.19	0.51	1.19	0.0003***
Equity / Total Assets	248	7.57	3.23	24.38	4.58	6.88	12.55	309	7.39	3.04	22.99	2.63	6.97	11.81	0.8011
Loan Loss Reserve / Gross Loans	236	2.06	0.56	3.68	1.27	2.00	3.00	262	1.80	0.85	4.39	0.00	1.89	3.26	0.0005***
Impaired Loans / Gross Loans	232	1.01	0.62	4.19	0.37	0.82	2.20	225	0.99	0.52	2.82	0.38	0.87	2.10	0.5274
Loan Loss Provisions / Net Interest Reven	248	14.65	6.91	51.90	3.51	15.00	31.99	309	11.11	7.34	47.16	-0.48	11.11	24.82	0.0000***
Interbank Ratio	239	129.70	154.02	942.27	8.49	77.72	525.23	290	166.20	187.20	984.42	8.24	98.00	607.60	0.0064***
Net Loans / (Dep + ST Funding)	248	93.40	25.13	165.23	57.18	93.68	137.19	309	80.14	27.24	151.86	5.60	82.21	119.32	0.0000***
Liquid Assets / (Dep + ST Funding)	248	16.85	9.65	48.95	4.78	14.50	35.55	309	22.75	18.26	123.80	4.81	18.45	61.25	0.0003***
ROA	248	1.00	0.78	9.07	0.51	0.87	1.74	309	0.86	0.55	6.06	0.10	0.83	1.81	0.0842*
ROE	248	12.82	4.19	30.00	7.18	12.20	19.11	309	11.29	5.16	50.14	3.72	11.54	17.41	0.0082***
CIR	248	58.32	8.96	57.36	43.49	58.77	72.80	309	60.77	12.16	94.73	46.06	58.78	85.18	0.1693
Size (Ln TA)	248	9.47	1.38	6.66	7.65	9.20	12.44	309	8.69	1.00	6.48	7.04	8.67	10.24	0.0000***

Table 3 summarizes the set of hypotheses and the explanatory variables expected effects over the likelihood to securitize assets.

Table 4 shows the results from our univariate analysis of differences for all the explanatory variables considered in our hypotheses. We also distinguish between two groups of banks: the banks that securitize and the non-securitizers. Similarly to what we explain in Section 3 regarding the *Cajas* and commercial banks samples, we avoid the traditional one-way analysis of variance ANOVA's F test, and the most common non-parametric tests, such as the Kruskal-Wallis analysis. Instead of this, we use the non-parametric Wilcoxon-Mann-Whitney test, and the results suggest that there is a statistically significant difference between the underlying distributions of the most characteristics between securitizing and non-securitizing entities. For instance, and in line with our hypotheses, securitizing entities have lower regulatory capital ratios (i.e., *Capital Ratio*, *K-Buffer*) than non-securitizing institutions. Securitizers are also more risky, less liquid and bigger institutions (i.e., *Loan Loss Reserve / Gross Loans*, *Loan Loss Provisions / Net Interest Revenue*) than non-securitizers. Finally, we find a positive and statistically significant relation between the performance ratios (i.e., *ROA*, *ROE*) and the securitization activity which, given our previous theoretical assumptions, induces us to perform the multivariate analysis of the data to contrast the results.

4.3. Model

Our goal is to correctly identify and measure the significant determinants behind the securitization behaviour of Spanish banks. To achieve this, we will use the most parsimonious model in order to avoid those variables that do not add relevant information. For this, we enter the variables in a stepwise fashion, by finding the best fitting equation model, using the maximum likelihood method. To obtain the final model we have started with a base model, including only our control variables (i.e., size, bank type and year dummies). Next, we have added the different variables from each group of determinants, one by one, while seeking a reduction of the likelihood ratio (i.e., -2 log likelihood value) and controlling for a substantial improvement of the chi square value, depending on the degrees of freedom considered for the new variables.

In order to control for possible multicollinearity problems in our regressions, we show the correlation matrix (see Table 5) for all the potential explanatory variables initially considered. One can observe high and significant correlations among some of the variables.

This is the case of *K-buffer*, *Equity / Total Assets* and *ROE*. To confirm a possible problem of multicollinearity originated by these variables, we perform a Variance Inflation Factor (VIF) analysis of all the explanatory variables initially considered. In particular, a VIF figure exceeding a value of 10 (or even a 2.5 value in weaker models) could indicate a problem of multicollinearity. Being the VIF values for the three mentioned variables higher than 12, we eliminate them while noting how the rest of variables maintain VIF values clearly below the 2.5 level. More importantly, we also carry out an additional VIF analysis for the explanatory variables present in the final model considered in section 4.3. For this particular case, the VIFs values are all very close to 1.

Following the stepwise approach, we have run several alternative models to contrast the determinants of bank asset securitization. After all this process, the resulting model is the following one:

$$S_{i,t} = b_0 + b_1 \cdot \text{Capital Ratio}_{i,t-1} + b_2 \cdot \text{Loan Loss Provisions / Net Interest Revenue}_{i,t-1}$$
$$+ b_3 \cdot \text{Net Loans / (Dep + ST Funding)}_{i,t-1} + b_4 \cdot \text{CIR}_{i,t-1}$$
$$+ b_5 \cdot \text{Size (Ln TA)}_{i,t-1} + b_6 \cdot \text{Bank type}_{i,t} + b_7 \cdot \text{Year}_{i,t} + \varepsilon_{i,t}$$

S is the dependent variable and it refers to the bank asset securitization, while the group of explanatory variables is composed by proxy variables for each one of the four main determinants of securitization. The equation also includes the control variables. Each bank is denoted by the sub-index *i*, while the sub-index *t* refers to the time period (year).

Since we are using panel data for our estimations, all models are run using random effects to deal with the unobserved heterogeneity across entities that the explanatory variables cannot capture. Although a simple model would assume that the regression constant coefficient is the same for all cross-sectional units, it is quite reasonable to think that we need to control the "individual" character of each bank. One problem with fixed effect estimations is that it is no longer possible to separate, in discrete choice models, the parameters accompanying the regressors in the likelihood function from the parameters of the effects (in case of being fixed, they are dummies and, therefore, they come with their respective parameters). Under these circumstances we cannot obtain consistent (unbiased) estimators. Furthermore, independent variables which are constant over the analyzed period

are not the most convenient ones in fixed-effects models, and they do not keep the observations in which a dichotomy dependent variable does not change over time.

Finally, and although we have also performed fixed-effects models showing similar results, we have applied the Hausman technique, which tests H_0 in that the estimators of random effects and fixed effects do not differ substantially. In our case we cannot reject H_0 (the tests show a Prob > Chi^2 higher than 0.05, in line with Cardone-Riportella et al., 2010), so there could be bias with fixed effects estimators and we prefer random effects. On the other hand, and to deal with potential problems of endogeneity, we have also carried out all the analyses taking the explanatory variables, or regressors, with a one-period lag.

In our first approach, we use a logit model to predict the probability that a Spanish bank securitizes its assets, being $S_{i,t}$ a dichotomous dependent variable with value *1* for the case the entity has issued securities a specific year, and value *0* in case it has not securitized that year.

Once we have carried out this analysis on the probability of securitizing, we go one step further: we want to know the factors behind the decision of securitizing assets in Spanish banks, and the possible reasons that affect the total securitized amount. To deal with this issue we use a tobit model with the censure coming from those banks that did not securitize and whose observed values are equal to zero. We maintain the same model and the explanatory variables as in the previous analysis, but we use now the log of the securitized amount, $S_{i,t}$ as dependent variable. This approach has the advantage of keeping the information on the dependent variable distribution contained in those banks that have not securitized their assets. Additionally, we have also performed the Heckman model, a selection model that jointly estimates the decision to securitize and the securitized amount. The estimate of the correlation coefficient between the errors in the two equations (i.e., Rho) is not statistically significant, as indicated by the Wald test. That is, the hypotheses of independence of both equations, Rho=0, cannot be rejected, which is a similar result to the one found by Martín-Oliver and Saurina, 2007.

Table 5. Correlation matrix

	Capital			Risk			Liquidity			Performance			Control
	Capital Ratio	K-Buffer	Equity / Total Assets	Loan Loss Reserve / Gross Loans	Impaired Loans / Gross Loans	Loan Loss Provisions / Net Interest Revenue	Interbank Ratio	Net Loans / (Dep + ST Funding)	Liquid Assets / (Dep + ST Funding)	ROA	ROE	CIR	Size (Ln TA)
Capital Ratio	1.0000												
K-Buffer	1.0000*	1.0000											
Equity / Total Assets	0.5637*	0.5641*	1.0000										
Loan Loss Reserve / Gross Loans	-0.0505	-0.0505	-0.0188	1.0000									
Impaired Loans / Gross Loans	-0.0488	-0.0489	-0.1115*	0.5432*	1.0000								
Loan Loss Provisions / Net Interest Revenue	-0.2751*	-0.2748*	-0.1459*	0.0855*	-0.1774*	1.0000							
Interbank Ratio	0.3844*	0.3844*	0.1853*	-0.0076	-0.0681	-0.1186*	1.0000						
Net Loans / (Dep + ST Funding)	-0.1595*	-0.1584*	0.1235*	-0.1569*	-0.2621*	0.5063*	0.1040*	1.0000					
Liquid Assets / (Dep + ST Funding)	0.3057*	0.3045*	-0.1716*	-0.0648	0.0651	-0.3480*	0.0919*	-0.5826*	1.0000				
ROA	0.4130*	0.4136*	0.7934*	0.0567	-0.0137	-0.2303*	0.1326*	-0.0003	-0.0713	1.0000			
ROE	-0.0381	-0.0379	0.0559	0.1607*	0.1571*	-0.2227*	0.0169	-0.1420*	0.0360	0.5808*	1.0000		
CIR	-0.1773*	-0.1771*	-0.2857*	0.0151	0.2080*	-0.1753*	-0.0206	-0.3155*	0.0657	-0.3773*	-0.2912*	1.0000	
Size (Ln TA)	-0.1411*	-0.1412*	-0.1553*	-0.0295	-0.0655	0.2646*	-0.1208*	0.1214*	-0.0174	-0.0679	0.1346*	-0.2471*	1.0000

**. Correlation is significant at least at the 0.1 level.*

5. Empirical findings

5.1. Results

Our basic models define the decision of asset securitization (or the securitization volume, respectively) as the dependent variable. As we use panel data with cross-sections and time-series, one could wonder whether the dependent variables are not correlated across time, as the decision on securitization (and its volume) in year *t* should be dependent on the decision (or the volume) in year *t-1*. As an extreme case, it could happen that the same banks could decide to securitize each year. All the models include lagged dependent variables as explanatory variables. Additionally, a generalized method of moments (GMM) regression, performed in Model 3, allows us to control for endogeneity, heterogeneity and autocorrelation, similar to Affinito and Tagliaferri, 2010.

Table 6 shows the results from the logit, tobit and GMM regressions analyses using the total sample of Spanish banks (Models 1, 2 and 3, respectively). As it can be seen, the signs of the different significant coefficients confirm the expected ones in our hypotheses. Thus, we find strong statistical significance for those variables which represent the risk and the liquidity factors, that is, *Loan Loss Provisions / Net Interest Revenue* and *Net Loans / (Dep + ST Funding)* respectively. These results support Hypotheses 2 and 3, regarding the exposure to risk and the search of liquidity. In other words, banks with higher risk levels and lower liquidity are more likely to securitize assets, and they securitize in larger amounts. This result is especially important in the case of risk factor, and it questions, or at least casts some doubts on, the *buy-and-hold* model of securitization for Spain argued in previous works (Martín-Oliver and Saurina, 2007; Catarineu and Pérez, 2008; Cardone-Riportella et al., 2010), in contrast with the *originate-to-distribute* model prevailing in other countries.

The fact that risk becomes significant in all the analyzed models may change our view about the proposed *buy-and-hold* model, at least for the boom period of Spanish credit market: banks with higher credit risk exposure are more likely to securitize, and they securitize assets in greater amounts. The variable *Size* also presents a strong statistical significance, and confirms the hypothesis that the largest entities, having more resources and biggest asset portfolios, run most of the securitization activity. Interestingly enough, the capital factor does not seem to play a role in Spanish banks securitization, since our results do not support Hypothesis 1 regarding capital arbitrage. A plausible explanation for

this result could be that Spanish banks have indistinctively used securitization and the traditional capitalization tools to raise further capital. In addition, we do not find significance for the case of the *CIR* performance ratio neither in the logit regression analysis, nor in the tobit analysis, although we find a significant positive effect of this variable in the GMM regression (Model 3). For this reason it could be interesting to carry out further analyses in order to confirm these initial results.

In Model 4 we have introduced the bank type dummies for *Cajas* and credit cooperatives to the basic model, in order to distinguish the effect according to the differentiated nature of each kind of institution. We find a significant negative effect of the *Cajas* dummy variable in the model, allowing us to focus on this kind of institutions through additional and specific analyses. The results for the case of *Cajas*-only are presented in Models 5, 6, 7 and 8. We have done the same stepwise process for these new models, using the maximum likelihood method to construct the best fitting equation model. To add further robustness to our original tobit model (Model 5), we have changed the original dependent variable by another one, the percentage of the *securitized amount over total assets* (Model 6), previously used by Affinito and Tagliaferri (2010). In addition, we have also performed the analysis with a new dependent variable, the percentage of the *securitized amount over gross loans* (Model 7), as it reflects more accurately the real extension of the securitization activity over those assets that are most likely to be securitized. In both cases, the results confirm the strong significance of the determinants obtained in former analyses. Finally, a GMM regression has been performed in Model 8, supporting the previous results.

The significant factors from Models 1, 2, 3 and 4 (risk, liquidity and size) are again confirmed for the sample of *Cajas*. Once again, the coefficients are strongly significant, supporting the hypotheses regarding the exposure to risk and the search of liquidity. However, it is necessary to mention the lack of significance of the capital variable, hence the capital hypothesis is rejected for the *Cajas*. Although this factor has often been mentioned as a driver of securitization, the variable *Capital Ratio*, which represents this factor, is not statistically significant, neither in the logit regression, nor in the securitization volume regression. Due to their limitations to raise further capital, *Cajas* have used both the securitization process and their traditional capitalization instruments (preferred shares and subordinated debt), and the latter instruments in a quite intensive way. Furthermore, the *CIR* performance ratio is not statistically significant in any of the models, a result that prevents us to present any conclusive result for this factor in the case of *Cajas*.

Table 6. Determinants of bank loan securitization activity

Regressors	All Spanish banks				*Cajas*			
	Logit	Tobit	System GMM	Tobit	Tobit			System GMM
	Securitize (1) or not (0)		*Ln Securitized Amount*		*Ln Securitized Amount*	*Securitized Amount / Total Assets*	*Securitized Amount / Gross Loans*	*Ln Securitized Amount*
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Capital Ratio	0,050	0,118	-0,032	0,306	0,994	0,256	0,360	0,367
	0,072	*0,414*	*0,179*	*0,406*	*0,585*	*0,184*	*0,257*	*0,238*
Loan Loss Provisions / Net Interest Revenue	0,076 ***	0,416 ***	0,152 **	0,446 ***	0,770 ***	0,165 **	0,239 **	0,228 ***
	0,027	*0,146*	*0,065*	*0,145*	*0,228*	*0,068*	*0,094*	*0,088*
Net Loans / (Dep + ST Funding)	0,026 ***	0,148 ***	0,068 ***	0,162 ***	0,182 ***	0,076 ***	0,102 ***	0,064 ***
	0,010	*0,049*	*0,015*	*0,047*	*0,072*	*0,024*	*0,033*	*0,022*
CIR	0,027	0,136	0,104 *	0,209	0,321	0,093	0,129	0,122
	0,024	*0,134*	*0,058*	*0,130*	*0,211*	*0,067*	*0,094*	*0,084*
Size (Ln TA)	0,407 ***	2,428 ***	2,124 ***	2,200 ***	2,916 **	0,852 *	1,195 *	2,032 ***
	0,155	*0,839*	*0,306*	*0,806*	*1,270*	*0,445*	*0,623*	*0,464*
Lagged dependent variable	2,021 ***	0,718 ***	0,086 **	0,687 ***	0,723 ***	0,629 ***	0,588 ***	-0,008
	0,314	*0,118*	*0,042*	*0,114*	*0,130*	*0,144*	*0,145*	*0,052*
***Caja* (dummy)**				-5,348 **				
				2,183				
Credit cooperative (dummy)				0,696				
				3,697				
Constant	-10,885 ***	-57,659 ***	-24,311 ***	-59,778 ***	-95,744 ***	-29,621 ***	-41,032 ***	-30,770 ***
	3,279	*17,275*	*6,344*	*16,304*	*25,821*	*8,390*	*11,659*	*8,889*
Year dummy	Yes	Yes		Yes	Yes	Yes	Yes	
Observations	367	367	367	367	253	251	251	253
Groups	58	58	58	58	39	39	39	39
Wald Chi2	79.28***	104.99***	162.88***	132.78***	79.96***	64.92***	57.54***	67.27***
Log likelihood	-178,24	-864,25	n.a.	-860,05	-532,65	-381,16	-417,05	n.a.
Test for AR (1): p-value	n.a.	n.a.	0,000	n.a.	n.a.	n.a.	n.a.	0,000
Test for AR (2): p-value	n.a.	n.a.	0,856	n.a.	n.a.	n.a.	n.a.	0,864

5.2. Robustness analyses

In order to confirm the results obtained from the basic models (Table 6), we further carry out several additional robustness analyses, some of them shown in Table 7. The main conclusion emerging from these additional analyses is that the different coefficients of our basic models are robust to the different specifications.

Additionally, it is here where we can better appreciate the differences between *Cajas* and commercial banks. If the significant *CIR* performance ratio shown in Model 3 had not any significant role in any of the *Cajas'* models, performance passes to play a determinant role in securitization activity of banks in general, now in line with the results from previous studies (Martín-Oliver and Saurina, 2007; and Cardone-Riportella et al., 2010). These results, in combination with those obtained for *Cajas*, confirm the different nature of both types of institutions, as it was already mentioned in Section 3.

We perform once more the analysis but including now all the explanatory variables initially considered before performing the maximum likelihood stepwise method. We keep away though those variables which may cause problems of multicollinearity (*K-buffer*, *Equity / Total Assets* and *ROE*). The results are presented in Model 9 and confirm that the coefficients and their levels of significance are practically unchanged respect the initial Models. We estimate again the previous model while substituting the *Capital Ratio* explanatory variable with the other two capital variables considered initially in our study (*K-buffer* and *Equity / Total Assets*). These regressions are shown in Models 10 and 11 respectively and also confirm the previous results. Next, in Model 12, we replace *ROA* and CIR performance ratios by *ROE*, avoided initially, and we observe how the magnitude and the signs of the coefficients remain constant. That is, none of these two ratios appears to have an effect on the decision to securitize, in contrast with the effect we observed for the *cost-to-income* ratio (*CIR*). We think this result should also lead us to rethink whether the Spanish model followed the *originate-to-distribute* model instead of the *originate-to-hold* model in the time period before the crisis. The previous four Models have been performed again under tobit regression (Models 13, 14, 15 and 16), with coincident results. Finally, the Model 13 has been performed again but we have now changed the original dependent variable by the percentage of the *securitized amount over total assets* (Model 17) and by the *securitized amount over gross loans* (Model 18). In both cases, these results confirm the strong significance of the determinants obtained in former analyses.

Table 7. Robustness checks

Regressors	Logit				Tobit					
	Securitize (1) or not (0)				*Ln Securitized Amount*				*Securitized Amount / Total Assets*	*Securitized Amount / Gross Loans*
	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
Capital Ratio	0,136			0,092	0,591			0,538	0,099	0,152
	0,092			*0,081*	*0,496*			*0,456*	*0,170*	*0,231*
K-Buffer		1,097				4,757				
		0,734				*3,959*				
Equity / Total Assets			-0,042				-0,109			
			0,086				*0,442*			
Loan Loss Reserve / Gross Loans	0,391	0,391	0,445	0,269	1,349	1,350	2,039	0,744	0,535	0,832
	0,393	*0,393*	*0,384*	*0,408*	*2,226*	*2,226*	*2,145*	*2,288*	*0,793*	*1,075*
Impaired Loans / Gross Loans	-0,425	-0,425	-0,622	-0,253	-1,848	-1,851	-3,789	-1,008	-0,895	-1,383
	0,445	*0,445*	*0,433*	*0,451*	*2,523*	*2,523*	*2,430*	*2,589*	*0,925*	*1,262*
Loan Loss Provisions / Net Interest Revenue	0,074 **	0,075 **	0,076 ***	0,067 **	0,405 ***	0,405 ***	0,417 ***	0,375 **	0,097 **	0,127 *
	0,029	*0,029*	*0,027*	*0,029*	*0,155*	*0,155*	*0,137*	*0,153*	*0,049*	*0,067*
Interbank Ratio	-0,001	-0,001	-0,001	-0,001	-0,008	-0,008	-0,009	-0,008	-0,004 *	-0,004
	0,001	*0,001*	*0,001*	*0,001*	*0,006*	*0,006*	*0,006*	*0,006*	*0,002*	*0,003*
Net Loans / (Dep + ST Funding)	0,035 ***	0,035 ***	0,028 **	0,027 **	0,163 ***	0,163 ***	0,147 ***	0,129 **	0,076 ***	0,095 ***
	0,012	*0,012*	*0,011*	*0,012*	*0,056*	*0,056*	*0,053*	*0,055*	*0,021*	*0,028*
Liquid Assets / (Dep + ST Funding)	0,006	0,006	-0,003	-0,001	-0,025	-0,025	-0,056	-0,066	0,011	0,010
	0,018	*0,018*	*0,018*	*0,018*	*0,094*	*0,094*	*0,093*	*0,095*	*0,032*	*0,043*
ROA	-0,025	-0,027	0,534		0,955	0,945	2,611		0,073	0,095
	0,350	*0,350*	*0,485*		*1,963*	*1,964*	*1,947*		*0,710*	*0,963*
ROE				-0,011				0,079		
				0,049				*0,251*		
CIR	0,055 **	0,055 **	0,038 *		0,278 *	0,278 *	0,216 *		0,088 *	0,121 *
	0,027	*0,027*	*0,022*		*0,150*	*0,150*	*0,123*		*0,053*	*0,072*
Size (Ln TA)	0,367 **	0,367 **	0,474 ***	0,306 *	2,291 ***	2,291 ***	3,065 ***	1,891 **	0,425	0,619
	0,160	*0,160*	*0,159*	*0,167*	*0,863*	*0,863*	*0,858*	*0,904*	*0,341*	*0,465*
Lagged dependent variable	1,895 ***	1,895 ***	1,903 ***	1,940 ***	0,674 ***	0,674 ***	0,633 ***	0,671 ***	0,543 ***	0,532 ***
	0,313	*0,313*	*0,311*	*0,325*	*0,114*	*0,114*	*0,110*	*0,116*	*0,107*	*0,108*
***Caja* (dummy)**	-1,164 **	-1,166 **	-0,606	-0,965 *	-4,815 *	-4,821 *	-2,765	-4,122	-1,944 **	-2,669 **
	0,484	*0,484*	*0,430*	*0,495*	*2,471*	*2,470*	*2,315*	*2,578*	*0,992*	*1,353*
Credit cooperative (dummy)	0,017	0,016	1,117	0,194	1,611	1,607	6,881 *	2,290	1,319	1,207
	0,812	*0,811*	*0,747*	*0,864*	*4,210*	*4,209*	*3,781*	*4,465*	*1,676*	*2,278*
Constant	-13,437 ***	-12,347 ***	-11,839 ***	-8,223 ***	-68,025 ***	-63,293 ***	-65,802 ***	-43,573 ***	-19,695 ***	-26,467 ***
	3,694	*3,478*	*3,216*	*2,747*	*19,238*	*18,370*	*17,319*	*14,112*	*7,038*	*9,546*
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	348	348	399	348	348		399	348	345	345
Groups	56	56	65	56	56		65	56	56	56
Wald Chi2	83.89***	83.90***	95.42***	77.65***	119.19***		138.93***	108.61***	113.79***	98.11***
Log likelihood	-165,40	-165,39	-185,35	-167,78	-829,54		-932,93	-831,14	-595,06	-650,98

We have also carried out the same analyses for the period 1999-2006. In our basic model we have considered 2007 as the last year of the boom period. However, it is impossible to determine the exact date on which the shift took place with the available data. The results with this sub-sample are practically identical to those obtained in the basic models. The detailed results are not shown here but they are available upon request.

An additional goal of the robustness tests was to check the consistency of the role played by the performance variable in the securitization activity. In the basic models the results were not conclusive, as it was shown in Table 6. After analyzing the different models contained in Table 7, we find a significant role for performance in the securitization decision for banks in general, although the results shown in Models 5, 6, 7 and 8 prevent us to present any conclusive result for this factor in the case of *Cajas*.

6. Concluding remarks

Asset securitization is a financial tool that banks use by pooling together various types of debt, and transform them into marketable securities with various levels of seniority through the means of financial engineering. Asset securitization in Spain seems to play a key role at explaining both the financial sector's credit growth and the depth of the crisis in recent years. This fact, along the recent turbulences in financial markets and the consequent restructuring of Spanish financial sector have motivated this work. We have first analyzed the specific determinants of bank asset securitization during the period 1999-2007, taking into account both the decision to securitize and, unlike most studies, the total securitized amount.

We can distinguish two main periods in most European credit markets. First, there is a period that finishes in the second quarter of 2007, a time just previous to the first financial turbulences. This period shows continuous high growth ratios in securitization. Second, there is another period that begins just after 2007, and that is characterized by irregular total issuing amounts. Although it has been impossible for financial firms to sell during this last period of crisis the originated bonds in capital markets, most banks have followed the strategy of holding the bonds and discount them as eligible collateral in the ECB money auctions. The securitization of liabilities is not our objective though, and we have focused on asset securitization before the crisis.

Our results support the hypotheses regarding the exposure to risk and the search of liquidity as main drivers of securitization, while the capital hypothesis is rejected. From the four determinants suggested in the literature, we find liquidity as a significant factor, like previous studies, but we also find, unlike other works on Spanish banks, that the risk variable becomes significant. This may change our view on the proposed *buy-and-hold* model for Spain, at least for the case of *Cajas* during the boom period of the credit market. Concerning the remaining two factors, capital shows no significant effect on securitization, and performance presents an effect on the whole sample of banks. This performance effect disappears when we only consider the case of *Cajas*, indicating that this type of banks may be more concerned with growth than with performance, in accordance with its governance mechanisms.

While previous works covering Spanish financial institutions (Martín-Oliver and Saurina, 2007; and Cardone-Riportella et al., 2010) argue in favor of the *buy-and-hold* model for all Spanish banks (as mentioned in Hypothesis 2), we observe here an *originate-to-distribute* behaviour in terms of risk for those institutions. This result may have important implications for banking regulators, since securitization activity may be used by banks as a tool to increase the risk-performance balance of their asset portfolios.

Due to the special nature of *Cajas*, our study on this kind of banks highlights the role of some key factors, specifically the regulatory capital and the risk factor. We conclude that, in one hand, those *Cajas* with greater credit risk exposure and lower liquidity are more likely to securitize. Even more, when they securitize assets they do it in a greater amount than the rest of banks. On the other hand, neither the performance measures, nor the capital variables show conclusive results. A plausible explanation for this result is that Spanish *Cajas* have used, interchangeably, the securitization process and the traditional capitalization instruments, such as preferred shares or subordinated debt. In addition, these two latter instruments have been used in an intense manner, to raise further capital. Finally, we should also point out the role of size, as a statistically significant variable.

As we already pointed out in the introduction, the problem with a research that covers large geographic areas that include several countries and different systems is that it often takes into account only the largest and/or the listed banks, with a number of implicit characteristics that may fail to offer a complete view of the reality. Other times this reality becomes oversimplified due to the inclusion of many heterogeneous countries, or quite different types of entities. By focusing on the Spanish banks, and also the *Cajas*, with a peculiar governance nature and risk features in contrast with the rest of Spanish financial

institutions, we have approach a context that allows us to go deeper in the analysis. The different nature of both commercial banks, with a mission focused uniquely on their profit maximization, and *Cajas*, with a wide mission that includes different stakeholders' goals, could explain the substantial differences in their respective results and behaviour.

