# School of Economics and Business Administration

## Three essays on credit unions financial stability

**Doctoral dissertation**

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*A mis Padres, gracias por su ayuda, por sus sacrificios y por sus oraciones. A Pedro, gracias porque siempre estuve en tus oraciones. A mi Pecosa, sin ti esto no habría sido posible, gracias por tu apoyo en los momentos difíciles, te amo con todo el corazón. A mi chiquita, mi princesita, Maria Antonia, eres lo más grande que Dios me ha dado, tú me inspiras, te quiero con toda mi alma.*

*Esta tesis está dedicada a mi familia.*

## Introduction

The three essays in this doctoral thesis explore financial stability issues on credit unions (CUs). CUs are financial cooperative institutions with restricted field of membership. In the US, CUs are increasingly gaining importance. In 2017 CUs had 1,380 billion assets, $1,100 billion shares and deposits, $957 billion in loans and 111 million members;[1] accounting for around 11.62% of the deposits in the US financial system. However, limited attention has been paid to issues of financial stability such as depositor discipline, earnings management practices or the relation between culture and risk taking. This thesis builds on these gaps, but also take advantage of the characteristics of CUs to propose novelty approaches to issues of financial stability.

The first chapter, coauthored with Javier Gomez-Biscarri and Germán-López Espinosa, analyzes the effect of a particular growth strategy and its effects on credit risk, paying attention to the level of depositor discipline in CUs. A significant characteristic of CUs is that they are subject to a field of membership restriction, which narrows the potential membership and financing via deposits that the CUs can attract. Thus, growth of a CU can be achieved mostly through three strategies: M&As, expansion of the field-of-membership (applying for a multiple field-of-membership), or by managing to expand the type of services (loans, mostly) that the CU provides. This chapter analyzes the effects of the last strategy, the expansion of the range of loans that the CU can offer, particularly through increases in member business loans, an activity which has been heavily regulated for CUs.

The regulation of members business lending seems to stem from two considerations. First, expanding into business loans would lead to significant increases in credit risk, since CUs are considered to be at a special disadvantage in the selection and management of assets other than personal loans. Second, the regulation tries to protect CU members (shareholders), who probably do not recognize these risks and would not exercise explicit monitoring or disciplining on the credit union. This chapter looks at these two issues. First, it provides evidence that indeed expanding the business loan portfolio increases the risk profile of the asset side of the CU. Then it shows that CU members exercise significant monitoring of the CU, in general, and of business loans in particular. The chapter offers both descriptive and quasi-experimental evidence, which suggests that CU members understand the risk characteristics of business loans and penalize the CU, by withdrawing deposits, when business loans increase significantly. Results have broad implications in that they

[1] https://www.ncua.gov/analysis/Pages/industry/industry-at-a-glance-december-2017.pdf

suggest that risky growth strategies, of even the "less sophisticated" financial institutions, are subject to significant discipline mechanisms from their main stakeholders.

The second chapter, coauthored with Javier Gomez-Biscarri and Germán López-Espinosa, analyzes the use of accounting (earnings) discretion by CUs. This chapter provides the first comprehensive evidence of the use of earnings management strategies by CUs, through the use of discretionary charges to the loan loss provision. It shows that CUs carry out strategies of income smoothing, big baths and loss avoidance, similar to those of other financial institutions. Then the analysis goes one step further and shows how this earnings discretion may be, at least partly, explained by their particular maximization problem, which leads to a saver/borrower orientation. Specifically, the chapter analyzes the relationship between earnings discretion and deposits, dividends and the supply of loans in a set of descriptive analyses. It shows how earnings management (EM) seems to be related to a higher supply of loans and higher remuneration on CU deposits. These descriptive results suggest that the use of EM strategies by CUs may have real effects in the economy through the potential impact on the local supply of loans. In order to provide some evidence of these real effects, the use of EM strategies is analyzed around a local exogenous shock. This analysis shows how those CUs which managed (increased) their earnings, through discretion, were able to achieve significantly higher rates of growth of their loan portfolio without losing members or deposits and, therefore, without generating tensions on the financing side of their balance-sheets.