Additionally, under a managerial point of view, we can interpret our results concerning the decision to securitize and the total securitized amount as signals of the managerial tasks and the decisions carried out by those managers in charge of the different banks. That is, those institutions with higher securitization activity may actually reflect a certain management style more likely to undertake greater risks for their institutions.

We also believe that these results, especially those concerning *Cajas*, may have important implications for banking regulators in other countries (i.e., Germany, and Norway, among others) where financial firms of similar nature to the *Cajas* coexist with traditional commercial banks. A more extensive study, in terms of securitization activity, concerning the past behaviour of the financial firms in these countries may reach more conclusive results.

We can argue a different story for the case of commercial banks. A story not about extreme growth, risk and need for liquidity, as in the case of *Cajas*, but about liquidity and performance, in line with the results obtained in previous studies (Martín-Oliver and Saurina, 2007; and Cardone-Riportella et al., 2010). These two different behaviours have also materialized in very different endings after the banking reforms: the *Cajas* have either disappeared or transformed into commercial banks (Sagarra et al., 2013).

At this point, it is important to note that the motivation behind the analyses for Spanish financial institutions comes from observing the large volume of securitization and the need to find the underlying reasons or the features behind such strong activity. We also believe that in future analyses it will become important to specify the uses of those resources generated through the securitization activity, taking also into account their ex-post effects. Such an approach will help us to understand in a more comprehensive way the problem of banks as a whole, and more specifically, the case of nonprofit organizations such as the *Cajas*.

Appendix 1. Univariate analysis of differences in firm-specific characteristics between *Cajas* and commercial banks

	Cajas							Commercial banks							Wilcoxon-Mann-Whitney test
	Obs.	Mean	Std. Dev.	Range	p. 5%	Median	p. 95%	Obs.	Mean	Std. Dev.	Range	p. 5%	Median	p. 95%	
Capital Ratio	280	12.31	2.42	18.20	9.55	11.90	16.00	98	11.16	2.26	14.20	8.60	10.80	15.60	0.0000***
K-Buffer	280	0.54	0.30	2.27	0.20	0.49	1.01	98	0.40	0.28	1.78	0.08	0.35	0.95	0.0000***
Equity / Total Assets	356	7.50	2.07	12.06	4.93	7.04	11.57	154	6.84	4.82	26.15	2.09	5.92	22.87	0.0000***
Loan Loss Reserve / Gross Loans	306	2.05	0.52	3.54	1.31	1.99	3.00	148	1.61	0.97	3.81	0.00	1.80	3.02	0.0000***
Impaired Loans / Gross Loans	306	1.02	0.60	4.33	0.38	0.85	2.13	111	0.95	0.54	2.32	0.36	0.83	2.20	0.2675
Loan Loss Provisions / Net Interest Reven	356	12.32	7.12	39.91	0.53	12.70	24.77	154	13.93	7.58	53.54	1.95	13.64	26.94	0.0344**
Interbank Ratio	336	166.31	184.44	981.40	12.33	98.82	586.67	154	77.48	95.82	723.85	2.87	53.12	221.10	0.0000***
Net Loans / (Dep + ST Funding)	356	87.79	25.78	205.75	55.57	85.84	131.45	154	79.06	30.89	145.57	5.55	82.30	129.03	0.0118**
Liquid Assets / (Dep + ST Funding)	356	21.04	13.69	123.17	5.97	18.44	42.15	154	20.43	19.64	98.55	3.05	14.52	67.67	0.0015***
ROA	356	0.91	0.33	2.18	0.47	0.87	1.58	154	0.91	1.14	10.43	0.01	0.75	2.91	0.0002***
ROE	356	12.22	3.39	22.99	6.87	11.88	17.79	154	11.68	7.21	57.15	0.24	12.42	22.73	0.9117
CIR	356	58.93	7.62	43.44	47.13	58.68	73.08	154	61.56	16.70	94.73	38.26	58.88	92.09	0.4053
Size (Ln TA)	356	8.94	1.05	6.11	7.38	8.85	11.05	154	9.52	1.55	6.78	7.66	9.11	12.75	0.0016***

Chapter 3

Good and bad *Banks*? Governance, human capital of top managers and performance

1. Introduction

The Spanish savings banks (*Cajas de Ahorros*, or *Cajas*) have been so heavily affected by the 2007–2008 financial crisis that most of them have already disappeared by the end of 2012. This collapse was preceded by similar problems in other countries (Ahrens et al., 2011; Erkens et al., 2012), although there were differential elements in the Spanish case. First, savings banks enjoyed an apparent great shape previous to the crisis, and, second, they constituted half of the financial system. Out of 45 entities in 2008, only 12 of them remained by the end of 2012 (see the Appendix 1). Many merged with other banks or had to be rescued and, finally, the remaining ones, had to transfer their business to a newly created (commercial) bank, while transforming the old Savings banks in financial foundations, which owned those new commercial banks. This transformation occurred even for those Savings banks that performed well. Furthermore, it seems this process may not be finished yet (Sagarra et al., 2013a) with some additional mergers in the waiting list. The *Cajas* transformation in commercial banks has a precedent in the Italian savings banks privatization (see Carletti et al. (2005) for a comprehensive survey).

In contrast with the previous description, most Spanish commercial banks have withstood the crisis in a successful way. Appendix 1 shows a summary on the restructuring of the Spanish banking sector between 2008 and 2012. As it is shown in the table, the restructuring involved 43 out of the 45 *Cajas*. Paradoxically, only the two smallest ones, Caixa Ontinyent and Caixa Pollença, were not involved in any restructuration process and they have maintained their own autonomy and their previous legal form. On the other side, among the eight biggest Spanish commercial banks, also involved in the 2008–2012 restructuring, only three of them were absorbed (i.e., Banco de Valencia, Banesto and Banco Pastor). Traditionally, Spanish commercial banks have been a more concentrated group than *Cajas*. Although the regulator considers 150 banks (Bank of Spain, 2011), in nominal terms, once we eliminate subsidiaries and very small banks, numbers fall

significantly. During the 2000–2009 period, less than 20 entities kept assets above 3 billion Euros, and only 9 surpassed the 10 billion Euros of assets in 2004, just in the middle of that period. In any case, it is important to mention that each type, *Cajas* and commercial banks separately, accounted for about half of the Spanish credit market during the decade 2000–2009.

Although these two types of banks shared the market in similar terms, they have experienced very different outcomes after the crisis. Our aim is to assess if this difference responds to governance practices and/or the human capital of their chairmen. First we test if there are differences in terms of the Cajas' performance with respect to banks, and also among themselves. Some authors (García-Marco and Robles-Fernández, 2008; Cuñat and Garicano, 2010; García-Meca and Sánchez-Ballesta, 2012) have pointed out that neither the formal governance institutions (i.e., the composition of the different governance bodies) nor the real governance (i.e., the role played by politicians) explain these differences in banks' results. To carry out our analysis we make use of both an extended period data, covering both a boom period and a period of crisis, and a more detailed description of the human capital of the chairmen. In particular, we consider their previous banking experience, formal education, and their political background to get a better grasp of these important issues. History seems to matter and the use of a better organizational capital of the chairmen, and the stakeholder composition can help us to get clearer results.

For our goals we make use of a dataset containing 42 *Cajas* (while previous studies compared only 30 *Cajas* on average in the) and 16 commercial banks for the period 2004–2009, covering a period of boom and also of crisis. This means practically the whole universe of *Cajas* (42 out of 45 *Cajas* for that period, with the only exception of the three smallest *ones*: Caixa Ontinyent, Caja Jaén and Caixa Pollença for which there was no available data), and the relevant Spanish commercial banks, those with at least 3 billion Euros of total assets.

Concerning the effect of governance structure on financial firms' performance there are some interesting and recent references (e.g., Adams and Mehran, 2012; Pathan and Faff, 2013) conducting the analysis in different countries. Although this helps us to better appreciate the differences and commonalities among banks, one important problem with these international comparative studies (i.e., cross-country studies) comes from the fact that they cover several countries and large geographic areas (e.g., Iannotta et al., 2007; Girardone et al., 2009; Erkens et al., 2012; Ferri et al., 2012). To do that, they only take into account the largest and/or the listed banks, introducing a bias that may offer an incomplete

picture of the sector. Other times banking reality is oversimplified due to the inclusion of heterogeneous countries, or the joint analysis of many different types of financial firms. Through our emphasis on the Spanish *Cajas*, banks with specific corporate governance and risk features, and its comparison with the rest of Spanish commercial banks, we think we can go deeper in the analysis of these two organizational forms. And still, we think some important lessons can be extracted for other countries where some type of non-commercial bank is competing in the industry.

We find that commercial banks were, in general, more profitable than *Cajas*, although they incurred in more risk during the boom period. However, during the crisis period commercial banks have shown a better performance, apparently because they managed to control their own risks in a better way than *Cajas*. Although many *Cajas* perform well, on average they did not, and these results would be coherent with the subsequent restructuring of the whole sector, confirming the different risk-taking behaviour models between commercial banks and *Cajas*, or at least with some of them.

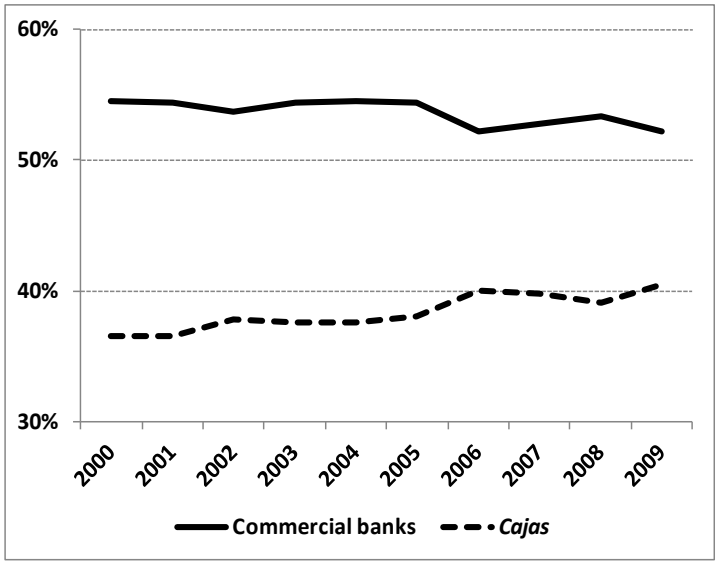
Our paper contributes to the very scarce literature assessing the relationship between the human capital and governance dimensions and the banks' performance, while establishing additional knowledge about the reasons for the collapse of many of the Spanish financial institutions. On the one hand, those institutions with a chairman that had more years of previous banking experience, more years spent in the entity and a top degree in their education, performed better than those with not such chairman's profile. On the other hand, and focusing on the effects of the level of politicization of *Cajas* governance, we find evidence that a major presence of politicized seats in the governing bodies of those entities implied a better profitability combined with higher risk, at least in boom periods. Due to the previously mentioned results, our findings have important implications for banking regulators and future supervisory policies, and not only for the case of Spain. Other countries with important shares of non-shareholder-oriented institutions should also consider these findings.

After this introduction, Section 2 provides an overview of the evolution and restructuring of the Spanish financial sector, especially for the case of *Cajas*. We also include a section (Section 3) describing the Spanish banks governance and our hypotheses, focusing mainly in the *Cajas*. In this section we also discuss our measures of the experience and human capital of the chairmen. Section 4 describes the collected data and the statistical methodology. Finally, section 5 presents the empirical findings, and the paper ends with a section containing conclusions and future challenges.

2. Evolution and restructuring of the Spanish financial sector

The traditional players in the Spanish banking sector have been commercial banks, *Cajas* (Spanish savings banks), and credit cooperatives. During the decade 2000–2009 both the commercial banks and the *Cajas* accounted for about one half of the Spanish credit market, while credit cooperatives held the remaining share, approximately 10% of the market (Bank of Spain, 2011). Figures 1 and 2 show the evolution of the assets and the loans held by *Cajas* and commercial banks as a percentage of the total credit for the period 2000–2009.

Figure 1. Assets (% over banks' total assets)



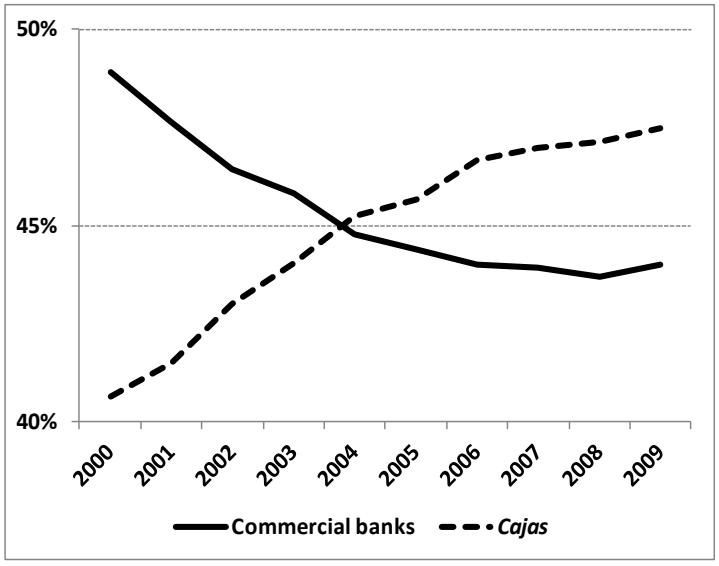
Source: own elaboration from Bank of Spain data.

Although many *Cajas* had a long history dating back to the late XIX and early XX centuries, it was in 1977 when an important series of reforms launched the process of liberalization of the Spanish financial system (Royal Decree 2290/1977). The *Cajas* were no longer publicly managed and highly controlled institutions, and started to compete directly with commercial banks. Previous to these legal changes, their activity was mainly focused on attracting deposits, but with the liberalization they competed with commercial banks to provide credit in different forms. In 1988 this trend was further strengthened. Until that year, the *Cajas* were geographically constrained to specific regions, something that was often reflected in their name but, after some important attempts by the largest savings bank, *La Caixa*, a 1988 Royal Decree (Real Decreto 1582/1988) allowed the *Cajas* to open

branches beyond their historical territories. Since that moment, the *Cajas* began to expand geographically and even displaced commercial banks from their traditional markets and businesses, especially in retail banking (Azofra and Santamaría, 2004). Meanwhile, the Spanish commercial banks were more involved in their international expansion across South America first and later in Europe.

As a result, the commercial banks strategy closed almost 4,000 branches in Spain during the 1990s and at the same time strengthened the international areas of business (where *Cajas* could not compete). Due to these strategic interactions with the commercial banks, the *Cajas* multiplied their presence by opening new branches all over the country. In less than 25 years the *Cajas* doubled the number of branches, from 12,547 branches in 1985 to 24,985 branches in 2008, the year in which they reached the peak (Sagarra et al., 2013a). From a strategic point of view, this territorial expansion of *Cajas* was based in their choice of a proximity banking policy, oriented to attract and enhance the loyalty of the small customers, focusing also on mortgage lending as a pivotal product in their business. Furthermore, the peculiar legal form and ownership structure of the *Cajas* prevented their acquisition by larger commercial banks as we will explain later.

Figure 2. Loans (% over banks' total loans)



Source: own elaboration from Bank of Spain data.

The arrival of the 2007–2008 financial crisis and the subsequent burst of the Spanish real state bubble changed the whole picture, when many *Cajas* and some commercial banks fell into severe financial distress. At the beginning, during 2008, 2009 and part of 2010 the regulatory authorities invoked the traditional ways of overcoming problems in previous episodes (Crespí et al., 2004). That is, the regulator facilitated the use of mergers among banks, and it encouraged well-managed *Cajas* to merge with those in difficulties, after some financial help, in order to achieve larger and healthier institutions. But the depth of the crisis and the limitations of this early approach became soon evident and, in 2010, a further legislative reform was introduced (Royal Decree-Law 11/2010). This reform paved the way to a dramatic change in the Spanish financial sector. The analysis of the reasons behind this change are complex and goes beyond the scope of this paper. Nevertheless, we would like to point out that several international institutions, like the IMF, and the regulator were often uneasy, when not critical, concerning the organizational form of the *Cajas*, and its governance peculiarities respect the commercial banks. In any case, the reform did require the *Cajas* to transfer their financial activity to a newly created banking entity (this time a corporation, an SA, not a foundation) transforming their legal form (Sagarra et al., 2013b). This change had important consequences and it has allowed commercial banks to takeover *Cajas*, something that was not possible before.

While Spanish commercial banks were shareholder-oriented and strongly controlled corporations, the *Cajas* had specific governance arrangements. As it has been already mentioned earlier, they were stakeholder-oriented organizations, not controlled by a formal owner. They could be considered as non-for-profit commercial institutions in the sense of Hansmann (1996). They had a general assembly and a board which were made up of representatives from the different stakeholder groups (i.e., founding entities, depositors, employees, and local and/or regional public authorities). Although this peculiar organizational form facilitated the involvement of other stakeholders such as customers, employees and local entities, it also had important implications in terms of raising capital and control. This same nature aggravated their difficulties at the time of raising capital (they could not issue capital) to sustain their increasing credit activity and, furthermore, it could lead them to a higher risk of politicization and mismanagement (Crespí et al., 2004). We will explore next these specific features and problems.

3. Corporate governance and human capital of the Spanish banks

3.1 Spanish commercial banks and Cajas

Commercial banks in Spain are privately owned, profit-maximizing, shareholder-oriented and strongly controlled corporations because of their concentrated ownership structure (for instance, Azofra and Santamaría (2011) find evidence that 96% of Spanish commercial banks have an ultimate controlling owner). Under a simplified point of view, we could say that shareholders are their sole owners, profits are distributed only among shareholders, and the agency relationship between shareholders and managers is well defined.

Quite different was the governance of the Spanish savings banks, or *Cajas*. The *Cajas* could be considered as non-for-profit commercial institutions in the sense of Hansmann (1996). They are private credit institutions with a foundational nature, with a lack of formal owners (i.e., shareholders), and where their principal governing bodies were the general assembly, which is analogue to the general meeting of shareholders from commercial banks, and the board of directors, which can delegate many of its functions to an executive commission. The chairman, who officially represents the bank, and the CEO, who is the responsible to execute the board resolutions, are elected by the board. In some *Cajas* the chairman has executive functions all together with the CEO. Both the general assembly and the board are made up of representatives of various stakeholders (i.e., depositors, employees, local and/or regional public authorities, and founding entities, which can be government-related, civic or religious institutions). These stakeholders have different, although sometimes interrelated, goals. More specifically, these goals have been described as follows: the universal access to financial services, promote competition and prevent monopoly abuse, make a contribution to social welfare and wealth distribution, make a contribution to regional development, and also contribute to profit maximization (García-Cestona and Surroca, 2008). Not only that, the *Cajas* should invest part of their profits in social and cultural programs (around 25% of their net profits) and retained the rest as reserves. Therefore, rather than only pursuing profit maximization, as it is the clear objective for commercial banks, the *Cajas* goal was to maximize the value or the utility of their stakeholders, a mission somewhat wider and more abstract then the one pursued by commercial banks. The controlling bodies of the *Cajas* did not pressure managers to seek profits because they would themselves benefit little from it (Ferri et al., 2012). For instance, the depositors group was usually formed by small and uninformed investors without sufficient incentives to monitor the *Cajas* activities (Freixas and Rochet, 1997). In more general terms, the wide range of missions from the dispersed stakeholders which induced to usual conflicts of interest among themselves, and the *Cajas* immunization to market corporate control (except from takeovers by other *Cajas*), gave managers a wide freedom of action, inducing the *Cajas* to undertake more risk (García-Marco and Robles-Fernández, 2008).

In summary, coalitions of different stakeholders were formed, and they were more interested in achieving their own goals than seeking an efficient allocation of resources. This justified suboptimal investment policies and the obligation to participate in alleged covert strategic projects for the state or community of origin. Regarding the internal supervision, this was assigned to the so-called control commission, but it ended up being worthless from the moment that replicated the same composition of other organs of government, and just ratified the decisions taken by the board of directors (Azofra and Santamaría, 2004).

Financial institutions are not an exception on which the above described agency conflicts apply (Fama and Jensen, 1983), but there are some reasons for which banking sector governance issues may differ from that of unregulated, non-financial firms (Adams and Mehran, 2003; Mehran et al., 2011). First, the business of banks is opaque and complex and can shift rather quickly. Secondly, the higher number of stakeholders (i.e., investors, depositors, regulators, among others) involved in financial institutions, thus complicating the governance of such banks. It is precisely the prominence of these parties with a stake, or groups of interest, or *"any group or individual who can affect or is affected by the achievement of an organization's purpose"* (Freeman, 1984), either in the shareholder-oriented banks (e.g., Spanish commercial banks) in general or in the stakeholder-oriented banks (e.g., *Cajas*) in particular, which motivates the analysis of such institutions under alternative theories. For instance, while agency theory motivates an analysis for which the different governance mechanisms contributes on the general objective of maximizing the shareholder value (i.e., it is a shareholder-oriented theory), the *stakeholder theory* (Freeman, 1984; Clarkson, 1995) questions the firm value maximization as the objective function of the firm, substituting it by the welfare maximization of all the stakeholders. The presence of externalities (e.g., the managerial decisions effects on specific stakeholders welfare) implies that the pursuit of particular interests in the firm does not necessarily results in collective efficiency.

Tirole (2001) points out that the shareholder-oriented approach provides a too-narrow view for an economic analysis of corporate governance (for instance, it is assumed that natural stakeholders such as employees, suppliers, customers and others, are protected by very powerful contracts or laws that force controlling investors to perfectly internalize their welfare). He also mentions that, unfortunately, there is little formal analysis of the economics of the stakeholder approach to articulate the basic ideas of this approach. Jensen (2002) makes a great criticism to the stakeholder theory, arguing that it is impossible to maximize in more than one objective at the same time, because multiple objectives (e.g., to maximize current profits, market share, future growth in profits, and anything else one

pleases) leads to a lack of objectives definition (i.e., confusion and lack of purpose), thus leaving the managers with no way to make a reasoned decision. As a result, a firm that adopts stakeholder theory will be handicapped in the competition for survival because, as a basis for action, stakeholder theory politicizes the corporation, and it leaves its managers empowered to exercise their own preferences in spending the firm's resources.

Describing the already complex reality of Spanish banks and *Cajas* governance in relation to the risk-taking behaviour of such entities, García-Marco and Robles-Fernández (2003, 2008) point out that the owner–manager agency conflict coexists with another problem of moral hazard, and this causes a twofold effect on the *"organizational form-risk taking behaviour"* relationship that is not easily predictable.

This added *moral hazard hypothesis* states that similarly to non-financial institutions, the limited liability generates an incentive to the shareholders to expropriate part of the wealth from depositors while increasing the risk held by the bank. Furthermore, the existence of deposit insurance raises the entities' incentives to take risk above the optimal level, either in their assets or in their liabilities portfolios, while it can diminish the regulators' incentives to control and to reduce the risk excess in financial institutions. And the entities' incentives to take risk diminishes with a more diffuse ownership structure (e.g., in the case of *Cajas* compared to commercial banks, or in commercial banks with lower levels of concentration). This moral hazard approach developed by Merton (1977) was widely applied to explain the American Savings and Loan (S&L) crisis in the eighties (Kane, 1989; White, 1991; Akerlof and Romer, 1993; among many others).

Nevertheless, we would like to point out that conflicts among different stakeholders could be solved in banks of similar nature, as shown in the Norwegian banking industry. There, besides the case of Norwegian commercial banks (regular stock companies that are controlled by their stockholders) we can find savings banks (entities in which the stockholders, if any, hold only one fourth of the control rights, while the remaining three quarters of the control rights are split equally between the employees, the depositors, and community citizens). Following an agency problem perspective, Bøhren et al. (2012) point out that, although conflicts of interest between the stakeholders might reduce the bank's ability to create value, there are some instruments (i.e., dividends) that are used to mitigate inherent agency conflicts in the bank's stakeholder structure (i.e., when the potential agency conflict in the firm increases, the actual conflict becomes smaller through a higher dividend payout).

In addition, previous empirical studies point out some results which differ from the expected ones in theory, when they compare the performance of the stakeholder banks over the shareholder banks. Comparing American mutual institutions with stock banks, Esty (1997) concludes that stock banks exhibit greater incentives to take risk, and that the conversion of the organizational form of American S&L from mutual to stock ownership, ironically a conversion promoted by the Congress and the regulators to save the industry, was associated with increased risk taking, thus concluding that the regulatory changes were not based on a consideration of agency conflicts. Some empirical evidence from countries other than US support the hypothesis of a more pronounced principal-agent problem in the case of stakeholder banks. For instance, Gorton and Schmid (1999) conclude that Austrian cooperative banks, assumed as organizational forms with an exogenous ownership structure, reduce their performance as the number of cooperative members increases, corresponding to a greater separation of ownership and control. They find that agency costs (measured by efficiency wages) are increasing in the degree of separation or dispersion of the ownership structure. However, Altunbas et al. (2001) evaluate the German case through the analysis of the private commercial banks, the government-owned savings banks and the mutual cooperative banks for the period 1989–1996. Following an efficiency approach, they find that savings banks and cooperative banks perform better than commercial banks under this dimension.

Regarding the cross-country studies, Iannotta et al. (2007) analyze a sample of 181 large banks from 15 European countries over the period 1999–2004 and find that, although private banks are better profit performers, this is sustained on higher net returns on their earning assets rather from a superior cost efficiency, in which public and mutual banks are better performers. They also conclude that public banks are worse performers in terms of loan quality and higher insolvency risk but that mutual banks are better than private banks in this aspect. Girardone et al. (2009) comparatively analyze the cost efficiencies among commercial banks, savings banks and credit cooperative banks from different European countries and, contrary to what agency theory would predict, they find that mutual banks are more cost efficient than commercial banks. Also in a comparative study among European countries, Ferri et al. (2012) conclude that, in terms of loan quality, shareholder-oriented banks are worse performers than stakeholder-oriented banks. However, it is very important to understand in detail the different and specific underlying organizational forms involved when doing comparative analyses. Precisely this is a great weakness of cross-country comparisons at the time of connecting governance and risk-performance issues. Different frameworks can lead to very different outcomes for the same approach.

In Spain, García-Marco and Robles-Fernández (2008) find that commercial banks are more risk-inclined than *Cajas*, supporting the moral hazard hypothesis described above, but contrary to a greater owner-manager agency conflict predicted for *Cajas*, with an organizational form that favours this problem and that, during the period (1993-2000), were in great territorial expansion (outside of their original Autonomous Community in which they traditionally operated) compared to commercial banks. However, when focusing on commercial banks, and contrary to the moral hazard hypothesis, the authors find that the degree of shareholder concentration has a negative impact on the level of risk-taking, arguing that a higher shareholder concentration implies a stricter control over managers under an agency problem approach, even when protected by deposit insurance. Finally, they conclude that size matters (in the sense of a less propensity to risk-taking), probably because a major capacity of bigger banks to diversify their risks (geographical and business diversification) and to gather information for their investments (Saunders et al., 1990).

The literature is also addressing the different banks' governance issues exposed by the recent global financial crisis. Mehran et al. (2011) makes a good general review of this topic. Regarding the empirical studies, see for instance Beltratti and Stulz (2010), Fahlenbrach and Stulz (2011) or Aebi et al. (2012). The three papers conclude by different ways that there is a strong relationship between the banks' governance structure before the crisis (i.e., in 2006, the last complete year before the financial crisis) and their performance during the crisis. Erkens et al. (2012) develop a cross-country comparative study to analyse the corporate governance effects on the performance of financial firms during the 2007–2008 crisis period. However, these studies must be taken with care since, additionally to the weaknesses pointed out before, they cover several countries and large geographic areas, while taking into account only the largest and/or the listed banks, introducing a bias that may offer an incomplete picture of the sector. For instance, in the case of Erkens et al. (2012) only 9 Spanish listed banks are covered, thus the sample (formed by just 8 listed banks and 1 listed insurance company) hardly represents the whole sector. Although, under several differentiated perspectives, the literature has extensively exposed and argued about the differences between Spanish commercial banks and *Cajas* during the "good" years, it is precisely the financial crisis originated in 2007–2008 and the subsequent distress of many of the *Cajas* that generates an additional motivation for this Thesis. There are very few papers addressing the relation between governance issues and performance for the specific case of stakeholder-oriented banks in the current crisis context, and precisely one of the main objectives (and contributions) of this Thesis is to provide new empirical evidences for the current debate.

There is the possibility that a hidden *Cajas* agency problem (aggravated by a potential lack of human capital) during the "happy" boom years in Spain became unmasked during the crisis years. For instance, Illueca et al. (2013) noted the negative effect of the 1988 Spanish banking deregulation (i.e., the removal of branching barriers on the *Cajas*) in connection with the specific governance nature (and the politicization) of *Cajas* over their *ex ante* risk-taking and their *ex post* loan defaults. This could explain the existence of a differentiated behaviour between *Cajas* (e.g., with less knowledge about the new territories in which they expanded rapidly thus taking residual high risks; mostly orientated in taking heavy real-estate risk shares; funding several nonviable political projects because of their influence in governing bodies) and commercial banks. Furthermore, this particular behaviour of many *Cajas* originated a deferred problem of distress (somehow hidden during the boom period and becoming visible during the financial crisis). Confirming these premises, García-Meca and Sánchez-Ballesta (2012) find that commercial banks performed better than *Cajas* during the crisis period.

Taking into account the previous literature and the *Cajas* wide mission approach, one would expect a better performance in the case of commercial banks. They enjoy a more specific and clear goal than *Cajas*, and this clearness becomes a useful governance feature especially during a financial crisis. Furthermore, it becomes necessary to control for risk measures at the time of comparing the results of the different organizations. This is particularly relevant in a context like the financial sector where the returns and the costs of decisions are allocated in different ways among the different stakeholders.

H1(a). Commercial banks are better performers than *Cajas* during the boom period.

H1(b). Commercial banks are better performers than *Cajas* during the crisis period.

3.2 Human capital of the Spanish banks chairmen

While great part of the financial literature has centred in the effects of formal features or composition of the boards (i.e., size, independence, or directors' stock ownership) over the banks' performance, Hau and Thum (2009) analyze the qualitative features of their members. These authors claim that features such as the education and the experience of the board members should receive more attention in the assessment of effects.

In a broader sense, and following Johnson et al. (2013), we could separate the qualitative characteristics (not only from board members but also from top managers) in different groups: demographics (i.e., age; education; gender), human capital (i.e., experience; tenure), social capital (i.e., ties to entities such as political parties; personal relationships; status or prestige), and others (i.e., business). For simplification, and as it is commonly used in most literature, we will denote the qualitative characteristics related to our study managers as 'human capital'.

Agency theory seems to play a specific (and sometimes limited) role in explaining the effect of governance mechanisms, since it focus on the *"incentives"* but not on the *"abilities"* of such mechanisms. The effects of human capital over the firms' performance have been addressed under many different points of view or theories. Without being exhaustive, we can mention for a comprehensive review of the literature the papers of Crook et al. (2011) and Johnson et al. (2013). Under the resource-based theory, in his empirical study Hitt et al. (2001) claims about the role of human capital as a key factor (i.e., a critical resource) to explain the differences on firms' performance. The variance in the firms' resources and capabilities is what explains the performance differences across firms. A competitive advantage (which may induce a better performance) can be more likely produced by intangible resources than by tangible ones, and firm's knowledge is an example of intangible firm-specific resource, and it mainly resides in the human capital of the organization.

A more recent study (Güner et al., 2008), allows to link the previous literature more centred in non-financial firms with banking industry, since it analyses a sample of publicly traded companies (excluding the financial firms), but utilizing different variables of interest regarding the financial expertise of the directors (i.e., previous commercial bank executive; previous investment bank executive; previous executive of a non-bank financial institution; previous finance executive, 'finance' professor; among others) as drivers of the corporate decisions. Fields et al. (2012) investigate if the quality of the board (i.e., they include variables regarding both formal and qualitative board measures) affects the cost of debt capital for S&P 1,500 firms, finding an inverse relation between both dimensions.

As mentioned above, very few studies deal with the effects of human capital over banks' performance. When searching for literature close to our debate (commercial banks and *Cajas*), we only find empirical evidences in Hau and Thum (2009) for the German case, and in Cuñat and Garicano (2010) and García-Meca and Sánchez-Ballesta (2012) for the Spanish case. Regarding the German banks, Hau and Thum (2009) analyze the

biographies data (i.e., educational background; finance experience; and management experience) of 592 board members from the 29 largest banks, comparing the performance of private and state-owned German banks in the 2007–2008 financial crisis, and relate this performance to qualitative measures of board competence. They find that measures of management and financial experience of the board members are systematically higher in privately owned banks compared to state-owned banks, and that a poorer quality in board competence is related to higher losses in the financial crisis. They also point out that *"most of the politically connected board members made their career in politics and in the administration but have little experience in banking and financial markets"*. This suggests that, under the resource-based theory, having such political background has a bad effect over performance.

Regarding the Spanish case, Cuñat and Garicano (2010) find a significant effect of the human capital of the *Cajas'* chairmen (i.e., education; previous banking experience; political affiliations) on the measures of loan book composition (i.e., the size of the portfolios of real estate and individual loans) and performance (i.e., the amount of non-performing loans in the crisis; the decrease in ratings) during the financial crisis. While education and previous banking experience have a positive effect over both dependent variables, the *Cajas* whose chairman is a political appointee have significantly worse loan performance. Although García-Meca and Sánchez-Ballesta (2012) only measure the human capital of the chairmen through the dichotomy of having or not previous banking experience, they find similar results to those from Cuñat and Garicano (2010).

Summarising, human capital (in the sense of personal qualities of the entities rulers) cannot be avoided as an important driver for the understanding of banks' performance. In the book relating his own long-time experience as the chairman of one of the most important *Cajas*, Serra-Ramoneda (2011) argues that the *Cajas* could have remained within their traditional regions and ignored the temptation to expand. Some of them did just this, but most managers saw growth as an opportunity to increase their power, their status in society, and their income.

Taking into account the issues arisen from the human capital (i.e., experience and education) of the chairmen from Spanish banks, and considering the previous literature, we could expect a positive influence of such human capital over the performance of the entities. On the contrary, it seems to be a negative relationship between the political affiliation of the chairmen and the performance of the banks.

H2(a). There is a positive relationship between the human capital (i.e., experience and education) of the chairman and the performance of both commercial banks and *Cajas*.

H2(b). There is a negative relationship between the politicization of the chairman and the performance of both commercial banks and *Cajas*.

3.3 The politicization of Cajas

The regulatory framework established in 1977 was substantially modified by the 1985 'Ley de Órganos Rectores de las Cajas de Ahorros (*Cajas* Governing Bodies Act)' Act. The 1985 Act allowed executive chairmen (with executive salaries) and regulated the presence of the various stakeholders in the governing bodies of the *Cajas*, definitively boosting the presence of public authorities: it was established the framework for the stakeholders voting power shares (depositors between 25 and 50%, employees between 5 and 15%, local public authorities up to 50%, and founding entities remained with the resting share). Additional regional laws (i.e., laws approved independently by each Autonomous Communities in which each respective *Caja* was established), which were supported by some sentences from the highest judicial body in the country (i.e., the 'Tribunal Constitucional', or Spanish constitutional Court), allowed not only an increased presence of the local public authorities in the bodies, but also the presence of the regional public authorities on them. In many cases the *Cajas* where ruled *de facto* by their correspondent regional governments, since the politicization limitation of 50% was easily surpassed. It is true that in some cases (i.e., seven out of the ten Catalan *Cajas*) this politicization was really low (i.e., up to the 20% level), due to the traditional control exerted by their respective founding entities, typically civic organizations.

The 44/2002 'Ley de Medidas de Reforma del Sistema Financiero (Measures for the reform of the financial system Act)', set a 50% limit to public bodies' representation on the governance bodies of the *Cajas* to conform to the European law for private banks. It also allowed to issue 'cuotas participativas' (non-voting equity units). Both measures were an effort to control and to monitor the politicization and performance of *Cajas*. However, both had little impact. On the one hand, there are evidences that the politicization limitation of 50% was easily circumvented by putting politicized people as representatives of other stakeholder groups. On the other hand, although there was some formal interest on issuing 'cuotas participativas' (CAM and Caixa Galicia were the unique issuers during the decade 2000-2009), in no case there was not a real interest, neither by the *Cajas* nor by potential

investors with aiming to control and monitor the firm (they had not voting rights). Later, the 'Ley Financiera (Financial Act)' 26/2003 introduced some additional information requirements for *Cajas* in order to increase transparency. And finally, the 11/2010 Royal Decree-Law reduced from 50% to 40% the ceiling on voting rights of the public authorities in *Cajas* governing bodies, while increased its transparency and the professionalization of the political representatives and top managers with requirements in terms of banking experience and education. Although this was probably implemented a little too late.

It is of interest to know if such level of politicization affected the performance of the *Cajas*. While Melle and Maroto (1999) and Azofra and Santamaría (2004) find a negative relationship between the presence of public authorities in the *Cajas* bodies and their economic efficiency, recent studies contradict those results. García-Marco and Robles-Fernández (2008) do not find that the control of the bank by public administrations causes any effect on risk-taking behaviour. More specifically, Cuñat and Garicano (2010) show that neither the formal nor the real *Cajas* bodies level of politicization are correlated with the composition and the performance of the loan book at the peak of the financial crisis. García-Meca and Sánchez-Ballesta (2012) do not find any kind of relationship between the share level of politicians in the general assembly and the *Cajas* economic performance. Analysing the effects of the 1988 Spanish banking deregulation (i.e., the removal of branching barriers on the *Cajas*), Illueca et al. (2013) find out the negative effect of such deregulation in connection with the specific governance nature (and the politicization) of *Cajas* over their *ex ante* risk-taking and their *ex post* loan defaults. They conclude that deregulation of an industry in which institutions are subject to weaknesses in corporate governance and political influence does not necessarily lead to the expected positive outcomes. Italy offers interesting results in the same line. Sapienza (2004) points out that the level of political influence in Italian state-owned banks affects their lending behaviour (i.e., in terms of lower interest rates charged). Menozzi et al. (2012) offer results in the same line for Italian local public utilities, in which the degree of politicization affects negatively their performance. Hau and Thum (2009) address the German state-owned banks case during the recent financial crisis, trying to establish a relationship between the governance quality of these banks (i.e., through the biographical background of their board members) and their constant underperformance regarding the private banks, and finding out a strong relation between both dimensions.

If we consider the issues arisen from the *Cajas* politicization, we could expect a negative relationship between the level of politicization of *Cajas* governing bodies and their performance, and during the financial crisis.

H3. Less politicized *Cajas* are better performers than more politicized ones.

4. Data and methodology

4.1 Data sources

We collected data from different sources. We used the Bureau van Dijk's Bankscope database to obtain the financial information about both *Cajas* and commercial banks. This database is widely used in international studies (see for instance Iannotta et al., 2007; Ferri et al., 2012; Pathan and Faff, 2013), and it contains both balance sheet and profit and loss account information for financial institutions. Regarding the information on *Cajas'* governance we obtained this from the Corporate Governance Reports published by the entities in The Spanish National Securities Market Commission (CNMV, or 'Comisión Nacional del Mercado de Valores'). Much harder was to obtain the information regarding the human capital (i.e., experience, education and political affiliation) of the chairmen from *Cajas* and commercial banks. We use different sources: the Boardex database, the web pages from the entities, the published *curriculum vitaes* of the chairmen, and from news clippings and different newspapers.

The final data set covers the period 2004–2009, and it includes 42 *Cajas* (248 bank-year observations) and 16 commercial banks (92 bank-year observations) in the study. We managed to collect information from almost the totality of the *Cajas* universe, with the only exception of the three smallest *Cajas* (Caixa Ontinyent, Caja Jaén and Caixa Pollença) since there was not available data from them. Regarding the commercial banks, we include those entities with a minimum size of, at least, 3 billion Euros of total assets in their last available year. The period 2004–2009 was chosen because it covers 4 years before the onset of the crisis (i.e., 2004–2007), and 2 years after the crisis (i.e., 2008–2009), and because the governance data was only available for those years. We did not collect data from 2010 onwards because of the financial sector restructuring, resulting in the integration of most entities in bigger groups, especially in the case of *Cajas* (see the Appendix 1). Furthermore, the governance nature of the *Cajas* was substantially affected by those changes introduced by the 11/2010 Royal Decree-Law. The financial data was collected for the period 2002–2009 because some dependant variables (i.e., ROA's volatility; Z-score) were calculated using standard deviations over 3-year windows.

4.2 Variables and models

4.2.1 Dependent variables

We have selected five different dependent variables to assess the entities' performance in its broad sense, ranging from the simplest profitability measures (i.e., return on assets) to the loan quality measures (i.e., impaired loans over gross loans), without avoiding more complex risk measures (i.e., ROA's volatility; Z-score). The reason for taking this varied and complete spectrum of variables is that, for instance, the stakeholder entities (i.e., the *Cajas*) do not aim to maximize their benefits and so, focusing only on profitability measures could mislead the results. Also, we want to understand the whole trade-off between risk and return of banks. Riskier portfolios may be very profitable in certain periods but they may also imply a higher probability of bad loan quality or even bankruptcy.

We measure profitability through the ROA, defined as the ratio of bank after-tax profits to its total average assets. It is a measure of the level of returns generated by those assets, and it is the most widely used ratio to compare the performance among financial institutions. We use ROA, instead of ROE (return on equity), because the latter is influenced by the bank's capital–asset ratio and, due to the different ownership nature of commercial banks and *Cajas*, this ratio could differ substantially among the different banks (Crespí et al., 2004; Ferri et al., 2012). The somewhat abstract concept of bank risk is measured through three different variables. First, we use the volatility of ROA, calculated as the standard deviation of the ROA over 3-year windows (Laeven and Levine, 2009; Barry et al., 2011; García-Meca and Sánchez-Ballesta, 2012). Here higher values imply higher risk. Second, we use the Z-score (full sample), as implemented by Hesse and Čihák (2007) and Lepetit and Strobel (2013), through the form of [[(Equity / Total Assets) + ROA] / ROA Standard Deviation]$^{-2}$. The ROA standard deviation estimates are calculated over the full sample [1 . . . T], and combine these with current period t values of Equity / Total Assets and ROA in t. A higher value implies a higher risk (i.e., probability of failure of a bank). Third, we refine the previous measure and we use the Z-score (year window) in the sense of García-Meca and Sánchez-Ballesta (2012), which follow some previous literature (Hannan and Hanweck, 1988; Laeven and Levine, 2009), through the form of the natural logarithm of [[(Equity / Total Assets) + ROA] / ROA Standard Deviation]. The ROA standard deviation estimates are calculated over 3-year windows, thus differentiating clearly this measure from the previous Z-score (full sample). In this case a higher value implies a lower risk (i.e., inverse probability of failure of a bank). Finally, we measure the

loan quality (or risk bad-output) through the Impaired Loans / Gross Loans ratio, which shows the loan portfolio quality in terms of the worst and more doubtful loans. This ratio is a measure of *ex post* credit risk (Salas and Saurina, 2002).

4.2.2 Explanatory variables and models

Our work analyzes three main groups of explanatory variables and models, according to the questions and hypotheses raised.

First of all, it is of crucial importance to select the bank-specific control variables that should be in the models since, as noted by Ferri et al. (2012), it could lead us to a misinterpretation of the results due to the heterogeneous nature of the different groups of observations. Next we describe the control variables: Bank, which takes the value of 1 for commercial banks, and 0 otherwise (i.e., *Cajas*); Crisis, which takes the value of 1 for the years 2008 and 2009, and 0 otherwise (i.e., years 2004 to 2007 in our sample); Ln Size, which is the natural logarithm of the Total Assets; Gross Loans / Total Assets, to control for the type of assets (i.e., business) of the entities; and Equity / Total Assets, to control for the equity/debt structure of the banks. In addition, our control variables are in line with Iannotta et al. (2007), Laeven and Levine (2009), Ferri et al. (2012) and Bøhren et al. (2012), among many other strongly related references from the literature, and it means a step further concerning the works of Hau and Thum (2009), Cuñat and Garicano (2010) and García-Meca and Sánchez-Ballesta (2012), which only control for size. Importantly, heterogeneity between entities does not only respond to differences in their size but also in their business model (i.e., assets) and its funding structure (i.e., liabilities). Finally, the time dummies allow us to control for unobservable and time-varying effects.

Our first hypothesis was to assess the difference in performance between the commercial banks and the *Cajas*. This is tested through the following model:

$$Performance_{i,t} = b_0 + b_1 \cdot \text{Bank}_{i,t} + b_2 \cdot \text{Crisis}_{i,t} + b_3 \cdot (\text{Bank x Crisis})_{i,t} + b_4 \cdot \text{Ln Size}_{i,t} + b_5 \cdot \text{Gross Loans/Total Assets}_{i,t} + b_6 \cdot \text{Equity/Total Assets}_{i,t} + b_7 \cdot \text{Year}_{i,t} + \varepsilon_{i,t} \quad (1)$$

In addition, the hypotheses regarding the human capital of the Spanish banks chairmen are tested through the following model:

$$\begin{aligned} Performance_{i,t} = {} & b_0 + b_1 \cdot \text{Chairman previous banking experience}_{i,t} \\ & + b_2 \cdot \text{Chairman entity experience}_{i,t} + b_3 \cdot \text{Chairman education 2}_{i,t} \\ & + b_4 \cdot \text{Chairman education 3}_{i,t} + b_5 \cdot \text{Chairman education 4}_{i,t} \\ & + b_6 \cdot \text{Chairman has political affiliations}_{i,t} + b_7 \cdot (\text{Chairman education 4 x Crisis})_{i,t} \\ & + b_8 \cdot (\text{Chairman has political affiliations x Crisis})_{i,t} + b_9 \cdot \text{Bank}_{i,t} + b_{10} \cdot \text{Crisis}_{i,t} \\ & + b_{11} \cdot (\text{Bank x Crisis})_{i,t} + b_{12} \cdot \text{Ln Size}_{i,t} + b_{13} \cdot \text{Gross Loans/Total Assets}_{i,t} \\ & + b_{14} \cdot \text{Equity/Total Assets}_{i,t} + b_{15} \cdot \text{Year}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

In this model the chairman's previous banking experience variable represents the number of years that a chairman has spent in other banks previously to their current entity. The chairman entity experience variable represents the number of years that a chairman has been working for their current entity. It is important to note here the limitations of using a dichotomic variable to capture the effects of previous banking experience as done by the previous studies. Such approach does not distinguish between a chairman who has worked one single year in other institutions from a chairman who has worked twenty years in four institutions. This is an industry where specific knowledge proves to be very important, and the accumulation and depth of this past experience can be more important than just having a short experience in the industry. The chairman education variable represents the graduate degree level which holds the chairman: education 2 has a value of 1 if the chairman has undergraduate university education non related to business or economics (i.e., Medicine, Law degree, etc), and 0 otherwise; education 3 has a value of 1 if the chairman has undergraduate university education related to business and economics (i.e., Economics degree, etc), and 0 otherwise; education 4 has a value of 1 if the chairman has a PhD in Business Economics or a MBA in prestige institutions, and 0 otherwise. The omitted variable is education 1, which has a value of 1 if the chairman has not any education degree and 0 otherwise. The chairman political affiliations variable has a value of 1 if the chairman has been an elected public official and 0 otherwise.

Finally, at the time of measuring the political effects the hypothesis regarding the politicization of *Cajas* is tested through the following model:

$$Performance_{i,t} = b_0 + b_1 \cdot \%\text{ of seats by Employees}_{i,t} + b_2 \cdot \%\text{ of seats by Depositors}_{i,t}$$
$$+ b_3 \cdot \%\text{ of seats by Municipalities and Regions (Politicization)}_{i,t}$$
$$+ b_4 \cdot \text{Compensation per board member}_{i,t} + b_5 \cdot \text{Crisis}_{i,t} + b_6 \cdot \text{Ln Size}_{i,t}$$
$$+ b_7 \cdot \text{Gross Loans/Total Assets}_{i,t} + b_8 \cdot \text{Equity/Total Assets}_{i,t} + b_9 \cdot \text{Year}_{i,t} + \varepsilon_{i,t} \quad (3)$$

This model introduces the particular ownership nature of *Cajas*. The first three variables contain the percentage of seats held by the different groups of stakeholders (i.e., employees, depositors, and local and regional public authorities, respectively) in the board, being the omitted variable the percentage of seats held by the founding entities (i.e., government-related, civic or religious institutions). It is important to note here that, compared to the previous studies regarding the *Cajas*, we have adjusted the distribution of the seats among the different stakeholder groups in order to represent the real political representation in the governing bodies, since the theoretically non-politicized stakeholder groups may have politicized seats. The compensation per board member variable is the total compensation of the board divided by the number of board members.

Since we need to control the individual features of each bank (i.e., there is a different constant value for every cross-sectional observation), all models are estimated using random effects, instead of pooled ordinary least squares (OLS) regression. The Breusch and Pagan test confirms that it is better to use random effects instead of pooled OLS is preferable, since the null hypothesis of the test is rejected (the test shows a Prob > Chi2 below 0.01). We cannot estimate the models by fixed effects since we need for time-constant dummies to control for bank type (i.e., in the first and second model), or other constant-type variables (i.e., % of seats in the board) in the third model. In addition, we have also estimated all the models using pooled OLS regression and dynamic OLS regression (i.e., with the lagged dependent variable as exploratory variable, since random effects cannot handle lagged dependent variables), with time dummies and standard errors adjusted for clustering at the bank level. We get very similar results compared to the random effects models. The results remain stable when we run these alternative specifications, and they are available upon request.

One important issue in governance studies is that of endogeneity (Hermalin and Weisbach, 2003; Adams et al., 2010; and Wintoki et al., 2012, make a good review of this topic). It is important to note that we are trying to establish an association between exploratory variables and dependent variables, and that we do not pretend to find a

causality connection or reverse causality issues. The great limitation in the number of observations prevented us to use the usual techniques (i.e., GMM, among others) to deal with this kind of issues.

5. Empirical findings

Table 1 shows a descriptive analysis of the human capital collected data of the chairmen from both *Cajas* and commercial banks for the period 2002–2009, synthetized in three dimensions, which are experience (having previous banking experience, and years of global, banking and entity experience), education (level of studies) and political affiliation (being a political appointee), along with the frequency and type of chairmen turnover.

We can see a quite different human capital approach when we compare these two institutions. Regarding the experience dimension, while most of the *Cajas'* chairmen have not previous banking experience (92.5%), this is not the case of chairmen of commercial banks (where 60% lack previous banking experience). Also, the number of years of experience of commercial banks' chairmen is higher than what *Cajas'* chairmen have, especially when we focus on banking and inside the firm experience. Quite surprising is the distribution of the *Cajas'* chairmen education, skewed clearly towards the lowest levels of education (i.e., no education, or university education but unrelated to economics or business). For commercial banks, chairmen educational background is more balanced and there are not cases of chairmen without education.

Regarding the political affiliation of *Cajas'* chairmen, it is quite interesting to see that, while almost two thirds of the non-executive chairmen have not a political affiliation, this situation is inversed in the case of executive chairmen. This could demonstrate a plausible interference by regional and/or municipal governments in those entities. On the opposite side, we have not found any political relationship among the executive chairmen from commercial banks.

Table 1. Human capital of the Spanish banks chairmen

	Value	Description	*Cajas*						Commercial banks					
			Chairman		Executive Chairman		Non Executive Chairman		**Chairman**		Executive Chairman		Non Executive Chairman	
Experience	0	With no previous banking experience	**62**	*92,5%*	21	*87,5%*	41	*95,3%*	**12**	*60,0%*	8	*61,5%*	4	*57,1%*
	1	With previous banking experience	**5**	*7,5%*	3	*12,5%*	2	*4,7%*	**8**	*40,0%*	5	*38,5%*	3	*42,9%*
		TOTAL	**67**	*100,0%*	24	*100,0%*	43	*100,0%*	**20**	*100,0%*	13	*100,0%*	7	*100,0%*
	Years	"Global" experience (Average)	**32**		28		35		**34**		33		37	
	Years	"Banking" experience (Average)	**13**		15		13		**25**		28		20	
	Years	"Entity" experience (Average)	**12**		13		12		**19**		21		16	
Education	1	No education	**10**	*14,9%*	2	*8,3%*	8	*18,6%*	**0**	*0,0%*	0	*0,0%*	0	*0,0%*
	2	Undergraduate university education (Medicine, Law degree, ...)	**32**	*47,8%*	9	*37,5%*	23	*53,5%*	**6**	*30,0%*	4	*30,8%*	2	*28,6%*
	3	Undergraduate university education (Economics degree, ...)	**12**	*17,9%*	5	*20,8%*	7	*16,3%*	**9**	*45,0%*	4	*30,8%*	5	*71,4%*
	4	PhD in Business Economics, or MBA in prestige institutions	**13**	*19,4%*	8	*33,3%*	5	*11,6%*	**5**	*25,0%*	5	*38,5%*	0	*0,0%*
		TOTAL	**67**	*100,0%*	24	*100,0%*	43	*100,0%*	**20**	*100,0%*	13	*100,0%*	7	*100,0%*
Political affiliation	0	Has not been a political appointee	**35**	*52,2%*	7	*29,2%*	28	*65,1%*	**17**	*85,0%*	13	*100,0%*	4	*57,1%*
	1	Has been a political appointee	**32**	*47,8%*	17	*70,8%*	15	*34,9%*	**3**	*15,0%*	0	*0,0%*	3	*42,9%*
		TOTAL	**67**	*100,0%*	24	*100,0%*	43	*100,0%*	**20**	*100,0%*	13	*100,0%*	7	*100,0%*
Turnover	1	Worsening (Overall)	**8**	*27,6%*	3	*30,0%*	5	*26,3%*	**4**	*66,7%*	3	*100,0%*	1	*33,3%*
	2	Remaining constant (Overall)	**12**	*41,4%*	3	*30,0%*	9	*47,4%*	**2**	*33,3%*	0	*0,0%*	2	*66,7%*
	3	Improving (Overall)	**9**	*31,0%*	4	*40,0%*	5	*26,3%*	**0**	*0,0%*	0	*0,0%*	0	*0,0%*
	1	Worsening (Education)	**5**	*17,2%*	4	*40,0%*	1	*5,3%*	**3**	*50,0%*	3	*100,0%*	0	*0,0%*
	2	Remaining constant (Education)	**17**	*58,6%*	4	*40,0%*	13	*68,4%*	**3**	*50,0%*	0	*0,0%*	3	*100,0%*
	3	Improving (Education)	**7**	*24,1%*	2	*20,0%*	5	*26,3%*	**0**	*0,0%*	0	*0,0%*	0	*0,0%*
		TOTAL	**29**	*100,0%*	10	*100,0%*	19	*100,0%*	**6**	*100,0%*	3	*100,0%*	3	*100,0%*

Appendix 2 reports the basic descriptive statistics and the correlations for all the variables considered in the three models. It is remarkable the maximum values which show the percentage of seats held by depositors and politicized stakeholders (municipalities plus regional governments in our sample). First, the mean and maximum values reflect the existence of a strong influence given both type of stakeholders, compared with other stakeholders (i.e., founders and employees). This influence is polarized in the existence of banks in which the depositors hold the majority of votes and institutions in which politicians hold the majority. And second, and more surprisingly, there are institutions in which the power held by politicized stakeholders surpasses the maximum established by law since, as commented earlier, the 44/2002 'Ley de Medidas de Reforma del Sistema Financiero (Measures for the reform of the financial system Act)', set a 50% limit to public bodies' representation on the governance bodies of the *Cajas* to conform to the European law for private banks. For the general assembly this was the case of Bancaja in 2005, Caixa Catalunya since 2006, Cajasol in 2007 and 2009, Cajastur in 2004, 2005, 2006 and 2008, Caja Granada since 2004, and Caixa Girona since 2007. Concerning the board this was the case of Caixa Galicia since 2004 and Caja España since 2004. The main reason behind these anomalies is that some *Cajas* report as founding entities those members coming from councils or regional governments, since they were labeled as founders. We have adjusted this carefully in order to assess more correctly the formal politicization of each entity.

The first hypothesis to be tested was if commercial banks, which are profit-maximizing institutions, are better performers than *Cajas*, which are stakeholder-oriented institutions, and Table 2 provides some evidence in this sense.