The third chapter looks at the relation between religiosity and risk taking. There is a growing and recent interest in the effect of local culture, social values and norms derived from religion on risk taking by firms. The growing literature on this topic has found evidence of the effect of religious adherence in reducing risk taking. However, the effect of difference in religious faiths (Catholics and Protestants) is still a matter of discussion. The CUs offer a perfect setting for this issue, given their cooperative nature and field of membership restrictions. Thus, this chapter takes advantage of a particular group of CUs, the so called associational faith-based, for which was collected information on religious affiliations. Given that the literature has used proportions by countries, associational faith-based CUs represent a perfect sample to see differences between Catholic and Protestant CUs, because the religious affiliation of both managers and owners is perfectly identified. Using these data, the chapter provides evidence that Catholic CUs take less risk than Protestant CUs, a result that may be partially explained by different attitudes in terms of trust, entrepreneurship and thrift between Catholics and Protestants. While Protestant CUs tend to grant higher amounts of unsecured and business loans, Catholic CUs appear to grant more real estate

and automobile loans. These results contribute to the discussion about the effect of differences in risk taking behavior among different faiths.

This thesis works on existing gaps in the literature of CUs. It analyzes issues related with financial stability such as growth strategy, depositor discipline, earnings management and the relation between religion and risk taking. It takes advantage of the special characteristics and regulations of CUs in order to contribute to the existing literature and to the policy-makers. First, this thesis documents the potential consequences of a particular strategy, diversification into business lending, in the credit risk of the CUs. It then shows that members are aware of the impact of this strategy and are capable to exercise depositor discipline. Second, it explains why a type of institutions with a cooperative nature, such as CUs, engage in earnings management practices and the implications of this practices in the real economy. Third, it takes advantage of the CUs particularities to contribute to the understanding of the effect of cultural differences in firm's behavior.

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# Chapter 1:

## 1. Cobbler, stick to thy last: the disciplining of business loans in credit unions


### Abstract

The credit union sector has grown quite significantly in recent years. Among other strategies, this growth has been achieved via expansion of the portfolio of services (mostly, the types of loans) that credit unions offer, an activity which has been heavily regulated. This regulatory emphasis seems to stem from two considerations. First, growth strategies based on expanding the range of services were thought to lead to significant increases in asset risk, since credit unions were considered to be at a special disadvantage in the selection and management of assets other than personal loans; second, the regulation tried to protect credit union member (shareholders) who probably did not recognize these risks and would not exercise explicit monitoring or disciplining on the credit union. We look at these two issues in the context of the particular example of credit union growth via expansion into member business loans. Using data from the universe of US credit unions we first provide evidence that indeed expanding the business loan portfolio increases the risk profile of the asset side of the credit union. We then show, however, that credit union members exercise significant monitoring of the credit union, in general, and of business loans, in particular. We offer both descriptive and quasi-experimental evidence which suggests that credit union members understand the risk characteristics of business loans and penalize the credit union by withdrawing deposits when business loans increase significantly. Our results have broad implications in that they suggest that risky growth strategies of even the "less sophisticated" financial institutions are subject to significant discipline mechanisms from their main stakeholders.



**Keywords:** credit unions, business loans, depositor discipline, asset risk.
**JEL Classification:** M41, G12.

## 1.1. Introduction

The credit union sector in the US has undergone a period of continuing growth in the most recent years (Figure 1). In 1994, US credit unions (CUs) managed around $295B assets, $260B in shares and deposits, $179B in loans and had 66 million members. These figures rose to $1,290B assets, $1,030B shares and deposits, $870B loans and 107 million members in 2016.[2] Thus, CUs currently account for approximately 11.62% of the deposits and 9.53% of the loans in the financial system. A peculiar characteristic of CUs is that they are subject to a field of membership definition, which greatly restricts the potential membership and financing via deposits that the CU can attract, and to regulations which place significant constraints on the type of services (loans) that the credit union can offer to its members. Thus, growth of a credit union can be achieved mostly through three strategies: through M&As (which in the CU sector have been quite frequent: the number of CUs went from 12,138 in 1994 to 5,875 in 2016), through expansion of the field-of-membership (applying for a multiple field-of-membership) so that the CU has access to an increased number of potential members, or by managing to expand the type of services (loans, mostly) that the CU provides.[3] Wilcox (2005; also Goddard et al., 2002, Legget and Strand, 2002) suggested that the latter two reasons have been the key strategies that allowed CUs to increase their size and gain economies of scale (thus providing efficiency gains to their members/shareholders). We do not know much, however, about the consequences of these strategies and the implications they may have on CUs and on the financial system in general.

In this paper we analyze the effects of one of the growth strategies, namely the expansion of the range of services that the CU can offer. In particular, we look at growth through increases in member business loans. Credit union regulation has traditionally placed significant restrictions in the amount of business loans –relative to net worth- that credit unions could grant. These restrictions tried to control risk-taking by the credit union and were based on the assumption that business loans are a significantly riskier asset for CUs to hold than personal loans given that CUs were at a disadvantage when screening the quality of business loans.[4] Nevertheless, since 2003 the National Credit Union Administration (NCUA) has been relaxing the requirements for credit unions to expand their business loans portfolio.[5] These changes have led to a significant increase

[2] NCUA Industry at a glance https://www.ncua.gov/analysis/Pages/industry/at-a-glance-dec-2016.pdf

[3] See Leggett and Strand (2002), Goddard et al. (2002), Goddard et al. (2008), Wilcox (2005) and Wilcox (2006) among others. Goddard et al. (2002) find that "the ability to increase business with existing members" is one of the determinants of growth of credit unions.

[4] See the report by the US Department of treasury to the US Congress in January, 2001: https://www.treasury.gov/about/organizational-structure/offices/Documents/Jan2001CreditUnionReport.pdf

[5] The latest significant change was the amendment, on February 2016, of the member business loans rule (723 of NCUA's Rules and Regulations). This change, which will be effective on January 2017, is considered to be one of the biggest shocks to the ability of CU to grant business loans in years. In particular, the new rules would imply

in CU business lending activity. The effects of this potential increase are, however, uncertain. On the one hand, diversification into business lending may produce social benefits in terms of access to credit for small businesses (see Ely and Robinson, 2009; Walker, 2016; Wilcox, 2011). These social benefits may have a positive effect on credit union fundamentals (financing) through increased membership and deposits. On the other hand, large increases in business loans may increase significantly the risk of the credit union assets: both the reduced experience of CUs in granting business loans and an adverse selection problem (in that the pool of applicants includes lower quality applicants who did not have access to the more experienced banking system) put credit unions at a disadvantage in identifying good business loans, thus leading to riskier loan portfolios (Howell-Best, 2003).[6] If credit union members are aware of and reactive to this increased risk, they may penalize the credit union through withdrawal of deposits. This sort of market-based discipline has been a key factor that has contributed to stability of the banking system, but it seems to be less relevant for credit unions. Indeed, the strict regulation that tries to curb risk-taking by credit unions seems to stem from the consideration that credit union members are less reactive and, therefore, exercise less "automatic" discipline on the credit union.

In this paper we use the above arguments as motivation to provide an in-depth study of the consequences of growth through business loan expansion by credit unions. In particular, we provide evidence that indeed business lending activity leads to an increase in the risk of the asset side of the credit union. We then examine if credit union (CU) members understand this increased risk and exercise significant discipline to the growth strategy of granting business loans. Specifically, we are interested in answering the following questions:

- Are business loans a significantly riskier type of asset for CUs?
- Do CU members exercise discipline on credit unions with bad fundamentals or which have riskier balance-sheets?
- In particular, is the strategy of growth via business loans penalized by CU members? Are other growth strategies similarly penalized?

The answers to this set of questions have important policy implications. First, understanding the way credit union depositors react to CU strategies should help design policies aimed at controlling CU risk taking: recent regulations which have relaxed the requirements for CU expansion of business loans may affect the stable financing of the CU. Second, given the special features of

greater flexibility for CU to grant business loans by changing some of the current business loans limitations by a "broad principles-based regulatory approach".