Commercial banks have a better performance in terms of profitability than *Cajas* (Model 1), although this is accompanied with higher levels of risk (Models 2 and 3). But, when we refer to the crisis period, banks perform better than *Cajas* in terms of risk (Models 2, 3, 4 and 5). This is contrary to the moral hazard hypothesis, and being a shareholder-oriented bank implies a stricter control over managers under an agency problem approach, even when protected by deposit insurance. Summarizing, we find that commercial banks are, in general, more profitable than *Cajas*, although by incurring in more risk during the boom period. However they manage to control their own risks in a better form than *Cajas*, since during the crisis period they show a better performance in all senses. These results support our first hypothesis, and they are coherent with the subsequent restructuring of the whole sector, while confirming the different risk-taking behaviour models between commercial banks and *Cajas*. Finally, if we focus on the control variables, we confirm that the crisis period has strong statistical significance affecting the whole sample, and that a higher sized and more capitalized bank becomes more profitable (Model 1) and less risky

(Model 3) than those who are not, although the latter is not supported by the rest of risky measures.

Table 2. Commercial banks and *Cajas* (boom and crisis periods)

	Model 1	Model 2	Model 3	Model 4	Model 5
	Random effects	Random effects	Random effects	Random effects	Random effects
VARIABLES	ROA	ROA Volatility	Z-score (full sample)	Z-score (year window)	Imp.Loans / Gross Loans
Bank (1 = commercial bank; 0 = Caja)	0.3616**	0.1469*	0.0156**	-0.3328	-0.2033
	[2.5154]	[1.6994]	[2.0357]	[-1.2558]	[-1.0067]
Crisis (1 = 2008 and 2009 years)	-0.4606***	0.2099***	0.0112***	-1.3010***	4.3777***
	[-4.8408]	[3.7001]	[2.8710]	[-9.5969]	[13.2906]
Bank x Crisis	-0.0428	-0.1594***	-0.0106**	0.4715**	-0.9791**
	[-0.2298]	[-2.9352]	[-2.0270]	[2.2220]	[-2.1139]
Ln Size	0.0517**	0.0027	-0.0040**	-0.0413	0.0489
	[2.0187]	[0.1607]	[-2.3301]	[-0.7475]	[0.7657]
Gross Loans / Total Assets	-0.0022	-0.0008	-0.0006***	-0.0019	0.0106
	[-0.8922]	[-0.5218]	[-5.8090]	[-0.2734]	[0.9256]
Equity / Total Assets	0.1736***	0.0312	-0.0033***	0.0380	-0.0965*
	[5.8845]	[1.1879]	[-2.9358]	[0.7526]	[-1.8816]
Constant	-0.8190***	-0.0717	0.1091***	4.9678***	0.4210
	[-2.8522]	[-0.4172]	[5.7563]	[6.3287]	[0.3043]
Time dummies	Yes	Yes	Yes	Yes	Yes
Observations	341	341	341	340	315
R^2	0.68	0.25	0.41	0.29	0.71
Chi^2	104.44***	69.38***	246.52***	204.76***	387.46***

Robust z-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1

Next, we consider the model of the effects of human capital over the entities' performance we report the results in Table 3. And we can extract some relevant conclusions from them. First, those institutions where a chairman has more years of previous banking experience and more years spent in the entity have a better performance in terms of risk (Models 7, 8, 9 and 10). Second, entities whose chairmen have a top degree in their education perform better than those lacking such chairman's profile. These both findings support the hypothesis H2(a). Although Models 8 and 9 show a negative effect of this variable over risk, its behaviour is very similar than that showed by commercial banks (i.e., during the crisis period, the chairmen with top degree in their education are better performers, as Models 9 and 10 show). Our results do not find evidence about a potential influence of the political affiliation of the chairmen over the entities' performance (except

in Model 7), so the hypothesis 2(b) does not find support from this analysis. The ROA results (Model 6) do not show any significant variable regarding the human capital of the chairmen, concluding that profitability was not a factor depending on this dimension. The effects of all the control variables are the same as in the previous basic models (Table 2). A higher sized and more capitalized institution is more profitable (Model 6) and less risky (Model 8) than those who are not, although this result is not supported by the rest of risky measures, Models 9 and 10.

Table 3. The role of chairman's human capital in commercial banks and *Cajas*

	Model 6	Model 7	Model 8	Model 9	Model 10
	Random effects	Random effects	Random effects	Random effects	Random effects
VARIABLES	ROA	ROA Volatility	Z-score (full sample)	Z-score (year window)	Imp.Loans / Gross Loans
Chairman: number of previous years experience	-0.0025	-0.0029	-0.0008**	-0.0017	-0.0244
	[-0.5243]	[-1.1169]	[-1.9949]	[-0.2512]	[-1.4784]
Chairman: number of entity years experience	-0.0010	-0.0031***	-0.0002[+]	0.0187***	-0.0143*
	[-0.4455]	[-2.8945]	[-1.5388]	[4.0608]	[-1.9192]
Chairman: education 2 (non economics degree)	-0.0652	0.0563	0.0036	-0.1341	-0.4674*
(the omitted is Chairman with no education)	[-0.7971]	[0.9746]	[0.9877]	[-0.5559]	[-1.9095]
Chairman: education 3 (economics degree)	-0.0313	0.0405	0.0086	-0.0834	-0.0642
	[-0.4140]	[0.6023]	[1.4444]	[-0.2914]	[-0.2107]
Chairman: education 4 (PhD, MBA)	-0.0897	0.1101	0.0100*	-0.6140**	-0.1209
	[-0.6858]	[1.4084]	[1.9587]	[-2.0834]	[-0.3805]
Chairman has political affiliations	0.0378	-0.0673**	-0.0045	0.2396	-0.1201
	[0.5368]	[-2.3937]	[-1.1218]	[1.3810]	[-0.8120]
Chairman (education 4) x Crisis	-0.1088	-0.0607	-0.0008	0.5184**	-0.8493**
	[-0.5083]	[-0.8790]	[-0.1734]	[2.1052]	[-2.0315]
Chairman has political affiliations x Crisis	-0.1112	0.0912	0.0077	0.0077	0.0906
	[-0.8293]	[0.9582]	[1.3484]	[0.0360]	[0.1684]
Bank (1 = commercial bank; 0 = Caja)	0.3950***	0.1499	0.0174**	-0.3156	-0.0661
	[2.8595]	[1.5171]	[2.2331]	[-1.1663]	[-0.2994]
Crisis (1 = 2008 and 2009 years)	-0.3699***	0.1758***	0.0077***	-1.4114***	4.5665***
	[-3.8998]	[3.5780]	[2.9234]	[-8.6306]	[12.9913]
Bank x Crisis	-0.0954	-0.1217***	-0.0072	0.4383**	-0.9944**
	[-0.5558]	[-2.5865]	[-1.6096]	[2.0020]	[-2.0805]
Ln Size	0.0604**	0.0006	-0.0048**	-0.0375	0.0738
	[2.3695]	[0.0391]	[-2.3293]	[-0.6789]	[1.1575]
Gross Loans / Total Assets	-0.0020	-0.0011	-0.0006***	-0.0015	0.0112
	[-0.8689]	[-0.6153]	[-7.0118]	[-0.2473]	[1.1141]
Equity / Total Assets	0.1771***	0.0285	-0.0035***	0.0515	-0.0863*
	[5.8312]	[1.0660]	[-3.3246]	[0.9843]	[-1.7782]
Constant	-0.8951***	0.0059	0.1195***	4.6634***	0.5552
	[-3.3271]	[0.0314]	[4.9349]	[6.5857]	[0.4214]
Time dummies	Yes	Yes	Yes	Yes	Yes
Observations	341	341	341	340	315
R^2	0,68	0,26	0,44	0,34	0,74
F-ratio (Chi²)	317.90***	118.26***	653.53***	259.30***	430.15***

Robust z-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1

Finally, focusing on the effects of the level of politicization of *Cajas* governance over their performance, reported in Table 4, we can conclude that a major presence of politicized seats in the governing bodies of those entities implies a better profitability but a worse risk performance (Models 11, 12 and 14).

Table 4. The influence of *Cajas'* politicization

	Model 11	Model 12	Model 13	Model 14	Model 15
	Random effects	Random effects	Random effects	Random effects	Random effects
VARIABLES	ROA	ROA Volatility	Z-score (full sample)	Z-score (year window)	Imp.Loans / Gross Loans
% of seats by Employees	1.9331	-1.8438**	-0.0813	3.8076	-2.1435
(the omitted is % of seats by Founders)	[1.4155]	[-2.0026]	[-1.4824]	[1.4979]	[-0.4369]
% of seats by Depositors	0.1457	-0.2093	-0.0039	0.2302	-0.5973
	[0.2497]	[-0.8531]	[-0.3043]	[0.2631]	[-0.3628]
% of seats by Municipalities and Regions	0.3940*	0.3509**	0.0055	-1.4087*	0.4450
(Politicization)	[1.8864]	[2.0494]	[0.9436]	[-1.8566]	[0.4835]
Compensation per board member	0.0005**	0.0003*	-0.0000	-0.0012*	-0.0005
	[2.3650]	[1.7508]	[-1.1963]	[-1.6746]	[-0.7104]
Crisis (1 = 2008 and 2009 years)	-0.5157***	0.2016***	0.0092***	-1.2224***	4.1144***
	[-7.0435]	[4.8994]	[2.9819]	[-9.0663]	[12.6333]
Ln Size	-0.0190	0.0088	0.0009	0.0723	0.1090
	[-0.6730]	[0.3293]	[0.7271]	[0.5018]	[0.8377]
Gross Loans / Total Assets	0.0030	-0.0015	-0.0002**	0.0148	-0.0099
	[0.8995]	[-0.6428]	[-2.0302]	[1.3752]	[-0.5129]
Equity / Total Assets	0.1148***	-0.0355	-0.0040***	0.1789***	-0.2470***
	[3.9443]	[-1.5914]	[-2.9307]	[3.4393]	[-3.0404]
Constant	-0.5631	0.4423	0.0518***	2.0079	2.8850
	[-1.0508]	[1.4567]	[3.3208]	[1.2065]	[1.3502]
Time dummies	Yes	Yes	Yes	Yes	Yes
Observations	240	240	240	239	232
R^2	0,54	0,24	0,37	0,44	0,74
F-ratio (Chi²)	169.80***	89.98***	224.36***	216.67***	289.90***

Robust z-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1

Probably a higher level of politicization does not necessarily mean a worse performance of a *Caja*, given the previous mixed results and taking a glance on what has happened to the entities individually (i.e., there are some examples of very high politicized *Cajas*, like BBK or Unicaja, that are examples of success), but we can conclude that, in general terms, the level of politicization affected in some manner the entities, including their risk taking. Or, at least, we cannot conclude that politicization of *Cajas* did not affect their final fate as a group, since hypothesis H3 is not supported. On the contrary, a higher percentage of seats by Employees seems to be associated with a better risk performance,

highlighting the positive influence of this collective in the entities, while the Compensation per board member seems to be associated with a higher performance in terms of ROA but also in relation with higher levels of risk. These non expected results are in line with those from Hau and Thum (2009), who find that higher average executive board compensation is positively correlated with bank losses, contrary to what can be expected in an efficient market for managerial pay, suggesting suggest that particularly large executive pay package signal not better management but rather more severe agency problems.

6. Conclusion

Spanish savings banks (*Cajas*) and commercial banks have had a different destiny. Our objective was to assess if such differences were related to their governance practices and the human capital of their chairmen.

We find that commercial banks were, in general, more profitable than *Cajas*, although by implying more risk during the boom period. However they managed to control their own risks in a better form than *Cajas*, since during the crisis period they showed a better performance in all senses. This is contrary to the moral hazard hypothesis, and being a shareholder-oriented bank implies a stricter control over managers under an agency problem approach, even when protected by deposit insurance. These results are coherent with the subsequent restructuring of the whole sector and confirm the different risk-taking behaviour models between commercial banks and *Cajas*. There is the possibility that a hidden *Cajas* agency problem (aggravated by a potential lack of human capital) during the "happy" boom years in Spain became unmasked during the crisis years. The particular behaviour of many *Cajas* (with less knowledge about the new territories in which they expanded rapidly thus taking residual high risks; mostly orientated in taking heavy real-estate risk shares; funding several nonviable political projects because of their influence in governing bodies) originated a deferred problem of distress (somehow hidden during the boom period and becoming visible during the financial crisis).

Our paper contributes to the very scarce literature assessing the relationship between the human capital and governance dimensions and the banks' performance, while establishing additional knowledge about the reasons for the collapse of many of the Spanish financial institutions. On the one hand, those institutions with a chairman that had more years of previous banking experience, more years spent in the entity and a top degree in their education, performed better than those with not such chairman's profile. Some authors

under the resource-based theory (e.g., Hitt et al., 2001) have argued that a competitive advantage (which may induce a better performance) may respond more to intangible resources than to tangible ones. Firm's knowledge is an example of intangible firm-specific resource, and it mainly resides in the organizational human capital.

Our results do not find evidence about a potential influence of the political affiliation of the chairmen over the entities' performance. On the other hand, focusing on the effects of the level of politicization of *Cajas* governance, we can conclude that a major presence of politicized seats in the governing bodies of those entities implied better profitability but a worse risk performance.

Due to the commented results above, our results have important implications for banking regulators and future supervisory policies, not only for the case of Spain but also for the case of other countries with important shares of non-shareholder-oriented institutions.

Appendix 1. Summary table on restructuring of the Spanish banking sector

Institutions that make it up (2008)	Transaction date		Resulting bank (2012)
BBVA	March 2010	March 2012	BBVA
UNNIM: *Caixa Sabadell*, *Caixa Terrasa*, *Caixa Manlleu*			
Bankinter			Bankinter
Caixabank: *La Caixa* + *Caixa Girona*	October 2010	March 2012	*Caixabank*
Banca Cívica: *Caja Navarra*, *Caja Canarias*, *Caja Burgos*	April 2010		
Caja Sol + *Caja Guadalajara*	December 2010		
Banco de Valencia	December 2012		
BBK-Cajasur	July 2010	December 2011	*Kutxabank*
Caja Vital/Kutxa			
Sabadell	December 2011		Sabadell
CAM			
Santander, Banesto	December 2012		Santander
Unicaja	April 2010		*Unicaja*
Caja Jaén			
Banco Popular, Banco Pastor	June 2012		Popular
Ibercaja	December 2011	Merger under way	*Ibercaja*
Caja 3: *CAI*, *Caja Círculo de Burgos*, *Caja Badajoz*			
Caja España	March 2010		*Ceiss*
Caja Duero			
Caja Murcia, *Caixa Penedés*, *Sa Nostra*, *Caja Granada*	June 2010		*BMN*
Cajastur-CCM	November 2009	April 2011	*Liberbank*
Caja Cantabria, *Caja Extremadura*			
Caja Madrid, *Bancaja*, *Caja Ávila*, *Caja Segovia*, *Caja Rioja*, *Caixa Laietana*, *Caja Insular de Canarias*	June 2010		*Bankia*
Caixa Catalunya, *Caixa Tarragona*, *Caixa Manresa*	March 2010		*Catalunya*
Caixa Galicia, *Caixanova*	June 2010		*NCG*
Caixa Ontinyent			*Caixa Ontinyent*
Caixa Pollença			*Caixa Pollença*

Source: own elaboration from Bank of Spain data.

Note: *Cajas* are shown in *italic* to distinguish them from commercial banks.

Appendix 2. Descriptive statistics and correlations

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 ROA	0.746	0.791	-3.060	9.240	1.000																		
2 ROA Volatility	0.181	0.330	0.000	3.082	0.237	1.000																	
					(0.000)																		
3 Z-score (full sample)	0.016	0.027	0.000	0.286	-0.369	0.173	1.000																
					(0.000)	(0.001)																	
4 Z-score (year window)	4.304	0.997	0.036	7.530	0.163	-0.600	-0.209	1.000															
					(0.003)	(0.000)	(0.000)																
5 Imp.Loans / Gross Loans	1.979	2.110	0.030	16.100	-0.461	0.370	0.395	-0.609	1.000														
					(0.000)	(0.000)	(0.000)	(0.000)															
6 Crisis	0.336	0.473	0.000	1.000	-0.288	0.232	0.051	-0.508	0.780	1.000													
					(0.000)	(0.000)	(0.348)	(0.000)	(0.000)														
7 Ln Size	9.710	1.265	6.806	13.920	0.047	0.067	-0.026	-0.161	0.078	0.134	1.000												
					(0.387)	(0.218)	(0.635)	(0.003)	(0.165)	(0.013)													
8 Gross Loans / Total Assets	72.630	11.602	2.790	91.041	-0.013	-0.047	-0.320	0.011	0.039	-0.024	-0.140	1.000											
					(0.814)	(0.382)	(0.000)	(0.844)	(0.492)	(0.661)	(0.009)												
9 Equity / Total Assets	7.134	3.434	1.080	27.820	0.756	0.372	-0.395	0.129	-0.253	-0.144	-0.093	0.058	1.000										
					(0.000)	(0.000)	(0.000)	(0.017)	(0.000)	(0.008)	(0.085)	(0.285)											
10 Chairman: number of previous years experience	1.786	5.773	0.000	31.000	-0.072	0.014	0.039	-0.153	-0.006	0.091	0.040	-0.024	-0.106	1.000									
					(0.184)	(0.801)	(0.471)	(0.005)	(0.918)	(0.088)	(0.467)	(0.664)	(0.051)										
11 Chairman: number of entity years experience	13.328	11.834	0.000	62.000	0.089	(0.014)	(0.047)	0.081	(0.062)	0.073	0.292	(0.136)	0.036	(0.048)	1.000								
					(0.099)	(0.791)	(0.390)	(0.134)	(0.273)	(0.174)	(0.000)	(0.012)	(0.512)	(0.369)									
12 Chairman: education 2	0.462	0.499	0.000	1.000	-0.094	-0.086	-0.048	0.051	-0.079	-0.030	-0.133	0.005	-0.097	-0.061	-0.041	1.000							
					(0.082)	(0.113)	(0.378)	(0.347)	(0.164)	(0.578)	(0.014)	(0.931)	(0.073)	(0.255)	(0.448)								
13 Chairman: education 3	0.217	0.412	0.000	1.000	-0.117	-0.028	0.185	-0.022	0.090	0.036	0.151	-0.034	-0.223	0.001	0.247	-0.487	1.000						
					(0.031)	(0.605)	(0.001)	(0.681)	(0.109)	(0.503)	(0.005)	(0.528)	(0.000)	(0.978)	(0.000)	(0.000)							
14 Chairman: education 4	0.199	0.400	0.000	1.000	0.292	0.192	-0.108	-0.099	-0.063	0.022	0.193	-0.038	0.378	0.169	-0.031	-0.462	-0.262	1.000					
					(0.000)	(0.000)	(0.046)	(0.069)	(0.269)	(0.679)	(0.000)	(0.483)	(0.000)	(0.001)	(0.558)	(0.000)	(0.000)						
15 Chairman: political affiliation	0.399	0.490	0.000	1.000	-0.127	-0.026	0.038	0.030	0.079	0.024	-0.261	-0.004	-0.061	-0.200	-0.355	0.051	-0.089	-0.072	1.000				
					(0.019)	(0.632)	(0.480)	(0.582)	(0.159)	(0.656)	(0.000)	(0.945)	(0.265)	(0.000)	(0.000)	(0.339)	(0.095)	(0.181)					
16 % of seats by Employees	0.095	0.032	0.050	0.158	0.040	-0.081	-0.041	-0.019	0.024	0.012	0.136	-0.024	-0.194	0.048	-0.226	0.053	-0.305	0.139	0.075	1.000			
					(0.533)	(0.201)	(0.522)	(0.767)	(0.712)	(0.846)	(0.032)	(0.704)	(0.002)	(0.442)	(0.000)	(0.398)	(0.000)	(0.026)	(0.234)				
17 % of seats by Depositors	0.131	0.125	0.000	0.471	-0.132	0.020	0.060	-0.020	0.016	-0.006	-0.094	0.033	-0.136	-0.005	0.216	0.225	-0.007	-0.206	-0.170	-0.136	1.000		
					(0.037)	(0.750)	(0.346)	(0.749)	(0.805)	(0.924)	(0.141)	(0.604)	(0.032)	(0.941)	(0.001)	(0.000)	(0.915)	(0.001)	(0.006)	(0.030)			
18 % of Politicized seats	0.414	0.108	0.167	0.529	0.082	0.059	-0.003	-0.014	0.027	0.016	0.078	-0.034	0.117	-0.106	-0.215	-0.058	-0.081	0.118	0.369	0.033	-0.762	1.000	
					(0.198)	(0.355)	(0.957)	(0.822)	(0.683)	(0.793)	(0.218)	(0.598)	(0.065)	(0.092)	(0.001)	(0.358)	(0.197)	(0.060)	(0.000)	(0.604)	(0.000)		
19 Retribution per board member	177.478	181.353	35.000	1187.048	0.107	0.138	-0.046	-0.108	0.013	0.056	0.620	-0.306	-0.018	0.405	0.166	0.122	-0.159	0.138	-0.198	0.220	0.184	-0.325	1.000
					(0.097)	(0.032)	(0.475)	(0.094)	(0.845)	(0.385)	(0.000)	(0.000)	(0.785)	(0.000)	(0.009)	(0.056)	(0.012)	(0.030)	(0.002)	(0.001)	(0.004)	(0.000)	

Significance levels are in parentheses.

Chapter 4

Assessing the effects of Spanish financial sector restructuring on branch rivalry

1. Introduction

Analysing the structure of market competition is important in order to understand the behaviour, performance, and even survival of firms in a given area of activity. Consequently, inter-firm rivalry studies have received much attention in the analysis of strategic behaviour, but these studies have concentrated on industrial analysis, or even the analysis of strategic groups. Such studies are based on aggregated measures, such as the number of firms, the market share of dominant firms, or concentration indexes, and they can miss relevant information on the nature of inter-firm rivalry, as pointed out by Fuentelsaz and Gomez (2008).

Chen (1996) goes one step further by changing the emphasis from aggregate industry measures to the individual firms that take the decisions. This author suggests that the analysis should take into account two dimensions of rivalry: (a) market commonality, based on the number of markets that a firm shares with its rivals, and (b) resource similarity, which takes into account up to what point a competitor shares strategic resources in type and quantities, with the firm that is the object of the competition. Chen (1996) builds indexes to measure market commonality and resource similarity between pairs of firms. Thus, for every sector of activity this procedure makes it possible to build matrices that capture inter-firm rivalry. These matrices are, in general, asymmetric, since the competitive pressure that firm A exerts on firm B is not necessarily the same as the competitive pressure that firm B exerts on firm A.

Although Chen's approach has attracted much attention for the analysis of various economic sectors, including banking (Fuentelsaz and Gómez, 2008), existing studies take a single-company perspective: the usual approach being to produce as many competitive maps as companies are in the dataset, and assess the differences between two or more competitive maps in order to reveal asymmetries in the market (DeSarbo and Grewal,

2007). However, such comparisons among multiple maps become difficult when the number of players is high. Here we propose a methodology that integrates and visualises inter-firm asymmetric competitive relationships within a single framework. We propose that multidimensional unfolding (MDU) techniques be used to construct a statistical map that visualises the asymmetric nature of inter-firm rivalry and reveals its mean features.

Our aim is to assess changes in the rivalry structure of the Spanish banking sector before and after its restructuring as a consequence of the financial crisis whose start can be traced to the year 2008. We base our work on Chen's concept of market commonality. Competition between banking institutions can take place in many ways, but here we concentrate on the presence branches of Commercial Banks and *Cajas* (savings banks) in the main street (i.e., retail banking competition), something that has received much attention in Spain after the de-regulation of the *Cajas* (Serra Ramoneda, 2011). Our work has ignored other distribution channels such as online banking. This is due to the traditional importance that branches (i.e., the physical channel) have in Spain.

The number of branches of the *Cajas* expanded continuously between 1985 and 2008 only to suffer a strong decline after this date. We take the years 2008, the last one before the financial crisis, and the year 2012, the last year for which we have data, and ask the following questions. First, is it possible to visualize, using information from the branch networks of Spanish financial institutions —at postal code level— the whole asymmetric competitive structure of the sector? Second, is it possible to visualise the changes of this competitive structure between the years 2008 and 2012, their effects, and their implications? Answering these questions in a unique framework is something that we think has not been done before.

We find that MDU clearly reveals the asymmetric nature of rivalry between Spanish financial institutions, both before and after the 2008 crisis. The difference between large nation-wide financial institutions (mainly banks) and locally based institutions (mainly *Cajas*) also becomes evident. The comparison between 2012 and 2008 representations shows that much has changed for all to stay the same.

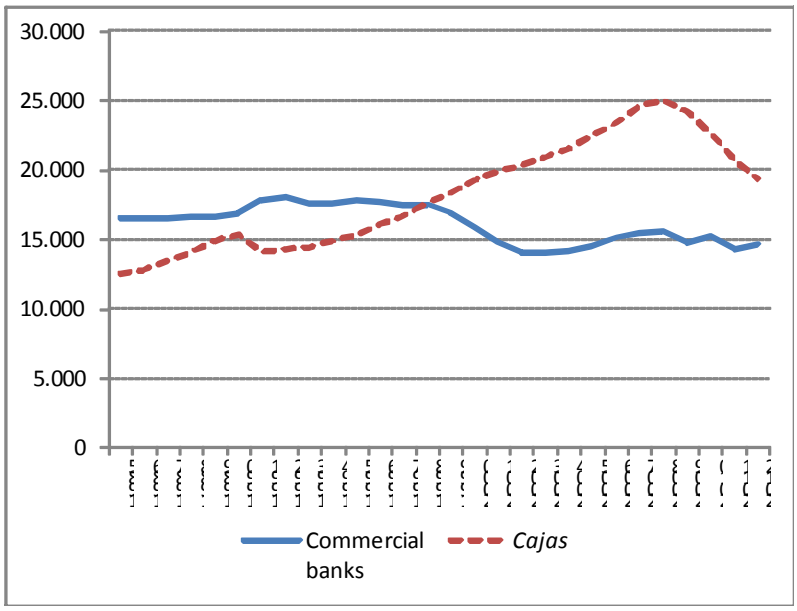
After this introduction we give a short background to the changes that have taken place in Spain with respect to financial institutions, mainly *Cajas*. This is followed by a discussion of Chen's (1996) concept of market commonality, on which our analysis is based, and the way in which this concept is applied to Spanish financial institutions. A

section on data sources and another section on methodology follow. Empirical findings are presented next, and the paper ends with a concluding section.

2. Evolution of the financial industry in Spain

The traditional players in Spanish banking sector have been commercial banks, the *Cajas* (savings banks), and credit cooperatives. During the decade 2001–2010 the commercial banks and the *Cajas* have accounted each for about one half of the Spanish credit market, while credit cooperatives have held approximately the remaining 10% of the market (Bank of Spain, 2011).

Figure 1. Evolution of the number of branches of *Cajas* and Spanish commercial banks (1985 – 2012)



Source: own elaboration from Bank of Spain data.

Until 1977 *Cajas* and commercial banks had different regulatory frameworks, but a Royal Decree (Real Decreto 2290/1977) established functional equivalence between these two kinds of institutions by increasing the *Cajas*' operational freedom and by opening the Spanish financial system to international capital markets. Since then, the *Cajas* are no longer publicly managed and highly controlled entities, and have become direct competitors

for commercial banks. Until recently, the legal status of the *Cajas* prevented their being acquired by commercial banks.

Competition between *Cajas* and commercial banks initially focused on deposits capture, and was followed by the expansion of the *Cajas'* credit operations (Azofra and Santamaría, 2004), but it was not until 1988 that this competition strongly hardened. Before and during the 1980s, the *Cajas* were restricted in their geographical coverage (at a Province level), something that is often reflected in their name, but a 1988 Royal Decree (Real Decreto 1582/1988) permitted the *Cajas* to operate anywhere in the country, thus further enhancing competition in the Spanish financial sector. Figure 1 shows the evolution of the number of branches of *Cajas* compared with those of commercial banks for the period 1985 – 2012.

The *Cajas* began to displace commercial banks from their traditional markets and businesses, especially retail banking. Figure 1 shows that during the 1990s almost 4,000 commercial bank branches were closed. Simultaneously, commercial banks strengthened their international areas of business. At the same time, and due to these strategic moves made by commercial banks, the *Cajas* multiplied their presence in the main street by opening branches all over the country (Azofra and Santamaría, 2004). In less than 25 years the *Cajas* doubled the number of branches, from 12,547 branches in 1985 to 24,985 branches in 2008, the year in which they reached the peak, as shown in Figure 1. From a strategic point of view, this territorial expansion of *Cajas* was based in the choice of a proximity banking policy oriented to attract the loyalty the small customer, focusing on mortgage lending.