[6] Indeed, Part 723.4 requires credit unions with commercial lending programs to adopt and implement a comprehensive written commercial loan policy and establish detailed procedures for commercial lending.

CUs, which differentiate them from other financial institutions, the disciplining mechanisms may work differently and, as a consequence, regulation of credit unions and banks might need to diverge further.

To carry out these ambitious objectives, we put together a large database of U.S. credit union accounting information. The sample includes all CUs with data available at the NCUA and assets larger than $50 million. Our sample period covers 1994Q1-2014Q4. This yields a maximum of 152,761 quarterly observations which correspond to 2,248 CUs. We use both regression analyses and quasi-experimental methods and deliver three main sets of results.

We first show how growth through business loans seems to be an alternative to growth through increasing the customer base via expansion of the field of membership. We show evidence that, contrary to expanding the field of membership, growth through business loans leads to significant increases in the asset risk of the CU. These results, we believe, provide a justification to the strict regulation on business loans but, also, give a motivation to the subsequent analysis of whether credit union members understand this risk and discipline the credit union by reducing their deposits.

Our second set of results shows descriptive evidence that, indeed, CU members understand the sources of risk and discipline the credit union for its risk-taking. We relate deposit growth to a set of CU fundamentals and risk indicators while controlling for idiosyncratic and macroeconomic factors: the results of these descriptive analyses show that CU members withdraw their shares and deposits when fundamentals deteriorate or the CU increases its risk-taking. We stress some results where discipline differs from previous findings for banks (such as the lack of discipline of total loans) and relate those differences to the peculiarities of credit unions. In particular, we stress the result that CU members seem to react negatively to the presence of business loans in the CU's loan portfolio.

This latter result becomes the starting point of our final analyses, where we look deeper into the disciplining of business loans: we carry out two semi-experimental studies around two "exogenous shocks" which allowed for increased risk-taking by CUs through increases in the capacity to grant business loans. Using quasi-experimental methods (matching and diff-in-diff estimators) we estimate parameters of depositor response which may be given a causal interpretation. In both cases we find significant evidence that depositors react negatively to the implementation of regulations which increase the risk-taking capacity -through expansion of business loans- of the CU relative to well-designed control groups. These final results may be especially relevant from a regulatory perspective: regulations which allow the increase of risk-taking capacity of CUs may,

in fact, have unwanted consequences for stability of the financing of the CU. Alternatively, we can read these results as pointing out that CU members indeed understand the sources of risk and exercise a significant (market-based) discipline on their credit union which acts as a complement to explicit regulation.

To our knowledge, our analysis is the first to show comprehensive results of depositor (member) discipline in CUs and, also, it is the first to examine depositor discipline of a particular growth strategy of a financial institution. Thus, our paper contributes in two main areas. We show that CU members react differently than bank depositors to some of the CU fundamentals: we link these differences to the dual character of CU members as depositors and owners. Second, our results stress that particular growth strategies of financial institutions may also be penalized, if they are perceived to change (increase) the future risk profile of the asset side. Our analyses focus on a particular type of financial institution and a specific growth strategy but we believe their implications may extend to broader contexts and are, therefore, of general interest.

The remainder of the paper is organized as follows. In Section 1.2 we justify the context of our analysis by presenting the peculiarities of CUs and of CU business loan regulation. In Section 1.3 we describe our data. In Section 1.4 we show evidence that business loans are a risky growth strategy. This result justifies the existence of regulatory limits and provides a motivation for the disciplining of such loans. In Section 1.5 we show results which describe the main mechanisms of depositor discipline of business loans in CUs. In Section 1.6 we take advantage of two quasi-experimental settings which allow us to draw conclusions indicative of causality effects from expansion of business loans to reduced deposits (and, therefore, of member-based disciplining of the credit union). In Section 1.7 we offer some concluding remarks.