But the 2008 financial crisis changed the picture. The special governance arrangements of the *Cajas* were at the root of their subsequent fall (Sagarra et al., 2013). Two reasons can be put forward. The first one was their limitation in raising capital to sustain their increasing credit activity, since they had no shareholders. The second reason has to do with the risk of politicization and mismanagement. The *Cajas* are non-for-profit commercial institutions (Hansmann 1996). They were not controlled by formal owners, although they had a general assembly and a board which were made up of representatives from the different stakeholder groups: founding entities, depositors, employees, and public authorities. This last group generally meant political party appointments, both local and/or regional.

The 2008 financial crisis put a majority of *Cajas* under great financial difficulties. Regulatory authorities argued that the *Cajas* would be in a stronger position if they were larger institutions, something that resulted in a series of mergers. The benefits of the larger size did not materialise and, in 2010, a further legislative reform through a Royal Decree (Real Decreto-ley 11/2010) required the *Cajas* to transfer their financial activity to a newly created banking entity. This made it possible, *de facto*, for commercial banks to take over *Cajas* (Sagarra et al., 2013). Merger and take-over activity was not limited only to *Cajas*, some commercial banks fell into difficulties and were also taken over by stronger financial entities.

Table 1. Summary table on restructuring of the Spanish banking sector (2008 – 2012)

Original institutions (2008)	Transaction date		Resulting bank (2012)
BBVA		March 2012	BBVA
UNNIM: Caixa Sabadell, Caixa Terrasa, Caixa Manlleu	March 2010		
Bankinter			Bankinter
Caixabank: La Caixa + Caixa Girona	October 2010	March 2012	Caixabank
Banca Cívica: Caja Navarra, Caja Canarias, Caja Burgos	April 2010		
Caja Sol + Caja Guadalajara	December 2010		
Banco de Valencia	December 2012		
BBK-Cajasur	July 2010	December 2011	Kutxabank
Caja Vital/Kutxa			
Sabadell	December 2011		Sabadell
CAM			
Santander, Banesto	December 2012		Santander
Unicaja	April 2010		Unicaja
Caja Jaén			
Banco Popular, Banco Pastor	June 2012		Popular
Ibercaja		Merger under way	Ibercaja
Caja 3: CAI, Caja Círculo de Burgos, Caja Badajoz	December 2011		
Caja España	March 2010		Ceiss
Caja Duero			
Caja Murcia, Caixa Penedés, Sa Nostra, Caja Granada	June 2010		BMN
Cajastur-CCM	November 2009	April 2011	Liberbank
Caja Cantabria, Caja Extremadura			
Caja Madrid, Bancaja, Caja Ávila, Caja Segovia, Caja Rioja, Caixa Laietana, Caja Insular de Canarias	June 2010		Bankia
Caixa Catalunya, Caixa Tarragona, Caixa Manresa	March 2010		Catalunya
Caixa Galicia, Caixanova	June 2010		NCG

Source: own elaboration from Bank of Spain data.

Table 1 summarises Bank of Spain information showing the restructuring process of the Spanish banking sector during the period 2008 – 2012. This process involved all the largest players of the whole sector. This re structuring for ever changed the structure and nature of competition among all the entities. It basically affected the *Cajas*, with nearly 6.000 offices closing, as it is shown in Figure 1. Additionally, the number of institutions in the sector decreased dramatically. While in 2008 there were 45 *Cajas*, in 2012 only 12 entities survived. The rest of them were merged with other *Cajas* or were integrated into commercial banks groups.

3. Market commonality between competitors and its asymmetric nature

Market commonality attempts to measure the degree in which two financial institutions overlap in the same market and the importance of every market for each institution. The line of thought is that a financial institution, say *A*, when thinking about another financial institution, *B*, in terms of rivalry in a market, *i*, will take into account the strategic importance it places on market *i* and *B*'s share of that market. This is a non-symmetric concept, as market *i* could be very important from *A*'s point of view– *A* may have a large share of its operations in market *i*– but not so important to *B*– *B*'s presence in market *i* may be small in terms of its overall activity.

Chen (1996) proposed an index to measure market commonality. Given the asymmetric nature of competition, we need to estimate it from the point of view of the institution that is assessing competition, say *A*. *B* is, in this case the institution that creates rivalry by acting as a competitor of *A*. Thus, *A* is the recipient of competitive pressure.

The index is developed as follows. Let P_A be the total number of branches of financial institution *A* in all the markets, of which *Ai* are located in market *i*. The importance of market *i* to institution *A* is measured by the proportion *A*'s total number of branches that are located in market *i*, P_{Ai}/P_A. Let P_i be the total number of branches of all financial institutions in market *i*. The share of firm *B* in market *i* is measured through the proportion of all the branches in market *i* that belong to institution *B*, P_{Bi}/P_i. The index of market commonality from the point of view of *A*, MC_{AB} is obtained by multiplying these two ratios for each market and adding them up over all the markets.

$$MC_{AB} = \sum_{i=1}^{n} \left[\left(\frac{P_{Ai}}{P_A} \right) \times \left(\frac{P_{Bi}}{P_i} \right) \right]$$

The competitive structure of a particular industry is, therefore, measured by means of a square matrix whose entries are the MC_{AB} indexes computed as above. This matrix is non-symmetric. MC_{AB} can be seen as an index that measures similarity between *A* and *B* in terms of the markets that they share. Scaling models are appropriate for the analysis and visual representation of similarity data, but most scaling applications are based on symmetric similarity matrices.

The MC_{AB} index treats all branches as if they were of equal size, and the size of the market is not taken into account. These are limitations of the technique that are shared by all the studies reviewed in this paper. In order to minimise the impact of market sizes on results, we have worked with Spanish postal codes as data units. Postal codes in Spain cover relatively large geographical areas, often coinciding with municipalities. Large cities, such as Madrid and Barcelona, contain several postal codes. When municipalities are relatively small, these are merged into a single postal code.

The analysis of scaling models based on non-symmetric relationships has received relatively little attention, although there are some exceptions that confirm the rule such as, for example, citations among journals (Heiser and Busing, 2004; Leydesdorff and Vaughan, 2006; Schneider and Borlund, 2009), car switching (Harshman et al., 1982; Okada and Imaizumi, 1987), voting behaviour (De Rooij, 2012), or brand switching (DeSarbo and Grewal, 2007; Okada and Tsurumi, 2012).

In this paper we use Multidimensional Unfolding (MDU), a technique that belongs to the Multidimensional Scaling family, and that is appropriate for non-symmetric distance data, in order to visualise the main features in Chen's rivalry matrix.

4. The data

The source of our data is the Guide of Banks, Credit Cooperatives and Spanish Savings Banks, edited yearly by Maestre-Ediban publishing house, in particular the years 2008 and 2012. We have chosen this database because it records the location of the branches of all the Spanish financial institutions at postal code level. There are other databases in existence, but they do not contain so much detail. This choice allows us to analyze the competitive structure of the Spanish financial sector with an unusual level of detail. An analysis at a higher level of aggregation could mask some important competitive features among institutions.

As a first step, it was necessary to clean the database. Financial institutions that did not have a physical branch were removed. We removed branches that did not engage in any financial activity. We also removed branches that were assigned to more than one entity at the same address and took care with branches that had changed ownership after a process of merger. Finally, we checked that, for a given financial institution, the total number of branches given by our cleaned dataset matched the total number of branches given by the periodically published Statistical Bulletin from Bank of Spain, or the total number of branches given by the Statistical Yearbooks published by three Spanish banking associations.

5. Methodological approach

We calculated Chen's market commonality indexes for all financial institutions in the Spanish market in 2008 and 2012. These indexes were collected in a rivalry matrix for 2008 and another rivalry matrix for 2012. However, the rivalry matrices do not contain all the financial institutions. Since our goal is to analyse the impact of competition on financial restructuring and to visualise it in the form of statistical maps, not all institutions were included in the rivalry matrices. The inclusion of all the institutions would have resulted in much cluttered statistical maps. We included in the rivalry matrices the 15 financial institutions that remained in 2012. When the institution, in 2012, was the result of a merger, we included in the 2008 matrix the leading member of the group, as given in Table 1. The indexes in the matrices were, however, computed taking into account all the financial institutions. Although we represent only the most important surviving institutions, we respected the influence exerted by the institutions not included in the rivalry matrices. The 15 institutions in the rivalry matrices accounted for 51% of the total number of branches in the business in 2008, and for 83.5% of the branches in 2012. We also performed the analysis with larger matrices that included all the financial institutions in the data set, but the results reported here did not change.

Table 2 shows the number of branches, for the 15 Spanish groups in 2012, involved in Spanish bank restructuring, and the situation of their leaders in 2008.

Table 2. Distribution of the number of branches for the 15 Spanish largest financial institutions (2008 and 2012)

		Number of branches				
Original leaders	**Market share**	**2008**	**2012**	**Market share**	**Resulting groups**	***Growth***
BBVA	7.2%	3,264	3,563	9.2%	BBVA	*9.2%*
Bankinter	1.2%	535	456	1.2%	Bankinter	*-14.8%*
La Caixa	12.2%	5,517	6,918	17.8%	Caixabank	*25.4%*
BBK	0.9%	430	1,240	3.2%	Kutxabank	*188.4%*
Sabadell	2.7%	1,203	1,836	4.7%	Sabadell	*52.6%*
Santander	6.6%	2,974	4,667	12.0%	Santander	*56.9%*
Unicaja	1.9%	876	785	2.0%	Unicaja	*-10.4%*
Popular	4.0%	1,802	2,560	6.6%	Popular	*42.1%*
Ibercaja	2.4%	1,081	1,633	4.2%	Ibercaja	*51.1%*
Caja España	1.3%	599	852	2.2%	Ceiss	*42.2%*
Caja Murcia	0.9%	431	1,477	3.8%	BMN	*242.7%*
Cajastur	0.7%	338	1,220	3.1%	Liberbank	*260.9%*
Caja Madrid	4.5%	2,022	3,063	7.9%	Bankia	*51.5%*
Caixa Catalunya	2.6%	1,200	1,183	3.0%	Catalunya	*-1.4%*
Caixa Galicia	1.9%	861	1,028	2.6%	NCG	*19.4%*
Total original leaders	**51.0%**	**23,133**	**32,481**	**83.5%**	**Total resulting groups**	***40.4%***
Total sector	**100.0%**	**45,374**	**38,900**	**100.0%**	**Total sector**	***-14.3%***

Source: own elaboration from the Guide of Banks, Credit Cooperatives and Spanish Savings Banks database.

As it can be deduced from Table 2, between 2008 and 2012 more than 6000 branches closed, a 14.3% reduction. Most of the branches that were closed belonged to *Cajas*. It is also relevant to highlight that, in 2008, the 15 original market leaders held 51% of the market. Their successors in 2012 had increased this share to 83.5%. The polarisation in the market can be appreciated: there are a few institutions with a high number of branches (i.e., Caixabank, Santander, BBVA, Bankia and Popular) while the remaining institutions have fewer branches. Some financial institutions had branches in most locations in Spain, while others were simply regional players (i.e., geographically less diversified).

Chen's commonality matrices for the 15 institutions in the study can be seen in Table 3 (2008) and Table 4 (2012). Asymmetry is evident in Tables 3 and 4. The matrices only show the values for the 15 entities in the study but Chen's values were calculated including in the data all the branches of all the financial institutions in the country. All the entries in the matrices have been multiplied by 100 in order to improve readability. This change of scale does not affect the results of the analysis.

Some authors (Burt, 1987; Chen and Hambrick, 1995; Chen, 1996) have pointed out the need to "normalize" the matrices so that market commonality indices for each focal entity (i.e., row banks) are equal to 100. We think that in our case this is not needed, since Chen index already captures the "normalized" nature of relationships between the focal firm and its competitors.

Table 3. Market commonality matrix for the 15 original leaders of the Spanish banking sector before restructuring (2008)

	BBVA	BANKINTER	CAIXABANK (La Caixa)	KUTXABANK (BBK)	SABADELL	SANTANDER	UNICAJA	POPULAR	IBERCAJA	CEISS (España)	BMN (Murcia)	LIBERBANK (Cajastur)	BANKIA (Madrid)	CATALUNYA	NCG (Galicia)
bbva		1.28	12.24	1.28	2.76	7.11	1.49	4.23	1.91	1.34	0.74	0.85	4.98	2.51	1.94
bankinter	7.83		11.68	1.47	3.12	7.32	1.36	4.21	1.97	1.26	1.02	0.78	6.60	2.72	1.54
caixabank (la caixa)	7.24	1.13		0.80	2.95	6.61	1.32	3.96	1.55	1.10	0.74	0.57	4.70	3.86	1.40
kutxabank (bbk)	9.71	1.83	10.22		1.77	7.11	1.15	3.88	1.38	0.49	0.44	0.46	4.72	1.31	1.09
sabadell	7.48	1.39	13.51	0.63		6.80	1.21	4.12	1.54	1.29	0.60	3.03	4.72	4.01	1.59
santander	7.80	1.32	12.26	1.03	2.75		1.45	4.08	2.08	1.37	0.75	0.70	5.51	2.58	1.65
unicaja	5.55	0.83	8.31	0.56	1.66	4.93		2.01	0.64	0.30	0.55	0.27	3.45	0.99	0.68
popular	7.66	1.25	12.11	0.93	2.75	6.74	0.98		1.77	1.82	0.79	0.75	4.77	2.26	2.40
ibercaja	5.76	0.98	7.89	0.55	1.71	5.72	0.52	2.95		0.81	0.34	0.33	4.31	1.84	0.76
ceiss (españa)	7.31	1.12	10.13	0.36	2.59	6.78	0.45	5.48	1.46		0.16	0.68	4.63	0.90	3.24
bmn (murcia)	5.63	1.27	9.48	0.44	1.68	5.15	1.11	3.30	0.84	0.22		0.38	2.23	1.62	0.64
liberbank (cajastur)	8.20	1.24	9.24	0.59	10.80	6.15	0.71	3.99	1.07	1.20	0.48		3.82	1.39	1.71
bankia (madrid)	8.04	1.75	12.81	1.00	2.81	8.10	1.50	4.25	2.30	1.37	0.48	0.64		2.57	1.30
catalunya	6.84	1.21	17.74	0.47	4.02	6.40	0.72	3.40	1.66	0.45	0.58	0.39	4.33		1.01
ncg (galicia)	7.37	0.96	8.99	0.54	2.22	5.70	0.69	5.02	0.95	2.25	0.32	0.67	3.06	1.41	

The matrices confirm the presence of big and geographically well diversified institutions (i.e., Caixabank, Santander and BBVA), well diversified but not so large national institutions (i.e., Bankia, Popular, Sabadell and Bankinter), and less diversified and regional institutions (all of them *Cajas*). However, our challenge is to construct a framework which allows us to visualize and to interpret easily all the information in Chen's

matrices in order to understand the competitive structure of the Spanish financial sector. This is done through MDU.

Table 4. Market commonality matrix for the 15 resulting groups of the Spanish banking sector after restructuring (2012)

	BBVA	BANKINTER	CAIXABANK	KUTXABANK	SABADELL	SANTANDER	UNICAJA	POPULAR	IBERCAJA	CEISS	BMN	LIBERBANK	BANKIA	CATALUNYA	NCG
bbva		1.24	18.32	2.95	5.33	12.25	1.31	6.59	3.08	1.71	3.74	2.24	7.87	4.04	2.42
bankinter	9.67		17.37	3.89	5.94	13.11	1.45	6.47	3.30	1.93	3.10	2.48	9.62	2.85	1.78
caixabank	9.44	1.14		2.62	4.54	11.68	1.70	6.48	2.89	1.30	4.02	1.67	7.35	3.95	1.56
kutxabank	8.49	1.43	14.60		3.98	11.23	3.05	5.49	1.90	0.85	1.94	1.34	5.02	1.29	0.98
sabadell	10.34	1.48	17.12	2.69		11.50	0.93	6.27	2.09	1.28	5.24	2.96	7.37	3.53	1.37
santander	9.35	1.28	17.32	2.98	4.52		1.65	6.84	3.41	2.03	2.93	3.54	8.41	2.62	2.64
unicaja	5.94	0.84	14.98	4.82	2.18	9.80		5.79	0.83	0.46	3.53	1.44	4.43	0.57	0.36
popular	9.17	1.15	17.51	2.66	4.50	12.48	1.78		2.43	2.25	3.22	1.98	6.87	2.25	5.45
ibercaja	6.71	0.92	12.26	1.44	2.34	9.75	0.40	3.81		1.55	1.37	1.73	6.54	1.63	0.76
ceiss	7.17	1.04	10.56	1.24	2.76	11.13	0.42	6.76	2.97		0.49	3.28	5.41	0.79	2.95
bmn	9.01	0.96	18.81	1.63	6.52	9.27	1.88	5.58	1.51	0.28		0.93	4.94	4.76	0.43
liberbank	6.54	0.93	9.47	1.36	4.46	13.55	0.92	4.15	2.31	2.29	1.13		5.60	1.00	0.88
bankia	9.15	1.43	16.60	2.03	4.42	12.81	1.14	5.75	3.49	1.51	2.38	2.23		2.74	1.36
catalunya	12.18	1.10	23.08	1.35	5.48	10.32	0.38	4.86	2.26	0.57	5.94	1.03	7.09		0.79
ncg	8.38	0.79	10.47	1.18	2.45	11.98	0.28	13.57	1.21	2.45	0.62	1.04	4.05	0.91	

MDU (Gower, 1977; Heiser and Busing, 2004) belongs to the class of multidimensional scaling models (MDS). MDS models find a low-dimensional representation of the data and visualize this representation graphically. MDS has been previously used in the analysis of Spanish banking data (Sagarra et al., 2013; Mar Molinero and Serrano Cinca, 2001; Serrano Cinca et al., 2004). However, standard MDS models work with symmetric proximity matrices. MDU is appropriate for non-symmetric proximity data, as the one that is contained in Chen's matrices. For an introduction to MDU see, for example, De Leeuw (2005) and Heiser and Busing (2004).

Unfolding is classically used for portraying two different sets of objects— one set of objects in the rows and the other set of objects in the columns— from a rectangular matrix, and it may appear that Chen's matrices do not conform to this rule, since in the matrices shown in Tables 3 and 4 are square, each row and each column representing a bank. But banks appear in the columns as the source of competitive pressure and in the rows as recipient of competitive pressure. They are the same banks, but seen in different roles. Hence, the standard MDU model also applies in this case.

An unfolding model uses more parameters than, for example, a drift vector model (Carroll and Wish, 1974) or a slide vector model (De Leeuw and Heiser, 1982), but it also provides more information. Unfortunately, the unfolding model suffers from problems of degeneracy, and special techniques have to be applied in the estimation process, something that has hampered is application in practice (Busing et al., 2005).

We notice that the terms in the main diagonals of Tables 3 and 4 are not defined. The MDU algorithm allows us to choose whether or not to include diagonal elements. In this case, the diagonal elements are not defined and the algorithm ignores them.

The off-diagonal elements in the matrices shown in Tables 3 and 4 can be interpreted as similarities because large values indicate strong competitors that operate with similar intensity in each market and for whom the markets are equally important.

For unfolding, similarities need to be converted into dissimilarities, and due to the large differences in the size of the coefficients and the many almost zero values in the matrices, a reverse scale transformation was employed as suggested by Fleiss et al. (2003), i.e.,

$$\delta_{AB} = \frac{1}{\sqrt{\sin^{-1}(MC_{AB})}}$$

The sinus transformation is used to reverse the scale and to differentiate in the objects that have close-to-zero values (DeSarbo and Grewal, 2007). If we do not transform the initial data, the almost zero values dominate the solution in such a way that the points in the solution collapse and only a few very tight clusters remain.

Decomposition of the asymmetric 2008 matrix into a symmetric and a skew-symmetric component shows that 77.5% of the total sum-of-squares is due to symmetry and 22.5% is due to asymmetry (79.9% and 20.1% for 2012). This implies that, although the symmetric part is dominant, the asymmetric part is large enough to justify an asymmetrical analysis, as done here.

□□□□

□

For the unfolding analysis, we used a preliminary version of IBM SPSS PREFSCAL (available from busing@fsw.leidenuniv.nl) with defaults options except for the following: an unconditional monotone spline transformation (second degree and one interior knot) was used for improved comparability and fit and penalty parameter ω (omega) was set equal to 2.0 for some increase in variation. A possible three-way model for the two matrices was not pursued due to the strong model restrictions and the complex changes in structures over the years. To avoid local minima, multiple start options were used and the default option (classical scaling on the super-matrix with imputations based on the triangle inequality) was adequately acceptable.

The fit of the two-dimensional solutions was good (Stress-I = 0.1171 (2008) and 0.1386 (2012)). The fit of the three-dimensional solutions was better, obviously, but not worth the additional interpretational difficulty (See Table 5).

Table 5. Statistics for the unfolding model

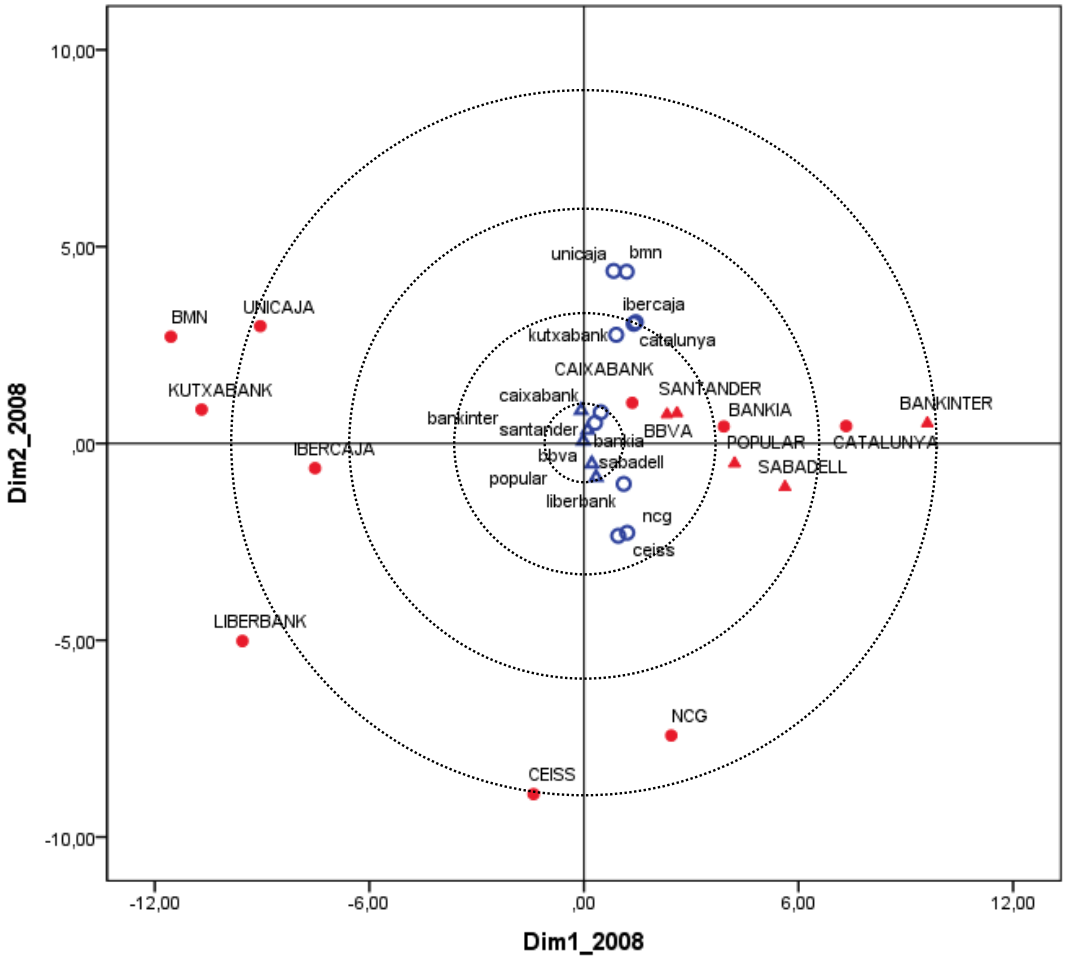
	2008		2012	
	2-dims	**3-dims**	**2-dims**	**3-dims**
Stress-1	0.1171	0.0862	0.1386	0.1019
Dispersion Accounted For (DAF)	0.9863	0.9926	0.9808	0.9896
Variance Accounted For (VAF)	0.9346	0.9633	0.9015	0.9413
Spearman's rho	0.9633	0.9783	0.9495	0.9703

6. Empirical findings

Figure 2 shows the multidimensional unfolding common space for the asymmetric competitive structure of the 15 original leaders in 2008, and Figure 3 shows the common space for the 15 resulting champions in 2012. Both figures are rotated to principal axes with most variance explained on the first dimension, as is standard practice in Scaling models. The full points— associated with capital letters— indicate financial institutions which exert competitive pressure, and the empty points— associated with lower case letters— indicate financial institutions that receive this pressure.

Figure 2. Asymmetric competitive structure of the Spanish banking sector

(15 original leaders, 2008)



Note: commercial banks are represented by triangles and *Cajas* are represented by circles

We must remember that Figures 2 and 3 are distance-based maps, that the institutions whose name is in upper case are the ones that exert competitive pressure, and that the institutions whose name is in lower case are the ones that suffer the competitive pressure. All institutions appear as source of competitive pressure and as recipients of such pressure. Competitive pressure of an institution against itself does not mean anything, and should not be interpreted. Large distances between institutions whose name is in upper case letters and institutions whose name is in lower case letters are to be interpreted as an indication of low competitive pressure. For example, "KUTXABANK" is far away in the map from "popular", indicating that Kutxabank exerts little competitive pressure against

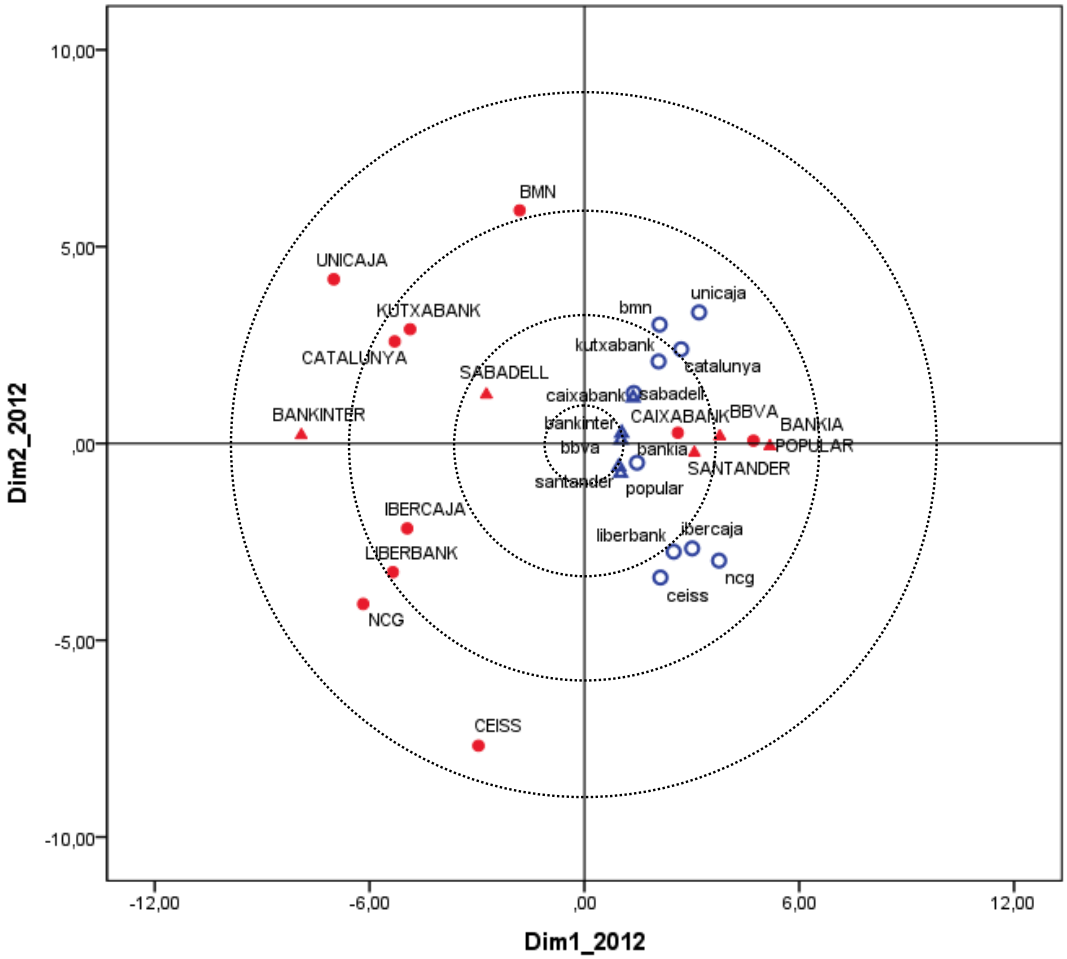
Popular, something that makes sense, as Popular is a nationally established bank while Kutxabank tends to operate mainly in the Basque provinces of northern Spain. Thus, the competitive pressure that Kutxabank exerts on Popular is naturally low, except in the Basque provinces, and these are of relatively small strategic importance to Popular. On the other hand, the distance between "POPULAR" and "kutxabank" is much smaller, indicating that Popular exerts a strong competitive pressure on Kutxabank. Indeed, in all the places where Kutxabank has branches, so has Popular, meaning that Kutxabank cannot ignore Popular, but Popular can ignore the policies of Kutxabank. In Tversky's (1977) words, we can say that Popular is a primary competitor of Kutxabank, but that Kutxabank is not a primary competitor of Popular. Figure 2 represents well this asymmetry in competitive pressure.

If we concentrate on the entities that exert pressure (capital letters), we can see a clear division between the positive and the negative side of Dimension 1. The largest and most geographically diversified institutions in Spain (i.e., Caixabank, Santander, BBVA, Bankia and Popular) are located on the right hand side of the maps (positive side of Dimension 1). Regionally based institutions, all of them *Cajas* before the re-structuring, are to be found on the left of the maps (negative side of Dimension 1). We conclude that Dimension 1 is associated with geographical coverage from the point of view of the institution that exerts competitive pressure. This polarisation observed in Figures 2 and 3 confirms that, from a rivalry point of view, nationally based institutions face a very different situation in terms of market rivalry from locally based institutions. Chen (1996) argues that such differences can lead to different rivalry policies.

We now turn our attention to banks as recipients of competitive pressure. These are represented by empty points with lower case letters. In this case, all institutions concentrate towards the centre of the first dimension, slightly to the right. They are close to the points that represent the largest Spanish banking institutions as source of competitive pressure (SANTANDER, CAIXABANK, BBVA, BANKIA, POPULAR, and SABADELL), and far away from the points that represent regional institutions as source of competitive pressure (UNICAJA, CATALUNYA, IBERCAJA, LIBERBANK, KUTXABANK, BMN, CEISS, NCG). Amongst the second group of banking institutions we also find BANKINTER, a relatively small but well diversified national bank. We conclude from the observation of Figures 2 and 3 that large national banks exert strong competitive pressure on all banking institutions, but that the remaining institutions only exert limited competitive pressure on banking institutions.

Figure 3. Asymmetric competitive structure of the Spanish banking sector

(15 resulting groups, 2012)



Note: commercial banks are represented by triangles and *Cajas* are represented by circles

Of particular interest is the closeness of the points that represent large banks as a source of competitive pressure and the points that represent large banks as recipients of competitive pressure. We are clearly observing a set of institutions that share similar strategic profiles and that give similar importance to the markets in which they operate. This situation was analysed by Chen (1996) who argued that:

"*high market commonality with a defender will reduce an attacker's aggression in initiating attacks, whereas high market commonality with an attacker will increase a defender's proclivity to respond*".

This proposition leads to the conclusion that large national banking institutions will not initiate competitive wars, for fear of retaliation from other large national banking institutions. Large national banking institutions may be tempted to start competitive actions in order to take market from small regional institutions, but a bank cannot alter its products without its move being followed by other national banks, from which we can conclude that small regional institutions can act reasonably freely without fear of retaliation from the large banks. It further follows that small regional institutions were more prone to take risks than large national banks. This risk taking attitude explains why the financial crisis that started in 2008 hit much harder the *Cajas* than the banks.

The geographical nature of the *Cajas* market can also be inferred from Figure 2. At the bottom of this figure we find NCG, CEISS, and LIBERBANK. All these institutions operate mainly in the north of Spain, while at the top of the figure we find Unicaja, and BMN, institutions that operate mainly in the south of the country. Institutions that operate all over the country are to be found in the middle of Figure 2. This indicates that institutions that operate in the north do not compete with institutions that operate in the south. For example, the distance between "UNICAJA" and "ncg" is very large, indicating that Unicaja does not consider NCG to be a marketing rival. In the same way, the distance between "NCG" and "unicaja" is also very large, indicating that NCG does not consider Unicaja to be a rival. This was to be expected since NCG operates mainly in the north west of Spain and Unicaja in the far south.

We see that Figures 2 and 3 capture the rivalry relations in the Spanish financial markets, and are useful in the interpretation of the behaviour of the institutions. These figures summarise all the available information, and not information for one institution at a time. MDU appears as a very strong tool to visualise rivalry relations between Spanish financial institutions.

How have matters changed after the financial sector re-structuring that took place between 2008 and 2012? This can be deduced by comparing Figure 2 and Figure 3. We see in Figure 3 that Sabadell has changed positions, abandoning the group of large national institutions, such as Popular, Santander, and BBVA. But the reason for the changing

importance of Sabadell in the financial market is not a loss in the number of its branches which did, in fact, increase by 52.6% between 2008 and 2012. The reason for Sabadell's change of position relates to the strong concentration that has taken place in the sector, resulting in the creation of new medium sized national players which compete just one step below of Sabadell: BMN, Kutxabank and Liberbank. In fact, BMN, Kutxabank, and Liberbank were the least influencing banks in 2008, as can be deduced from their position on the far left hand side of Figure 2. Also, BBVA has lost part of his influence, especially when compared with his most direct rival, Santander (the reason being that Santander merged with Banesto, another national bank that was not plotted in Figure 2). Among the medium sized regional players, Bankinter, Catalunya, Unicaja and NCG (the old Caixa Galicia) lose part of their leadership in the restructuring, becoming the new less influencing banks. But the most striking feature when comparing Figures 2 and Figure 3 is their similarity. After a painful re-structuring period, things look very much the same in terms of rivalry.

Spanish financial authorities insisted on a process of mergers in order to move away from a history of atomisation and large players. The reasoning was that larger institutions would be more efficient and more able to stand on their feet during the crisis. The end result was can be seen in Figure 3: a more distributed image of regional institutions, which increased their influence in the market, although not sufficiently to become rivals to the large national banks.

Rotational indeterminacy (i.e., the dimensions are not unique) is characteristic of scaling procedures, of which multidimensional unfolding is only one example. For this reason we cannot discard the thought that rotating the solution obtained will produce a map with a better interpretation. However, we find that in both Figures 2 and 3 give reasonable solutions since the axes have a clear interpretation. The horizontal axis could be interpreted as a first dimension, with a meaning of "power" in terms of number of branches. This dimension seems to be centred, separating the entities in two types, regional or medium and small players (on the left), and national or big players (on the right). Also, we find that the vertical axis could be interpreted as a second dimension, with a meaning associated to geographic location and diversification. This second dimension is of special interest for the regional entities, since it separates them depending on the Spanish geographical area they are located. To verify the accuracy of the interpretation of this second dimension, we have constructed aggregated matrices of the number of branches per each entity at a province level and at a regional level and we have calculated the Herfindahl–Hirschman index of branch concentration, confirming our intuition about this "geographical market diversification" concept. These matrices are available under request.

7. Conclusion

Up to date there has not been a methodology which allows to integrate and to visualize inter-firm asymmetric competitive structure in a single framework, since all the results arisen in previous studies take a single-company perspective. We have shown how Multidimensional Unfolding (MDU) is a very strong tool that allows us to represent the whole spectrum of inter-firm rivalry, including its asymmetric nature.

Our approach is innovative in the sense that we analyse rivalry between financial institutions on the basis of their physical location in the market. In this we differ from DeSarbo and Grewal (2007) who also applied the MDU algorithm to asymmetric proximities between firms and brand, and whose matrices were based on information on consumer choice sets; i.e., a demand-based approach.

The object of study has been the Spanish financial sector and its restructuring between 2008 and 2012. Our methodology would be of interest not only to policy makers (i.e., Competition Commissions), but also as a tool for strategic managers in decisions such as market repositioning, mergers and acquisitions activities or commercial strategies, and to researchers in the context of *game theory*: a greater multimarket contact of a rival with a focal company assumes that the probability that the focal company attacks the opponent will be small due to its risk position, while the motivation to take action in response to an attack will be greater, for the same reason (Young et al., 2000). We can think of other interesting applications for MDU in many different areas, such as, for example, the analysis of inter-country commercial and financial flows, or the study of migration flows in macroeconomics. MDU produces statistical maps that can be interpreted in an intuitive way, something that makes it possible communication with the non-specialist.

We should point out as a limitation that our work has focused only on the physical channel of the entities (i.e., branches), and has ignored other distribution channels such as online banking. This is due to the traditional importance that branches have in Spain. We have not taken account either the types of products or services commercialised, nor differences among types of clients. We also need to remember that the re-structuring process was not yet over in 2012, the last year for which we had data.

The main finding of our study is the dual aspect of Spanish financial markets. On the one hand there are a few national banking institutions, with interests all over the country, and also international interests, that compete against each other in the main street, and for whom all areas (post codes) are equally important. One of these institutions will think twice before starting a move in the market for fear of retaliation from other similar institutions. On the other hand, we find smaller, more localised financial institutions that are exposed to the competitive pressure of the large banks, but have a freer hand to innovate in the market. These smaller institutions can act without fear of retaliation from other similar institutions given their different geographical coverage, although the situation is changing as a result of the mergers that followed the 2008 financial crisis. Fear of retaliation from the large banks is also limited, as large banks cannot innovate without retaliation from other large banks.

Although one could interpret these results with the classical phrase *"plus ça change, plus c'est la même chose"*, there have in fact, been many changes in the structure of proximity banking in Spain. The institutions that have arisen from the ashes of the *Cajas* now have commercial bank status. A single, unified banking framework has been created, and this is something that will impact on future developments.

Thesis Conclusion

The separate status of the *Cajas* was given a definite blow with the Royal Decree 11/2010, which forced most *Cajas* to transfer their financial activity to a commercial bank, something that produced further changes in the *Cajas* sector. The financial world that emerged in Spain after that was very different from the one existing before 2007. Only a few *Cajas* survived in their initial form. Most had to abandon their non-for-profit orientation and operate as banks with, almost certainly, a substantial reduction in their charitable activities.

Understanding the particular nature of the *Cajas*, analyzing their behaviour and performance, and comparing them with their most direct competitors (i.e., the Spanish commercial banks) were the aim of this Thesis. We wanted to find answers for the initial questions in a time framework that included both a boom period and a crisis.. Furthermore, we wanted to analyze the *Cajas* under related (but quite differentiated) angles in order to understand the underlying nature of their distress. This differentiated approximation to the problem will allow us a richer and deeper interpretation of it.

The question addressed in the first chapter was whether there were underlying financial weaknesses in the system that had remained hidden and were brought forward as a result of the credit crunch. We were also interested to find out if past financial information could be used to trace the path that *Cajas* had followed in the way to success or distress. We have used multivariate statistics to show that this was indeed the case. While having a strong theoretical basis, a multivariate statistical methodology (i.e., Multidimensional scaling, or MDS) visualizes the results in the form of maps, making the results accessible to the person who does not have a strong statistical background. The statistical maps revealed that the *Cajas* that had to be rescued had low values of capital adequacy ratios, low performance ratios, high risk ratios, high cost of sales ratios, and low intermediation efficiency in the DEA (Data Envelopment Analysis) sense. We have also used the statistical maps to trace the time evolution of two successful *Cajas* and two *Cajas* that had to be rescued. The changes in financial regulation that allowed the *Cajas* to compete with commercial banks made it possible for these institutions to expand beyond their traditional local environment and to take up business that, in the past, would have been left to commercial banks. By opening new branches and taking on more risky business, the *Cajas* increased their assets and, by so doing, the denominator of their solvency coefficient. But

the *Cajas* had to keep their solvency coefficient above the limit set by the financial regulator, something that they could only do in a limited way, as they have no shareholders and could only increase their capital (numerator or the coefficient) through the way of retained profits. The result was deterioration in their solvency ratios, something that left those with 'ambitions' in a very delicate position when the credit crunch arrived. A separate question is whether the peculiar Corporate Governance arrangements of the *Cajas* had influenced their success or failure. We were particularly interested in the presence of political appointees in Boards of Directors. But the analysis did not reveal any association with distress, as measured through the financial ratios.

The first chapter has several contributions. Having a strong theoretical statistical base, this methodology allows us to reliably visualize the results in the form of statistical maps. Doing so, they become accessible even to people who do not have a strong statistical background. Furthermore, these statistical maps allow us to trace the evolution of the different *Cajas*, both successful and distressed ones, so one can see the determinants that explain the fate of each *Caja*. Traditional bankruptcy prediction techniques do not allow us to trace such evolutions. Additionally, for the first time, Data Envelopment Analysis (DEA) efficiency scores (i.e., under two main approaches to banking efficiency modelling: the production model and the intermediation model) have been added to the MDS analysis, allowing to interpret in a better way the results. Finally, since not all the dimensions may be relevant in the context of the paper, a stepwise method is proposed to explore different dimensional specifications and to find the one which gives the best results.

The second chapter goal was to explain which are the factors underlying the decision of securitizing assets in Spanish banks for the boom period 1999–2007, distinguishing also between savings banks (*Cajas*) and the rest of Spanish banks (commercial banks and credit cooperatives). Securitization has been one of the key exponents of the intense financial innovation carried out in recent years and it has played an essential role, both during the boom period and in the crisis of the financial system. In spite of the potential benefits of securitization as a powerful funding tool, there has been, in general, little detailed analysis about the real risks concerning the generated securities, or the existing conflicts of interest in some parts of the process. In particular, those conflicts affecting credit rating agencies and the risk behaviour of the banks have not been addressed. Only after the impact of the recent crisis, the European Union (EU) authorities, among others, have shown their intention to regulate and supervise more carefully. And additional measures have also been taken by the different national authorities.

In this framework, asset securitization seems to play a key role explaining both the sector's credit growth until 2007 and the deep crisis afterwards. We contribute to the existing literature about Spanish banks securitization in two ways. Firstly, through our emphasis in the *Cajas*, banks with specific corporate governance and risk features, and its comparison with the rest of Spanish financial institutions, we go deeper in the analysis, highlighting the role of some determinants, more specifically regulatory capital and risk transfer factors, that have important implications for future supervisory policies. Secondly, we perform the analyses through different dynamic panel data models concluding the robustness of our previous models and even enhancing the influence of some factors (i.e., risk), not found as significant in the previous literature regarding Spanish entities.

Our results support the hypotheses regarding the exposure to risk and the search of liquidity as main drivers of securitization. From the four determinants suggested in the literature, we find liquidity as a significant factor, like previous studies, but we also find, unlike other works on Spanish banks, that the risk variable becomes significant. This may change our view on the proposed buy-and-hold model for Spain. Concerning the remaining two factors, capital shows no significant effect on securitization (the capital hypothesis is rejected), and performance presents an effect on the whole sample of banks. This performance effect disappears when we only consider the case of *Cajas*, indicating that this type of banks may be more concerned with growth than with performance, a result that is in accordance with its governance mechanisms.

Since Spanish savings banks (*Cajas*) and commercial banks have had a different destiny, our aim in the third chapter was to assess if such different fates experienced by both types of banks which shared equally almost the entire Spanish market are related to their governance practices and the human capital of their chairmen. We test if there are differences in terms of the *Cajas'* performance with respect to banks and among themselves. Some authors have pointed out that neither the formal governance institutions (i.e., the composition of the different governance bodies) nor the real governance (i.e., the role played by politicians) can explain these banks' results. We make use of an extended period data, covering both a boom period and a period of crisis, and of a more complete picture of human capital of the chairmen (previous banking experience, education, and political background) to get a better grasp of these important issues. History seems to matter and the use of a better organizational capital of the former chairmen, and the stakeholder composition can help us to get clearer results. We find that commercial banks were, in general, more profitable than *Cajas*, although by implying more risk during the boom period. However they managed to control their own risks in a better form than *Cajas*, since during the crisis period they showed a better performance in all senses. These results

are coherent with the subsequent restructuring of the whole sector and confirm the different risk-taking behaviour models between commercial banks and *Cajas*.

The third chapter contributes to the very scarce literature assessing the relationship between the human capital and governance dimensions and the banks' performance (with special focus on stakeholder-oriented banks and the financial crisis context), while acquiring additional knowledge about the reasons for the collapse of many of the Spanish financial institutions. On the one hand, those institutions with a chairman that had more years of previous banking experience, more years spent in the bank and a top degree in their education, performed better than those with not such chairman's profile. On the other hand, and focusing on the effects of the level of politicization of *Cajas* governance, we find evidence that a major presence of politicized seats in the governing bodies of those entities implied better profitability but worse risk performance. Due to the findings mentioned above, our results have important implications for banking regulators and future supervisory policies, not only for the case of Spain but also for the case of other countries with important shares of non-shareholder-oriented institutions.

The third chapter has also a substantial number of additional contributions. First, we cover a wide spectrum of performance definitions with measures like ROA, ROA volatility, Z-score (with both "full sample" and "year-window" variants) and Impaired Loans/Gross Loans. Second, we make use of an extended dataset, since it contains 42 *Cajas* (compared to the 30 Cajas analysed on average in the previous studies) for the period 2004–2009, covering thus both periods of boom and crisis. Third, we make use of a more complete picture of human capital of the chairmen. In particular, we consider previous banking experience, formal education, and political background to get a better grasp of these important issues. History seems to matter and the use of a better organizational capital of the former chairmen, and the stakeholder composition can help us to get clearer results. Fourth, we make a more accurate use of bank-specific control variables and of interactions. Finally, until now no previous literature has found an effect of the level of politicization over *Cajas'* performance.

Finally in the last chapter of the thesis we approach another methodological study where the *Cajas* are involved. Although Chen's approach and other rivalry indices have attracted much attention for the analysis of different economic sectors, even for banking (Fuentelsaz and Gómez, 2008), there is still no single methodology that integrates and visualises interfirm asymmetric competitive relationships in a single framework, since all previous studies take a single-company perspective: the usual approach is to produce as

many competitive maps as companies are in the dataset, and assess the differences between two or more competitive maps in order to assess the asymmetry in the market (DeSarbo and Grewal, 2007). However, such comparisons among multiple maps become difficult when the number of players is high. The fourth chapter proposes, for the first time and as a contribution to the literature, a new approach to the analysis of rivalry data. We rely on the multidimensional unfolding (MDU) techniques to support our work, a methodology which allows us to visualise through a statistical map the asymmetric nature of such rivalry. Our aim is to assess changes in the rivalry structure of the Spanish banking sector before and after its restructuring as a consequence of the financial crisis whose start can be traced to the year 2008. Answering these questions in a unique framework is something that we think has not been done before. This methodology would be of interest not only to policy makers (i.e., Competition Commissions), but also as a tool for strategic managers in decisions such as market repositioning, mergers and acquisitions activities or commercial strategies, and to researchers in the context of *game theory*: a greater multimarket contact of a rival with a focal company assumes that the probability that the focal company attacks the opponent will be small due to its risk position, while the motivation to take action in response to an attack will be greater, for the same reason (Young et al., 2000). Our methodology could help to generate a unified framework to deal with such kind of issues.

The results of this work can be interpreted in an intuitive way, something that makes it possible the communication with the non-specialist. We should point out as a limitation that our work has focused only on the physical channel of the entities (i.e., branches), and has ignored other distribution channels such as online banking. This is due to the traditional importance that branches have in Spain. We have not taken account either of types of products or services commercialised, nor among types of clients. We also need to remember that the re-structuring process was not yet over in 2012, the last year for which we had data. The main finding of our study is the dual aspect of Spanish financial markets. On the one hand there are a few national banking institutions, with interests all over the country, and also international interests, that compete against each other in the high street, and for whom all municipalities are equally important. One of these institutions will think twice before starting a move in the market for fear of retaliation from other similar institutions. On the other hand we find smaller, more localised financial institutions that are exposed to the competitive pressure of the large banks, but have a freer hand to innovate in the market. These smaller institutions can act without fear of retaliation from other similar institutions given their different geographical coverage, although the situation is changing as a result of the mergers that followed the 2008 financial crisis. Fear or retaliation from the large banks is also limited, as large banks cannot innovate without retaliation from other large banks. Although one could interpret these results with the classical phrase *"plus ça change, plus c'est la même chose"*, there have been, in fact, many changes in the structure

of proximity banking in Spain. The institutions that have arisen from the ashes of the *Cajas* now have commercial bank status. A single, unified banking framework has been created, and this is something that will impact on the industry concentration and on the industry future developments.

In light of the results obtained from the different chapters of this Thesis, we can synthesize and unify them into some central ideas. In the first chapter, we concluded that what essentially distinguished those *Cajas* that had to be rescued or absorbed from the rest of institutions, was their risk profile, their ability to provide returns and the existing debt/equity structure (i.e., capitalization). In other words, there were entities with a risk profile unable to generate a good performance (in terms of profitability). At the same time, these banks were unable to offer a debt/equity structure that could support their growth policies, the same policies that led them to their failure (e.g., the recent scandal of the preferred shares in Spain is clearly a chapter of this scenario). In addition, and given the limitations of the time period (i.e., we could only consider since the year 2006 to analyze governance issues due to a lack of available data, beyond the presence of great heterogeneity among entities), we focus on governance issues with panel data in the third chapter. The interrelation of those results obtained in the second and the third chapters, both developed with panel data and comparing the *Cajas* with the commercial banks, reveals that, while commercial banks were able to find a risk-profitability relation that could be sustainable over time (especially in front of the crisis), the *Cajas* (with certain politicized and non-politicized exceptions such as BBK, Kutxa, Ibercaja, Unicaja and La Caixa) were not able to do the same as a group. The second chapter tries to go deeper into a mechanism (i.e., asset securitization), which was of crucial importance to sustain the *Cajas* growth. Doing so, we better understand the nature of *Cajas'* behaviour when compared with commercial banks. The third chapter, whose results are in line with those raised in the second one, supplements our knowledge of the *Cajas* from the side of governance and human capital. Finally, the fourth chapter plays a complementary role to the previous ones because, as a faithful and objective chronicler, this chapter reveals the strategic structure and changes in the sector.

The latest chapter on the history of *Cajas*, written under a period of severe financial turbulence, may be located within a central debate today: the government of the corporation and its future. Mayer (2013), no stranger to this debate, focuses on the role of the corporation in today's society. This author outlines its benefits and costs, and argues why these benefits and costs will keep growing, and suggest some solutions we could consider. By applying his thesis to our case, we assume that the dominant paradigm concerning the nature of the corporation is that it exists for the benefit of its owners (i.e., shareholders),

and those who manage the organization must have a common interest to achieve the objectives pursued by owners or shareholders (i.e., agency theory). But the first and foremost objective of the corporation is to produce goods and services, and to serve people, communities and nations; and not merely to shareholders. To achieve such a goal, the corporation is in full relationship with investors, employees, suppliers, clients and the community at large (i.e., its stakeholders). In short, it may be that, if the traditional balance between authority (i.e., control) and commitment (i.e., restraint on control that is damaging the others) is perverted, then this unbalance will affect the operations (and therefore the performance) of the organizations. And the *Cajas* example may have been one of the most extreme examples to this dilemma, given their special nature (it was easier to break all ties with the stakeholders). Maybe it was forgotten (and the *Cajas* context was precisely one of those scenarios where to forget was not a possibility) that the institution is not a mere instrument of control (i.e., authority), and also (especially) a mechanism to provide commitment to others. That commitment from which the *Cajas* were indebted regarding their stakeholders was destroyed (i.e., was perverted, and the founding objectives were changed), favoring different purposes not in line with their own nature, while trying to imitate a model that was never their own. Such situation worsened under the economic growth context of those years previous to the crisis. Following Mayer's terminology, the *Cajas* became organizations as *"acephali—headless monsters"*, with powerful and unaccountable directors and managers, completely immune due to the ineffectiveness of the corporate governance mechanisms/tools in these institutions.

Coming back to the debate by Mayer (2013), on the role of the corporation in society, what can we add from the side of the *Cajas*? First, from a global point of view, since their foundation the *Cajas* had played a key role in society, with a broad sense of mission that has allowed them to provide an indispensable value that the traditional banking sector has not offered. Such model should be seriously considered by all social agents in the future, and not merely be scrapped by pressures, influences or drifts from the strategy of certain sectors. Second, analyzing the results of the different chapters of this Thesis we can assert that it was possible to determine, under very different perspectives, which entities were following a road or drift into a fatal destiny. Third, the *Cajas* governance was unable to deal with that *"acephali–headless monster"* that many of them had become. The problem, in light of our results, was not the level of politicization, but rather the inefficiency and inability of their governance mechanisms to preserve a consistent and sustainable model over time. In more simple terms, the *Cajas* governance did not perform, and was not expected to perform. Summarizing, with the enormous growth (and its potential opportunities) in recent years, the *Cajas* lost sight of their founding origin, their territorial compromise and their horizon (with some mentioned exceptions), a lesson that

allows us to question the role of growth in future cases. Strong growth implies focusing on the role of capital while sacrificing the existing commitment with other stakeholders.

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Appendix

Evaluating the success of educational policy in Mexican Higher Education

Introduction

Mexico's population exceeded 112 million inhabitants in the 2010 census. Of these, 21 million people were aged between 15 and 25, the age group that encompasses individuals of university age, which is normally acknowledged to be between 19 and 23 years old. Although the population pyramid is showing a reduction in its base, its shape suggests that the number of individuals of university age will increase in the near future. Later declines in the size of the age group are expected to be compensated by increases in the university participation rate (CONAPO, 2013). The need for university educated individuals is expected to increase, as Mexico has been industrialising, and its economy has been growing strongly (Gereffi, 2009). These facts have not been ignored by the Mexican government who has taken an active role in HE planning, including policies for improving academic quality.

Three stages of development can be identified in the evolution of the Mexican university system. The first stage can be described as expansion without academic regulation, and would last from 1960 to about 1982. An acute crisis followed from this point, when purchasing power of employees and university resources declined by as much as 60%. The inflection point arrived in 1989 with the Educational Modernisation Programme (Kent-Serna, 2009; Lopez et al, 2009). The Modernisation Plan for the period 1989-1994 introduced an academic quality assessment and monitoring system (Secretaría de Educación Pública, 2006). Mexican federal expenditure in HE increased from 0.42 per cent of GDP in 1990 to 0.62 per cent of GDP in 2003 (ANUIES, 2004). However, the number of students registered also increased, and expenditure per student only increased by 16 per cent (OCDE, 2012).

In this paper we concentrate on exploring the changes that have taken place in State, Federal, and Private universities. The relevant question is up to what point educational

policies aimed at the enhancement of academic quality have had an observable impact in the different university groups. It is not our intention to enter into a debate about what is meant by academic quality. In fact, academic quality may imply at the very least producing competent graduates who can contribute to the development of society; or advancing the limits of established knowledge; or using public resources efficiently. We have a much more limited objective, which is understanding a complex data set so that the information it contains can be visualised to help with impact assessment.

The data was analysed by means of Ordinal Multidimensional Scaling, in order to visualise the characteristics of the system, and to make it possible to add qualitative information. The results of the scaling analysis can be interpreted in an intuitive way, something that makes it possible the communication with the non-specialist; Chatfield and Collins, 1992. Multidimensional Scaling maps were augmented with other multivariate analysis tools in order to give context to the results and to study the dynamics of the system. It was found that the different university types- federal, state, and private- organise themselves differently, that all of them have evolved during the period 2007-2010, and that this evolution can be explained in terms of the response of the institutions to the educational policies of the government.

After this introduction, we give an overview of the changes that have taken place in the Mexican university system. This is followed by a methodological section. The results of the analysis are presented next. The last part reflects on the findings and concludes the paper.