### 1.2. Risky assets and market discipline: business loans in credit unions

Credit unions are financial intermediaries which have several differentiating features. First, they are cooperative associations which serve a limited group of members according to a defined "field of membership" (Black and Dugger, 1981; Ely, 2014; Frame et al., 2003; Goddard et al., 2008). The National Credit Union Administration (NCUA) defines three forms of membership: community, occupation (including being employees of a specific employer) and association. Credit unions may be chartered by the federal government or by their state government. Federally chartered credit unions may serve a single bond membership or several groups (multiple bond of membership) whereas for state-chartered credit unions the possibility of serving more than one field of membership depends upon state regulations. This field of membership definition effectively restricts the scope of a CU's operations and strategies and the CU's capacity to grow.

Second, CUs have a unique structure, compared with other financial intermediaries such as banks, in that CU members play a dual role as both owners and depositors (Leggett and Stewart, 1999; Smith et al., 1981; Smith, 1984): member shares are treated as deposits for which members receive a dividend rate. CU members receive both shares and deposits protection by the National Credit Union Share Insurance Fund (NCUSIF), which provides deposit insurance to federally chartered credit unions and to most state-chartered credit unions. Finally, CUs are much more saver/borrower oriented than other financial institutions: CUs provide, in general, higher rates on deposits (as pointed above, this constitutes a way to remunerate CU members/shareholders: Bauer, 2008; Leggett and Stewart, 1999; Smith et al., 1981; Smith, 1984) and/or lower rates on loans, which typically lead to larger percentages of consumer and personal loans than in other financial institutions and makes CUs competitors of the banking industry in the area of consumer financing (Feinberg, 2001; Hannan, 2003; Tokle and Tokle, 2000). This consumer orientation has heavily influenced CU regulation, which has limited the risk-taking of CUs by constraining the type of services (loans) that credit unions can provide to their members. The objective of this regulation is the protection of credit union members, which typically are considered to be less sophisticated than investors/depositors of other financial institutions and, therefore, less reactive and more exposed to potential risk-taking by the credit union.

A relevant example of this regulatory emphasis refers to the limits set on the expansion of the credit union's loan portfolio via business loans. Member business loans, as defined by Part 723 of the NCUA Rules and Regulations, generally include any loan, line of credit, or letter of credit (including unfunded commitments) where the borrower uses the proceeds for commercial, corporate, or other business investment property or venture, or for agricultural purposes.[7] These loans have been considered a risky asset for CUs for two main reasons. First, CUs have less experience in screening and granting business loans, given their typical focus on consumer loans and their less sophisticated risk analysis facilities. Second, credit unions face a significant adverse selection problem in that the pool of applicants for business loans includes lower quality applicants who did not have access to the more experienced banking system. The above reasons put credit unions at a significant disadvantage in the process of granting business loans and, as a consequence, credit unions that are heavily invested in such loans are expected to present riskier loan portfolios. Hence, the US Congress imposed in 1998 a ceiling on the amount of business loans CUs could grant. This limit, in its current wording, prevents a CU from making any member

[7] The most recent update (81 FR 13530 of March 14. 2016, applicable from January 1, 2017) of regulation 12CFR Chapter VII Part 723 of NCUA regulations introduces the definition of a commercial loan, mostly equivalent to a member business loan (though there are exceptions to the equivalence): statutory limits on commercial lending are set on member business loans so we will generally use the term "business loans" hereafter.

business loan that would result in a total amount of such loans outstanding equal to more than the lesser of 1.75 times the actual net worth of the credit union or 1.75 times the minimum net worth required for a credit union to be well capitalized (7% of total assets). Thus, the regulation imposes in practice a cap of business loans at 12.25% of total assets.[8] Despite the fact that the presence of this limit suggests that business loans are a risky way of expanding the CU assets, the NCUA has been steadily introducing changes in business loan regulations in order to soften or eliminate some of the restrictions in place. A first major change was introduced in 2003 with regulation 68 FR 56552, which eliminated some of the restrictions on business loans although it maintained the cap of 12.25% of CU assets.[9] As a consequence, there was a significant increase in credit union business lending, which continued through almost seven years (see figure 3). More minor changes in business loan regulations were introduced in 2005 and 2013 and, finally, in 2016 the NCUA implemented the latest modification (723 of NCUA's Rules and Regulations). The amendments introduced, which were effective at the beginning of 2017, again gave greater flexibility for CUs to grant business loans, although still the limits as percentage of total assets are applicable.