Changes in the Mexican university system

In this paper we concentrate on the university system, to the exclusion of sub-degree institutions. Amongst the degree awarding institutions, the most influential group is made up of federal and local state financed institutions. There are only seven federal universities. About 400,000 students had enrolled in federal universities in 2008. About 900,000 students were enrolled in the 56 Local State universities in 2008. Private universities are the other important player in the university system with almost one million students at all levels of studies (Gil-Antón, 2005; Acosta-Silva, 2005). Private universities need to be validated by either the central government or the local state governments in order to award qualifications (Secretaría de Educación Pública, 2003).

Starting with the 1989 Education Modernisation Act (*Programa de Modernizacion Educativa*, PME), the Mexican federal government has taken an active role in university policy. This has materialised in economic incentives aimed at improving efficiency and productivity (Kent-Serna, 2009). The Modernisation Plan set up a system of institutional assessment and, at the same time, tried to rationalise enrolment. The shortfall of state funded university places in areas that had ceased to be a priority has been taken up by private universities (Silas-Casillas, 2005).

Academic quality control is performed by the Council for Accreditation of Higher Education (COPAES) and the Inter-Institutional Committee for Higher Education Assessment (CIIES); (SEP, 2010).

The National Council for Science and Technology (CONACYT) has offered important financial incentives for the enhancement of quality degrees. Another initiative in this respect is the creation in 1984 of National Researchers System (SNI) with the aim of strengthening and incentivising, using internationally agreed criteria, the efficiency and quality of the research function (CONACYT, 2008).

The Mexican government has used its financing ability to improve the educational system. The education budget has been divided into an ordinary component, which is devoted to paying salaries and other basic university expenditure, and an extraordinary component which is distributed on a competitive basis for quality enhancement initiatives. The extraordinary component amounted to about 30 per cent of the budget in 2009 (ANUIES, 2009).

Initiatives financed through the extraordinary component of the education budget have been aimed at: improving the quality of university staff; improving university degrees incorporating information technology in the teaching and administration of universities; developing the infrastructures of validated institutions; supporting collaboration between national and foreign institutions; improving the quality of equipment and fixed assets; and improving postgraduate programmes and undergraduate programmes (ANUIES, 2004).

The question that we wish to address is whether these initiatives have resulted in changes in the general structure of the Mexican university system that can be observed by analysing published official statistics. Clearly, just the analysis of public statistical data cannot fully address the question of quality. The question of what is a quality researcher and how the identification of a quality researcher changes over time goes beyond statistical analysis of published data.

Data and methodology

Source of the data

This study concentrates on private and public Mexican universities during the period 2007 to 2010. The data has been obtained from the Comparative Study of Mexican Universities (UNAM, 2010). This comparative study of Mexican Universities is an on-going project that systematically collects data from about 2,800 Mexican Higher Education institutions, including state and private institutions, research institutes, government institutions, and various relevant organisations. The ECUM does not aim at producing rankings or classifications, but only to provide relevant data for the understanding of the Mexican HE system and its performance. Full details on the project can be obtained from http://www.ecum.unam.mx/.

There are 57 Mexican universities in the dataset used in this research: 7 federal universities, 35 local state universities, and 15 private universities. This includes all federal universities, most local state funded universities, and the largest private universities. The reason for excluding universities from the study being lack of data. The list of universities, and the type they belong to can be seen in Appendix A.

All variables included in the study were in the form of ratios calculated from the raw data. These ratios have been grouped into five categories: faculty, enrolment, research, quality, and structure of the public budget. We only had public budget information for public universities, so the last group of ratios was not calculated for private universities. Ratios are used in order to correct for size effects. It is clear that a large university will have more teaching and research staff than a small one, and the use of original variables would lead to conclusions that could be misinterpreted. But the way in which institutions organise

themselves may depend on size. For example, large institutions may have research institutes, and be able to produce more and better research papers. This is particularly relevant to federal universities. Private universities, more limited in funds than state ones and depending mainly on fees income, may be more oriented to teaching. This is why we kept track of the type of university and explored possible size related effects by including the total number of students enrolled in each university as an extra variable. The list of variables and their definitions can be seen in Table 1.

Table 1 – Groups of variables used

Group	Ratio	Ratio Description
Faculty	R1	Full Time Equivalent Faculty / Total Faculty
	R2	Full Time Faculty / Total Faculty
	R3	Number of Total Academic Programs / Full Time Equivalent Faculty
Enrollment	R4	Enrollment / Full Time Equivalent Faculty
	R5	Technichal Superior Enrollment / Enrollment
	R6	Under Graduate Enrollment / Enrollment
	R7	Especialty Enrollment / Enrollment
	R8	Master Enrollment / Enrollment
	R9	PhD Enrollment / Enrollment
Research	R10	Articles cited in the ISI Web of Knowledge / Full Time Equivalent Faculty
	R11	Articles cited in SCOPUS / Full Time Equivalent Faculty
	R12	Solicited Patents / Full Time Equivalent Faculty
	R13	Granted Patents / Full Time Equivalent Faculty
	R14	Publications in the Latin Index / Full Time Equivalent Faculty
	R15	Publications in the CONACYT Index / Full Time Equivalent Faculty
	R16	Faculty with PhD Degree / Total Faculty
	R17	Faculty with PhD Degree / Enrollment
Quality Graduate Programs and Researchers	R18	Graduate Programs in de National Quality Program (PNPC) / Number of Total Academic Programs
	R19	Number of researchers in the National Researcher's System (SNI) / Total Faculty
	R20	Number of researchers in the National Researcher's System (SNI) / Full Time Equivalent Faculty
	R21	Number of researchers in the National Researcher's System (SNI) / Faculty with PhD Degree
Budget	R22	Total Budget / Full Time Equivalent Faculty
	R23	Number of Total Academic Programs / Total Budget
	R24	Total Budget / Enrollment
	R25	Federal Ordinary Budget / Total Budget
	R26	Federal Extraordinary Budget / Total Budget
	R27	State Ordinary Budget / Total Budget
	R28	Sate Extraordinary Budget / Total Budget

It is important to emphasise that the ratios are indicators obtained from published statistics and that, as it happens with all indicators, they may not accurately reflect the underlying concept. This is particularly relevant to quality ratios. It is possible for the number of staff in the National Researcher's system to increase without the quality of such researchers improving. Thus, we must always keep in mind the difference between the indicators and the reality that the indicators attempt to measure. To establish if quality has improved one would have to dig into the details of research undertaken, students'

experience, and course content rather than just look at the evolution of the indicators. We have long known that the publication of indicators can have negative consequences, and that they can be manipulated (Smith, 1995; Bird, 2005). It is, for example, possible to simulate achievement in order to obtain additional personal or institutional income, although under the Mexican system, this element of additional personal income is lost on retirement.

The final data set is a table of 28 variables (ratios) by 57 cases (universities) for each academic year in the four year period 2007-2010. This will be analysed using Ordinal Multidimensional Scaling models (Kruskal and Wish, 1978).

Analysis

A geographical map is a very sophisticated tool but its interpretation is intuitive. Given any two points in a map we can estimate the distance that separates them. For example, we can use a map to estimate that the distance between Veracruz and Oaxaca (two cities in Mexico) is about 240 Kms. In fact, we can do this from any pair of cities in order to derive a table of distances. Multidimensional Scaling proceeds in the opposite direction: given a set of distances between pairs of points, we attempt to create a map that locates the points in the space. In this work we use the ordinal version of the algorithm, which performs the calculations on the basis of relationships of order: if the distance between two points is "small" they are placed close to each other in the map, and if the distance between two points is "large", they are placed far apart. For example, the distance between Veracruz and Oaxaca is smaller than the distance between Guadalajara and Veracruz, so we would locate Guadalajara further away from Veracruz than Oaxaca. Multidimensional Scaling generates reference scales, hence its name.

The map, or configuration, so constructed is then augmented with vectors that indicate the direction in which a particular property increases, in direct equivalence to East-West or North-South directions in geographical maps. The technique to draw such vectors is known as Property Fitting and relies on linear or logistic regression. For a clear account of how Property Fitting works see, for example, Schiffman et al (1981).

Because scaling maps are built using relationships of order, the problem of discordant, or extreme, observations is minimised (Coxon, 1982). The technique has the further advantage of not making distributional demands on the data. Multidimensional Scaling is closely related to other data reduction techniques such as Principal Components Analysis, or Factor Analysis (Chatfield and Collins, 1992). Examples of the use of Multidimensional Scaling in HE are Stenberg and Davis (1978), Mar-Molinero and Mingers (2006), and Mar-Molinero (1989; 1990).

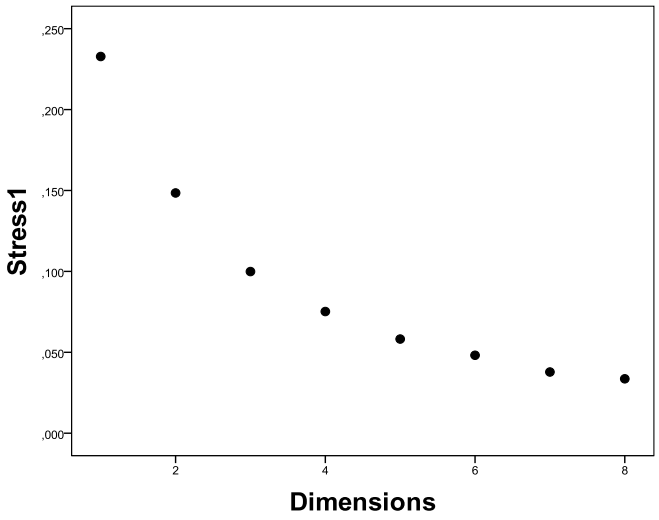
We ignore, for the moment, budget related ratios, as these are not available for private universities. With this proviso, the data consists of 21 ratios for 57 universities. We concentrate on modelling 2010, the most recent year for which we have data, and will use the results obtained for this year in order to assess evolution.

A way of assessing the dimensionality of the data is to see how the value of a measure of fit changes as the number of dimensions increases. The more dimensions in the configuration, the better the fit. But there is a moment when the addition of extra dimensions increases very little the measure of fit. As a measure of goodness of fit we have used $Stress_1$ (Kruskal and Wish, 1978). Table 2 shows how $Stress_1$ changes with the dimensionality of the data. The plot of $Stress_1$ against the number of dimensions is given in Figure 1. The eight dimensional representation returns a value of $Stress_1$ of 0.034, considered to be "excellent" in Kruskal's (1964) verbal classification.

Table 2 – $Stress_1$ and dimensionality

Dimensions	$Stress_1$
1	0,23280
2	0,14847
3	0,09990
4	0,07519
5	0,05819
6	0,04817
7	0,03782
8	0,03361

Figure 1 – Elbow diagram



Following the above results, the Mexican university system was represented in an eight dimensional space. It is not possible to visualise an eight dimensional map and we have to resort to projections onto pairs of dimensions. The projection of the configuration on Dimensions 1 and 2 can be seen in Figure 2 where universities have been identified by means of their short names as given in Appendix A.

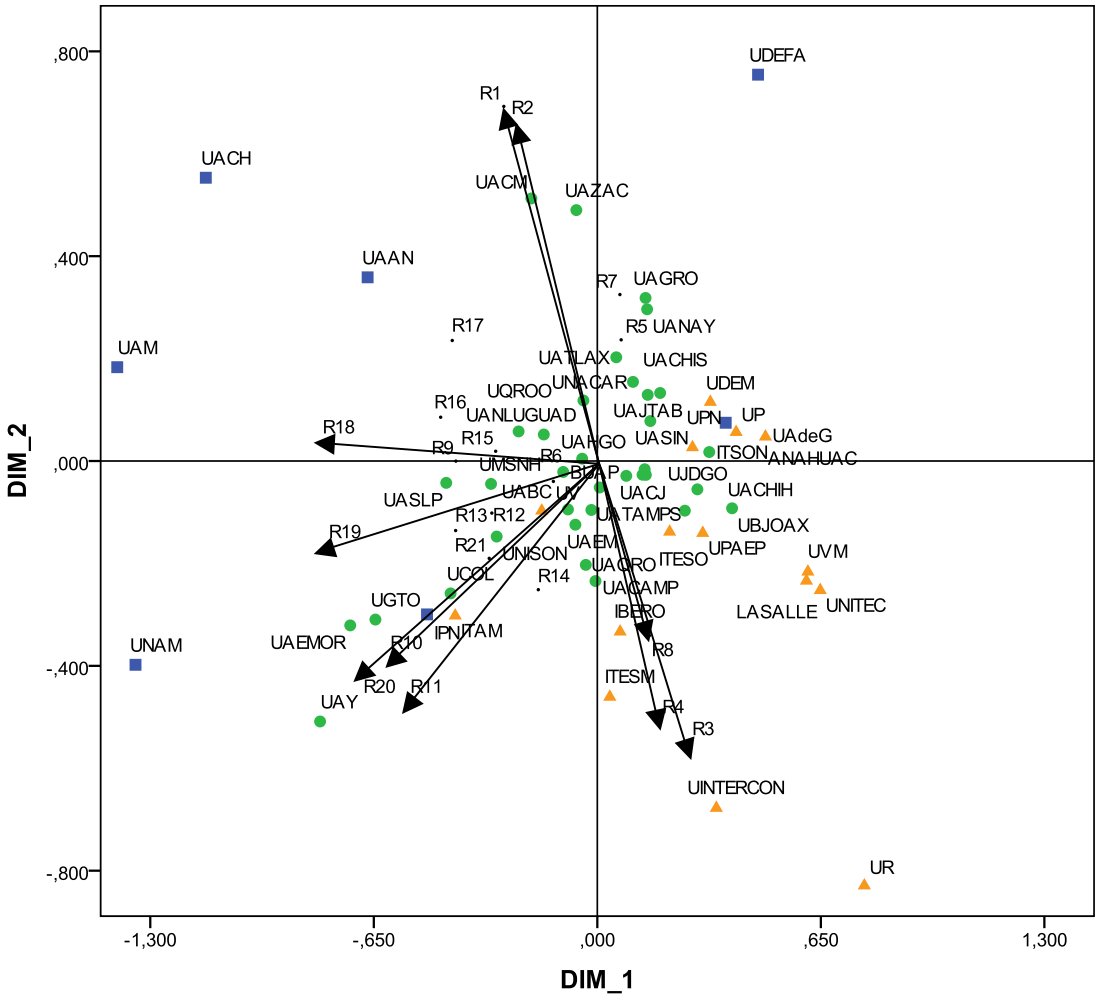
Adding meaning to the configuration: Hierarchical Cluster Analysis and Property Fitting

In Figure 2, we see that federal universities, with the exception of UDEFA, the University of the Armed Forces, are located on the negative side of the first dimension; local state universities are, on the whole, located towards the positive end of the second dimension and the positive side of the first dimension; and private universities are to be found on the negative side of the second dimension, towards the positive side of the first dimension. It is clear that there are structural differences between the three types of universities.

We need to remember that universities are points in an eight dimensional space, and that it is possible for two universities to appear near to each other in Figure 2 while having very different educational ratio structures. This issue is explored by means of Hierarchical Cluster Analysis. We are interested in finding out if two universities are close to each other in the eight dimensional configuration. For this reason, we have used the eight coordinates

that locate each university in the space as variables. The clustering method is the one suggested by Ward, which maximises homogeneity within clusters and heterogeneity between clusters. The resulting dendrogram is shown in Appendix B.

Figure 2 – Multidimensional Scaling configuration in Dimensions 1 and 2 (2010)



The dendrogram shows a clear division between two clusters, one at the top of the dendrogram and one at the bottom. Concentrating first on the cluster at the bottom of the dendrogram, we see that it contains five out of the seven federal universities, four local state universities, and two private universities. The two federal universities not in this cluster are UPN and UDEFA, which are not standard institutions. All universities in this cluster (Cluster 1) are located on the positive side of the first dimension. The second large cluster can itself be divided into two sub-clusters. The sub-cluster that appears lower down

in the dendrogram (Cluster 2) contains 12 out the 15 private universities, and is located towards the positive side of the first dimension and the negative side of the second dimension, with the local state universities in this cluster located at the top of the cluster. The remaining sub-cluster (Cluster 3) occupies a central position in the configuration, although universities in this sub-cluster tend to be located towards the top of the second dimension. All universities in this second sub-cluster are local state universities.

In order to understand what differentiates the clusters and the various types of universities, we resort to Property Fitting. Property Fitting is a regression based technique that comes under the general umbrella of Biplots (Gower and Hand, 1996; Mar-Molinero and Mingers, 2006; Sagarra et al, 2013). Property Fitting fits a vector through the eight dimensional configuration in such a way that a particular characteristic of the data grows in the direction of the vector.

There are two types of Property Fitting analyses: internal, and external. Under the internal analysis version, a property is a variable that has been used to build the configuration. In the case of external analysis, we plot vectors associated with variables that have not been previously used.

The position of the end point of the Property Fitting vector is given by means of its directional cosines. Being regression-based, we measure the quality of fit by means of the coefficient of determination R^2. Quality of fit is normally higher for internal analysis than for external analysis. We do not normally represent vectors associated with values of R^2 lower than 0.5. Standard regression diagnostic statistics, such as p-values for regression coefficients, have no meaning in this context although tests of global significance, such as F statistics, do. For this reason, we may plot vectors associated with relatively low R^2 statistics when the F value indicates that there is something in the regression, although when we do, we interpret the results with care. R^2 values and directional cosines are given in Table 3. Internal analysis has taken place for variables R1 to R21, and external analysis for the remaining variables. The projection of the first 21 eight dimensional unit vectors on the first and the second dimension can be seen in Figure 2. Not all vectors have been represented in full in order not to clutter the figure. When the full vector is not represented, only the end point is given.

We see Figure 2 that the end point of most vectors is far away from the origin of coordinates, in most cases near a hypothetical circle of unit radius, implying that Figure 2 is

important in order to interpret the different educational structures of the three types of universities.

Table 3 – Results of ProFit analysis

Var.	*Name*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Dim5*	*Dim6*	*Dim7*	*Dim8*	*Adjusted R-square*
R1	FTEF/TotFac	-0,27	0,69	-0,16	0,07	-0,19	0,07	0,24	0,56	0,85
R2	FTF/TotFac	-0,26	0,66	-0,19	0,06	-0,22	0,06	0,23	0,59	0,85
R3	NAcProg/FTEF	0,26	-0,55	0,34	-0,05	-0,28	0,25	0,00	0,60	0,71
R4	Enroll/FTEF	0,18	-0,51	-0,34	0,22	0,01	0,25	0,13	0,68	0,84
R5	TSE/Enroll	0,07	0,24	0,09	-0,43	-0,39	0,16	-0,75	0,07	0,83
R6	UGE/Enroll	-0,13	-0,04	-0,80	0,55	0,05	0,13	-0,13	-0,08	0,92
R7	EspE/Enroll	0,07	0,33	0,35	-0,71	-0,05	-0,07	0,37	0,35	0,77
R8	MasE/Enroll	0,15	-0,34	0,81	0,04	0,07	-0,23	0,30	0,24	0,81
R9	PhDE/Enroll	-0,41	0,00	0,56	0,15	0,61	0,16	0,20	-0,26	0,72
R10	ISI/FTEF	-0,60	-0,38	-0,05	-0,33	-0,37	0,30	0,34	-0,18	0,93
R11	SCO/FTEF	-0,54	-0,47	-0,01	-0,38	-0,42	0,14	0,23	-0,29	0,89
R12	SolPat/FTEF	-0,31	-0,10	0,21	-0,13	0,38	0,53	-0,46	0,45	0,78
R13	GraPat/FTEF	-0,41	-0,14	0,11	-0,31	0,67	0,20	-0,46	0,08	0,79
R14	Lat/FTEF	-0,17	-0,25	0,13	0,08	-0,31	-0,71	-0,46	0,27	0,82
R15	CON/FTEF	-0,30	0,02	-0,01	-0,07	0,43	-0,71	-0,07	0,46	0,75
R16	PhD/TotFac	-0,46	0,09	0,39	0,64	-0,40	0,12	-0,09	0,20	0,92
R17	PhD/Enroll	-0,42	0,24	0,67	0,45	-0,27	-0,15	-0,04	-0,14	0,87
R18	PNPC/NAcProg	-0,80	0,04	0,01	0,09	0,48	0,13	-0,10	-0,31	0,78
R19	SNI/TotFac	-0,78	-0,17	-0,12	-0,05	-0,51	0,10	0,21	0,20	0,94
R20	SNI/FTEF	-0,69	-0,41	-0,08	-0,23	-0,49	0,13	0,20	-0,09	0,94
R21	SNI/PhD	-0,31	-0,19	-0,47	-0,63	0,08	-0,41	0,21	0,16	0,77
R22	Bud/FTEF	-0,10	-0,07	0,39	-0,19	-0,37	-0,21	-0,19	0,76	0,30
R23	NAcProg/Bud	0,34	-0,63	0,33	0,20	-0,55	0,01	-0,07	-0,15	0,50
R24	Bud/Enroll	0,02	0,44	0,66	-0,46	-0,25	-0,29	-0,01	0,14	0,75
R25	FOB/Bud	-0,38	0,29	0,31	-0,39	0,31	0,15	0,62	0,12	0,15
R26	FEB/Bud	0,31	-0,37	-0,14	0,29	-0,14	0,06	-0,26	-0,76	0,36
R27	SOB/Bud	0,30	-0,13	-0,35	0,35	-0,23	-0,25	-0,63	0,36	0,01
R28	SEB/Bud	0,06	-0,27	0,25	-0,12	-0,64	0,17	-0,19	-0,61	0,10
SCI	Scimago Ranking	-0,61	-0,46	-0,41	-0,20	0,37	-0,02	-0,22	-0,15	0,84
QS	QS Ranking	-0,63	-0,54	0,29	-0,24	-0,01	0,15	0,04	0,39	0,48
WEB	Webometrics Ranking	-0,33	-0,31	-0,59	0,02	0,11	-0,03	-0,54	0,37	0,66
4ICU	4icu Ranking	-0,21	-0,26	-0,02	0,12	0,34	-0,30	-0,77	0,28	0,38
Size	Total Enrollment	-0,45	-0,23	-0,30	-0,25	0,69	-0,16	-0,24	-0,20	0,31

Results

All vectors of the quality group point towards the left hand side of Figure 2, suggesting that the negative side of the first dimension is associated with academic quality. This implies that, for the universities located towards the left hand side of the figure, a higher proportion of their academic programmes have been recognised of being of National Quality standard, that a higher proportion of researchers have been included in the National Researcher's system, and that a higher proportion of the academic staff that hold a doctorate have been included in the National Researcher's system. Universities in Cluster 1 are located on the left hand side. Remembering that most Federal universities are located in this cluster, we

conclude that the highest academic quality is to be found in universities funded by the federal government. Two private universities (ITAM and ITESM) also appear to have achieved high quality levels. The rest of the private system appears to be associated with lower academic quality, at least the way it is measured by ratios R18 to R21. Four local state universities also appear in the high quality group: UAY, UCOL, UGTO, and UAEMOR.

Research quality is measured through ratios 10 to 17. All these ratios also point towards the left hand side of the figure adding weight to the interpretation of the first dimension as a general measure of quality. The two crucial ratios in this group, based on articles in internationally recognised academic journals per member of staff, have associated vectors that point towards the bottom of Figure 2, differentiating the universities that are salient in published research per member of the academic staff (located towards the bottom of Dimension 2) from those whose main strength relies on the quality of their staff or of the programmes they offer (located towards the top of Dimension 2). Ratios in the Quality group are closely related to ratios that measure research quality, as we can see from the fact that the vectors in the first group are at acute angles with vectors in the second group. This suggests that quality staff (as recognised by the National Researcher's System) tend to publish papers in quality journals.

Enrolment ratios also tell a clear story, although a more complex one. R4, the student to staff ratio points towards the negative side of the second dimension, indicating that private universities tend to put more pressure on staff resources. Ratio R8 points in the same direction as ratio R4, suggesting that an orientation towards master studies is to be found in private universities. Ratios R5 and R7, that are appropriate to technical studies point towards the top of the second dimension, indicating that Local State universities tend to specialise on technical subjects. Ratio R9, that indicates orientation towards doctoral programmes, points towards the negative side of the first dimension, in line with the interpretation that quality universities with research oriented staff tend to offer more doctoral studies.

We see that ratios R1 and R2 point towards the top of the first dimension, something that is consistent with the view that private universities rely more than state funded universities on the employment of part-time staff. Ratio R3 points towards the bottom of Dimension 2, indicating that private universities have a more diverse academic course offering per member of staff than state funded universities.

Summarising, we see that the first dimension is related to quality, both in terms of academic output quality, such as academic papers in international journals per member of staff, in terms of academic programmes officially branded as quality ones, and in terms of staff. Following this interpretation, we can state that the highest quality is to be found in Federal Universities (with the exception of UPN and UDEFA). With a few exceptions, private universities are located on the left hand side of the first dimension. One must not conclude, however, that there is a lower emphasis on quality in private universities. We must remember that ratios R18 to R21, on which our quality definition is based, are driven by the participation of universities in the bidding for extraordinary budget resources, something that concerns mainly state funded universities. Private universities can apply for extraordinary budget funds, but they are expected to match government funds with their own funds in the proportion 70 per cent private funds, 30 per cent state funds, CONACYT (2008).

Dimension 2 appears to be associated with academic diversification in terms of courses on offer, and with higher pressure on staff, both towards the negative side of this dimension. Private universities are located on the negative side of this dimension, in line with the explanation that they offer more programmes per member of staff, that a higher proportion of the academic staff is on part-time contracts, and that academic staff are subjected to a higher pressure in terms of student to staff ratios. Ratios R5 and R5 point towards the top of Dimension 2, suggesting that universities funded by local states tend to specialise in technical subjects.

Budget related ratios were also treated as properties, but this time the analysis was an "external" one, since these ratios had not been used to derive the eight dimensional configuration. We can see in Table 3 that the values of R^2 are much lower for this set of ratios than for the previous 21 ratios that have just been discussed. We must remember that these ratios were not available for private universities, which means that in the plotting of the relevant Property Fitting vectors, only data for Local State and Federal Universities has been used. We can see in Table 3 that only two ratios achieved R^2 values of 0.5 or more, our criterion for plotting them in the configuration. These are Ratio 23 (Number of Academic Programmes / Total Budget), and Ratio 24 (Total Budget / Enrolment).

Ratio 23 has not been plotted in Figure 2 as it is almost coincident with ratios R8, R4, and R3. This ratio points in the direction where private universities concentrate,

indicating that private universities tend to run academic programmes cheaply. This may be associated with the fact that private universities tend to stay away from the more expensive technical degrees.

The vector associated with Ratio 24 almost coincides with the vertical axis in the positive direction. In interpreting this result we must take into account that many factors affect Ratio 24. Per student budget depends first, on the number of students enrolled, as overheads will be divided by a higher number if the university has more students enrolled. Second, subject mix also affects Ratio 24, since technical subjects are, in general, more expensive to teach.

A relevant question is up to what point size is a driver in the results that we have observed. It can be argued that larger universities can concentrate more effort in following policies of quality enhancement. This they would do, for example, by having specialised staff that would advise academic departments on the intricacies of bidding for resources. To explore this issue we have also used as a property the size of the university. The vector associated with size does, in fact, point towards the bottom left hand side, indicating that universities that are successful in quality ratios, and research ratios, tend to have more students. However, the relationship is not a strong one, as shown by a coefficient of determination, R^2, of only 0.31, and this ratio has not been plotted in Figure 2. We conclude that size matters, but not very much.

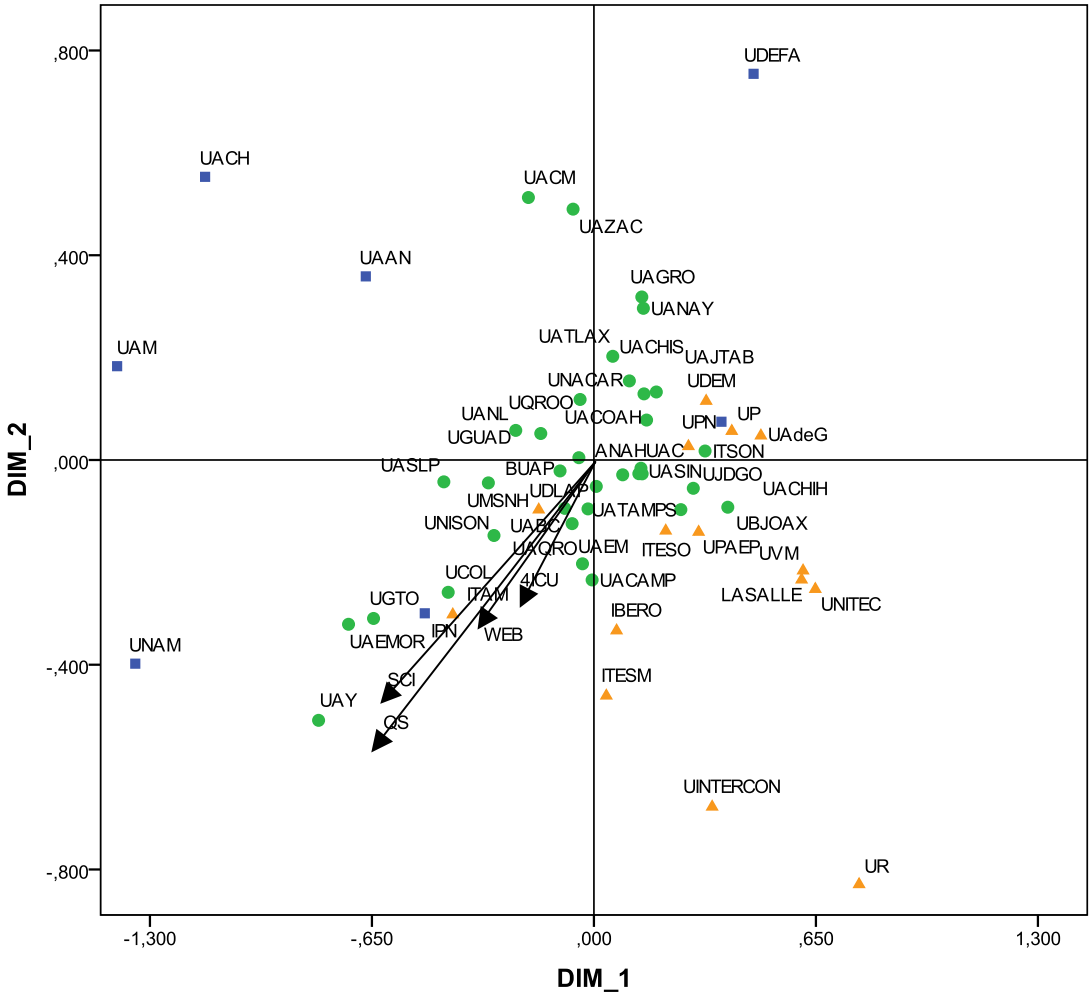
Quality rankings

University quality is a matter of general interest. The question arises if quality rankings, as deduced from official Mexican statistics, coincide with the rankings published by the various international organisations specialising in this activity.

There are at least six important international rankings of universities: Scimago, QS World University Ranking, Webometrics, 4icu, Shanghai Jiao Tong (ARWU), and Times Higher Education (THES). Amongst Mexican universities, only UNAM, the largest university in Mexico, appears in the ARWU and THES rankings. For this reason, both rankings were not included in this part of the research. Between 15 and 20 Mexican universities, are ranked in Scimago, QS, Webometrics, and 4icu. Considering that only the

"best" universities make it to the rankings, we are dealing with a quality censored sample. Following this reasoning, we set up a variable that, for a particular university, took the value 1 if the Mexican university appeared in the relevant ranking, and 0 otherwise. We then applied a slight modification of the Property Fitting technique to plot the appropriate directional vector, (Mar-Molinero and Mingers, 2006).

Figure 3 – Rankings under configuration in Dimensions 1 and 2 (2010)



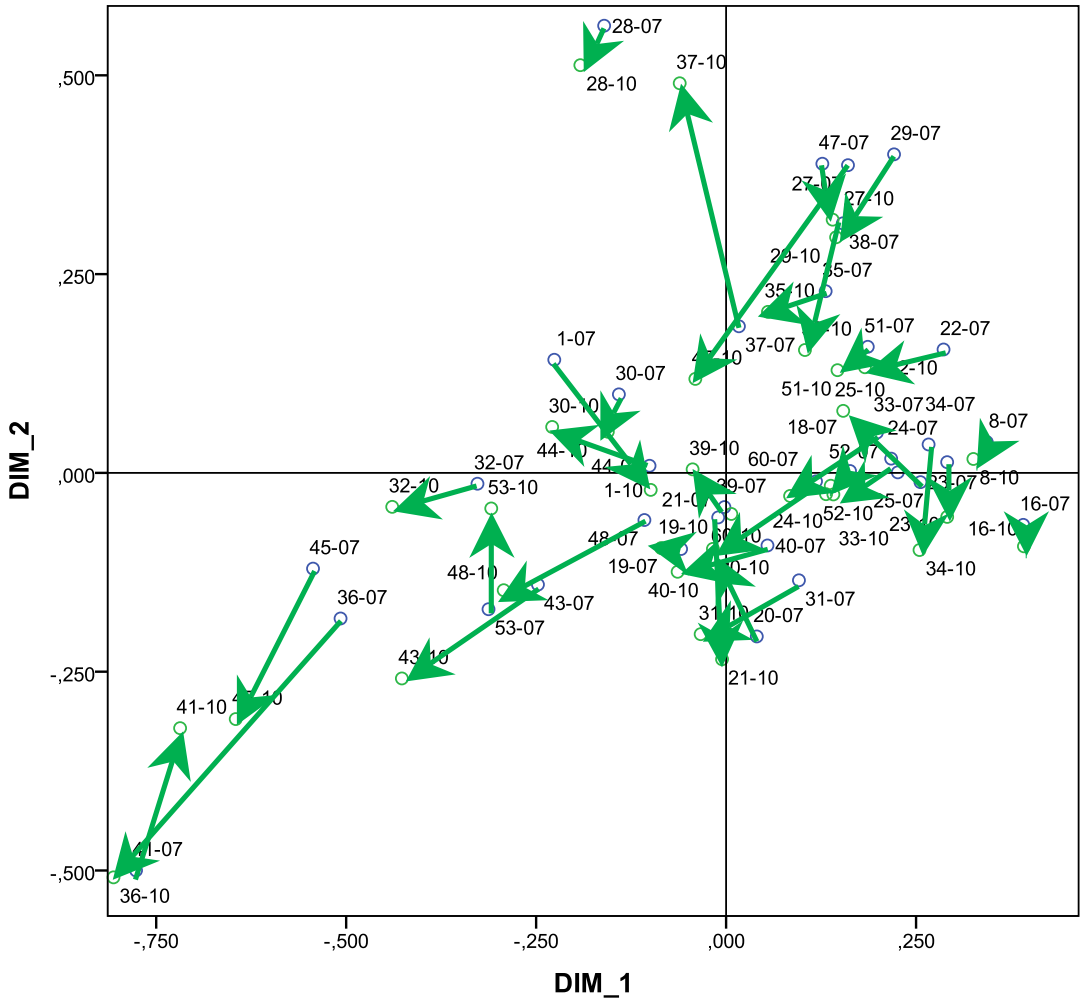
The values of Negelkerker's R^2 range from 0.84 (Scimago) to 0.38 (4icu), with Webometrics and QS taking intermediate values of 0.66 and 0.48. This variation is not surprising given the different methodology employed. Nevertheless, all directional vectors associated with the rankings point in the same direction, as can be seen graphically in Figure 3. It is worth noting that these directional vectors almost coincide in position with

the directional vectors associated with ratios R10 and R11, suggesting that ranking agents base their conclusions principally on the published research quality.

The evolution of the Mexican university system 2007-2010

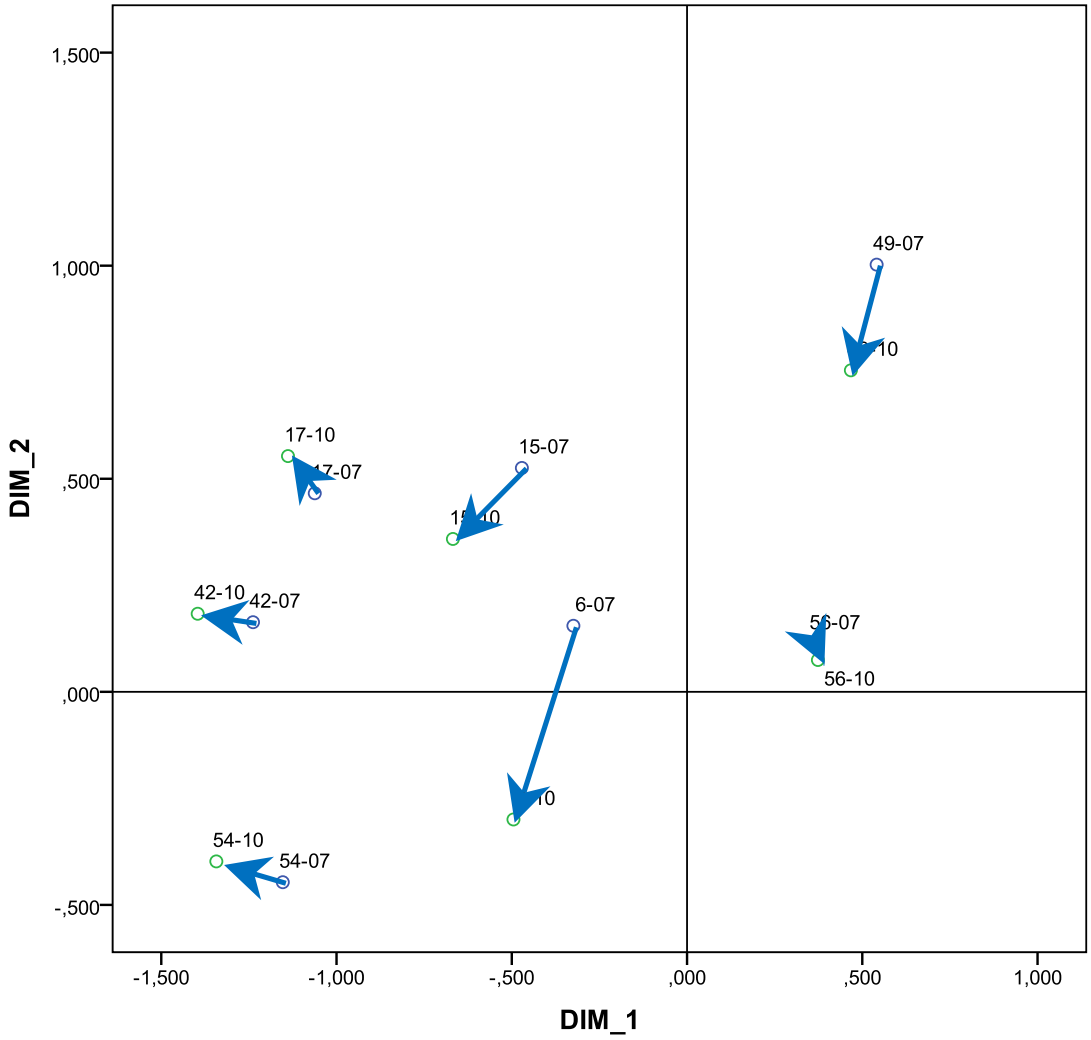
This section will address the question of whether the modernisation attempts made by the Mexican government can be observed in the statistics. For every university we no longer have one set of ratios, but four, since we have four values for every ratio, one for every year from 2007 to 2010.

Figure 4 – Evolution of state universities in the period 2007-2010



It would have been possible to resort to three way analysis such as, for example, the Individual Differences Scaling model of Carroll and Chang (1970), in order to explore the extended data set. However, three way models add further complexity to the interpretation and our objective was to visualise the main characteristics of the Mexican university system in a way that was easily interpreted. Instead, we have decided to "freeze" the configuration obtained with 2010 data, and project on it the data corresponding to universities during the previous three years. As a consequence of this procedure, each university produces four points in the configuration, of which the one that relates to 2010 remains in the same location as in Figure 2. This way of proceeding allows us to visualise the path that universities have followed between 2007 and 2010. This methodology keeps Property Fitting vectors unchanged and, therefore, the interpretation of the results.

Figure 5 – Evolution of federal universities in the period 2007-2010



The objective of the Mexican Educational Modernisation Plan was to improve quality in the Mexican state university system. This implies better quality in course offering, acknowledging the best academic staff, and valuing the number of research papers per member of staff. In terms of our previous discussion, success in the Modernisation Plan would be observed through a movement towards the bottom left hand side corner. However, movements towards the left hand side will be observed in any case, since the continuing presence of the Modernisation Plan means that every year new staff are added to the National Researcher's System, and new courses are added to the list in the National Quality Programme, with the consequence that ratios that contain these variables in their definition will improve. Of much more interest are movements towards the bottom left hand side of Figure 2, since these will be associated with improvements in the quality of published research.

Figure 6 – Evolution of private universities in the period 2007-2010

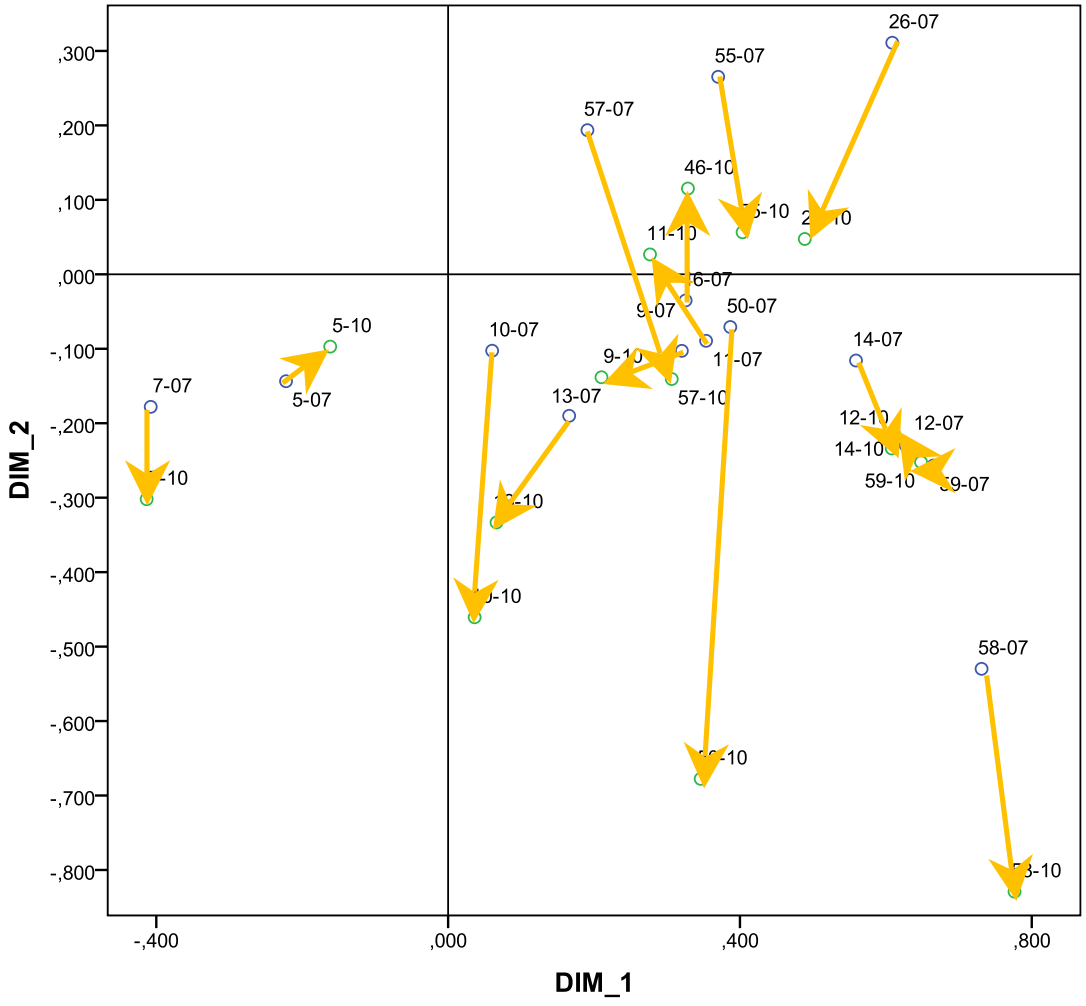


Figure 4 shows the evolution of state universities in the period 2007-2010 and Figure 5 shows the evolution of federal universities in the same period. Rather than show one point for every university and for every year, we have only shown the points for 2007 and 2010, and replaced university names with their number as shown in Appendix A. With few exceptions, we can see a general movement towards the bottom left hand side, something that suggests that the Mexican university efforts in quality improvement have, on the whole, been successful.

The result of applying the same procedure to private universities can be seen in Figure 6. As can be observed, the points associated with private universities have shifted towards the bottom of the figure. This implies that private universities have become more reliant on part-time staff, the number of academic programmes that they offer has increased faster than the academic staff they employ, they have become more oriented towards Master courses, they have more students per member of staff, and their staff have more publications in internationally recognised journals.

Conclusions

Since 1984, but particularly after 1989, the Mexican government has been immersed in a series of programmes aimed at modernising state universities. An important policy tool to this effect has been the splitting of the budged aimed at universities in two parts, an ordinary part that finances current expenditure, and an extraordinary part that contains an element of competitive bidding on the basis of quality improvement initiatives put forward by the institutions.

It is important to ask if it possible to assess, on the basis of officially published information, whether public expenditure has achieved the results it was aiming to achieve. However, this question is difficult to answer given the size and complexity of the Mexican university system. We wished to present the results of the analysis in a way that could be understood by the non-specialist. For this reason we resorted to Ordinal Multidimensional Scaling techniques.

It was found that, on the basis of available data, the issues on which we were interested can be analysed in the representation on a two-dimensional map. These are not

predetermined constructs, but are derived from the statistical model and interpreted using Property Fitting. The first dimension was clearly associated with quality. The second dimension was more difficult to interpret as it captured several related characteristics: subject orientation (technical versus non-technical studies), pressure on staff in terms of students per member of staff, orientation towards master or undergraduate programmes, and diversity of academic offering.

In the 2010 representation we observed a clear differentiation between the three types of universities in the data set. Federal universities tend to be salient in terms of quality. Universities funded by local states tend to concentrate on technical studies and their staff tend to produce fewer papers in internationally recognised journals. Private universities tend to rely on part-time staff, have more student pressure per member of staff, offer more Master courses, and their staff tend to be good at publishing in internationally recognised journals.

The main question was up to what point the effort made by the Mexican government in order to improve academic quality can be observed, and up to what point the effect can be felt in the whole of the university sector or only on a limited number of institutions. We found that quality improvement has been general during the four years 2007 to 2010. This quality improvement has also taken place in the private sector. A possible force behind quality improvement in the private sector may be academic quality accreditation. Accredited universities can receive subsidies which allow them to increase enrolment, not forgetting image improvement that follows having quality recognised by the government.

We have shown, graphically, that the government's objectives have been met. The analysis has also revealed the special case of some universities that have not followed the general trend. Special case studies should be undertaken in order to find out why this is the case.

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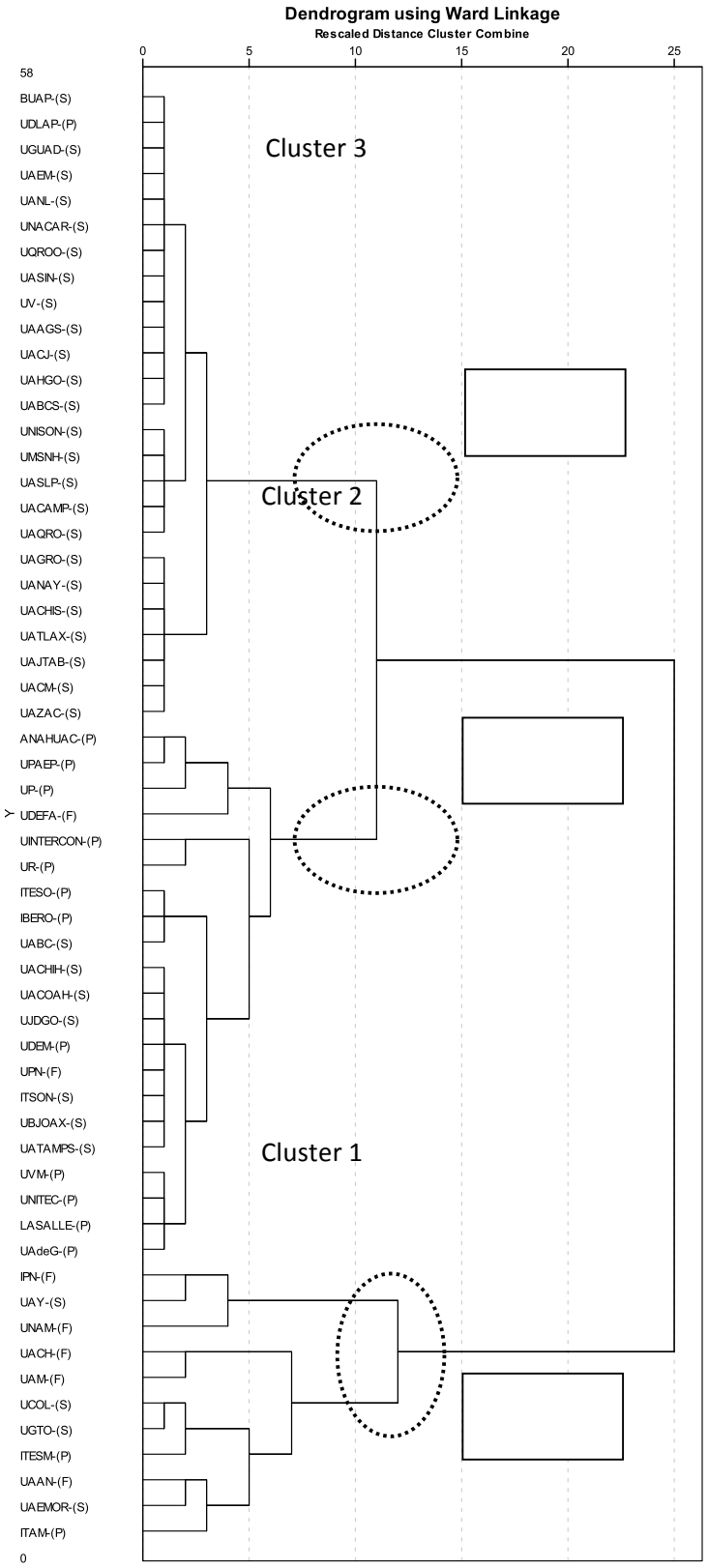
Appendix A

Id	*Abreviation*	*Institution*	*Type*
1	BUAP	BENEMERITA UNIVERSIDAD AUTONOMA DE PUEBLA	State University
5	UDLAP	FUNDACION UNIVERSIDAD DE LAS AMERICAS-PUEBLA	Private University
6	IPN	INSTITUTO POLITECNICO NACIONAL	Federal University
7	ITAM	INSTITUTO TECNOLOGICO AUTONOMO DE MEXICO	Private University
8	ITSON	INSTITUTO TECNOLOGICO DE SONORA	State University
9	ITESO	INSTITUTO TECNOLOGICO Y DE ESTUDIOS SUPERIORES DE OCCIDENTE	Private University
10	ITESM	SISTEMA INSTITUTO TECNOLOGICO Y DE ESTUDIOS SUPERIORES DE MONTERREY	Private University
11	ANAHUAC	SISTEMA UNIVERSIDAD ANAHUAC	Private University
12	UVM	SISTEMA UNIVERSIDAD DEL VALLE DE MEXICO	Private University
13	IBERO	SISTEMA UNIVERSIDAD IBEROAMERICANA	Private University
14	LASALLE	SISTEMA UNIVERSIDAD LA SALLE, AC	Private University
15	UAAN	UNIVERSIDAD AUTONOMA AGRARIA ANTONIO NARRO	Federal University
16	UBJOAX	UNIVERSIDAD AUTONOMA BENITO JUAREZ DE OAXACA	State University
17	UACH	UNIVERSIDAD AUTONOMA CHAPINGO	Federal University
18	UAAGS	UNIVERSIDAD AUTONOMA DE AGUASCALIENTES	State University
19	UABC	UNIVERSIDAD AUTONOMA DE BAJA CALIFORNIA	State University
20	UABCS	UNIVERSIDAD AUTONOMA DE BAJA CALIFORNIA SUR	State University
21	UACAMP	UNIVERSIDAD AUTONOMA DE CAMPECHE	State University
22	UACHIS	UNIVERSIDAD AUTONOMA DE CHIAPAS	State University
23	UACHIH	UNIVERSIDAD AUTONOMA DE CHIHUAHUA	State University
24	UACJ	UNIVERSIDAD AUTONOMA DE CIUDAD JUAREZ	State University
25	UACOAH	UNIVERSIDAD AUTONOMA DE COAHUILA	State University
26	UAdeG	UNIVERSIDAD AUTONOMA DE GUADALAJARA	Private University
27	UAGRO	UNIVERSIDAD AUTONOMA DE GUERRERO	State University
28	UACM	UNIVERSIDAD AUTONOMA DE LA CIUDAD DE MEXICO	State University
29	UANAY	UNIVERSIDAD AUTONOMA DE NAYARIT	State University
30	UANL	UNIVERSIDAD AUTONOMA DE NUEVO LEON	State University
31	UAQRO	UNIVERSIDAD AUTONOMA DE QUERETARO	State University
32	UASLP	UNIVERSIDAD AUTONOMA DE SAN LUIS POTOSI	State University
33	UASIN	UNIVERSIDAD AUTONOMA DE SINALOA	State University
34	UATAMPS	UNIVERSIDAD AUTONOMA DE TAMAULIPAS	State University
35	UATLAX	UNIVERSIDAD AUTONOMA DE TLAXCALA	State University
36	UAY	UNIVERSIDAD AUTONOMA DE YUCATAN	State University
37	UAZAC	UNIVERSIDAD AUTONOMA DE ZACATECAS	State University
38	UNACAR	UNIVERSIDAD AUTONOMA DEL CARMEN	State University
39	UAHGO	UNIVERSIDAD AUTONOMA DEL ESTADO DE HIDALGO	State University
40	UAEM	UNIVERSIDAD AUTONOMA DEL ESTADO DE MEXICO	State University
41	UAEMOR	UNIVERSIDAD AUTONOMA DEL ESTADO DE MORELOS	State University
42	UAM	UNIVERSIDAD AUTONOMA METROPOLITANA	Federal University
43	UCOL	UNIVERSIDAD DE COLIMA	State University
44	UGUAD	UNIVERSIDAD DE GUADALAJARA	State University
45	UGTO	UNIVERSIDAD DE GUANAJUATO	State University
46	UDEM	UNIVERSIDAD DE MONTERREY	Private University
47	UQROO	UNIVERSIDAD DE QUINTANA ROO	State University
48	UNISON	UNIVERSIDAD DE SONORA	State University
49	UDEFA	UNIVERSIDAD DEL EJERCITO Y FUERZA AEREA	Federal University
50	UINTERCON	UNIVERSIDAD INTERCONTINENTAL	Private University
51	UAJTAB	UNIVERSIDAD JUAREZ AUTONOMA DE TABASCO	State University
52	UJDGO	UNIVERSIDAD JUAREZ DEL ESTADO DE DURANGO	State University
53	UMSNH	UNIVERSIDAD MICHOACANA DE SAN NICOLAS DE HIDALGO	State University
54	UNAM	UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO	Federal University
55	UP	UNIVERSIDAD PANAMERICANA	Private University
56	UPN	UNIVERSIDAD PEDAGOGICA NACIONAL	Federal University
57	UPAEP	UNIVERSIDAD POPULAR AUTONOMA DEL ESTADO DE PUEBLA	Private University
58	UR	UNIVERSIDAD REGIOMONTANA, AC	Private University
59	UNITEC	UNIVERSIDAD TECNOLOGICA DE MEXICO	Private University
60	UV	UNIVERSIDAD VERACRUZANA	State University

Appendix B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UACAMP-(S)
UAQRO-(S)
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UANAY-(S)
UACHIS-(S)
UATLAX-(S)
UAJTAB-(S)
UACM-(S)
UAZAC-(S)
ANAHUAC-(P)
UPAEP-(P)
UP-(P)
UDEFA-(F)
UINTERCON-(P)
UR-(P)
ITESO-(P)
IBERO-(P)
UABC-(S)
UACHIH-(S)
UACOAH-(S)
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ITSON-(S)
UBJOAX-(S)
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