These regulatory restrictions to business loans have the objective of protecting credit union members (depositors) from the increased risk coming from the credit union moving into "less known territory". Implicitly, the limits rest on the consideration that credit union members (who are also shareholders of the credit union) may not be sufficiently aware of the risks involved in business loan expansion and, thus, may not exercise effective monitoring and discipline on the credit union. Market-based discipline of financial institutions has been considered a key factor which reinforces and supports the effects of explicit regulation and supervision: financial markets have the ability to monitor bank performance and influence risk-taking by punishing banks who take excessive risks or whose fundamentals deteriorate. This disciplining process, which works through reduced access to financing or through an increase of interest rates on deposits, gives banks incentives to limit risk or to take corrective actions which, in turn, lead to increased stability of the financial system (see, e.g., Nier and Baumann, 2006). Besides the disciplining effect that

[8] This limit does not apply to CUs chartered for the explicit purpose of making business loans or to CUs with a low-income designation or which are community development financial institutions: we take advantage of one of these exceptions in our analyses below.

[9] The specific changes included: "reducing construction and development loans equity requirements"; allowing regulatory flexible credit unions to ask or not for personal guarantees; "allowing well-capitalized credit unions to make unsecured member BLs (MBL) within certain limits"; "providing that purchases of nonmember loans and nonmember participation interests do not count against a credit union's aggregate MBL limit, subject to an application and approval process"; "allowing 100% financing on certain business purpose loans secured by vehicles"; "providing that loans to credit unions and credit union service organizations (CUSOs) are not MBLs for purposes of the rule"; "simplifying MBL documentation requirements"; simplifying and removing unnecessary provisions for MBL and allowing CUSO to "originate business loans" (see Federal Register /Vol. 68, No. 190 /Wednesday, October 1, 2003 /Rules and Regulations)

equity markets may exercise, deposit markets have been shown to be a major source of discipline for financial institutions which rely on deposit financing: when fundamentals deteriorate, depositors react by leaving or by demanding higher interest rates. There is by now abundant empirical evidence of depositor discipline both in domestic and international contexts (see Berger and Turk-Ariss, 2015; Calomiris and Powell, 2001; Cook and Spellman, 1994; Macey and Garret, 1988; Martinez Peria and Schmukler, 2001; Park and Peristiani, 1998, among others). This literature, however, is still lacking in some areas. First, it has mostly focused on bank depositors. The evidence regarding discipline in other financial institutions is scarce and we lack systematic studies on the existence of depositor discipline, for example, in credit unions, and on how the peculiarities of these other institutions may affect how discipline works.[10] Second, most of the discipline literature has focused on depositor reaction to bottomline fundamentals (earnings, capital, volatility) but analyses which have looked at depositor discipline of bank strategies like growth or diversification are quite scarce.[11]

Our analysis in this paper contributes to filling these two gaps by looking at the reaction of credit union members to the business loan activity of the credit union. We develop our analysis in three steps. We first build on the assumption that business loans are heavily regulated because such loans imply a departure from the "natural" operations of the CU and represented a shift toward riskier asset portfolios. Thus, we start by offering evidence that increases in business loans lead to a riskier loan portfolio of the CU. We then link this increased risk to the issue of member discipline of the credit union. In particular, we first show some baseline descriptive analyses where we link deposit growth with CU fundamentals. These regressions show that indeed credit union members understand the sources of credit union risk and discipline the credit union by withdrawing deposits when fundamentals deteriorate. These results represent a contribution on their own since we show significant differences in how this discipline works relative to the traditional results of bank depositors. We argue that these differences are reflective of the peculiarities of credit unions and credit union members. Finally, we focus our attention on the disciplining of business loans. We show that credit union members understand the higher risk of such loans and discipline the credit union, thus providing market-based discipline which complements that given by regulation. In particular, we take advantage of changes in the regulation on business loans and use two regulatory

[10] There is some scattered evidence of discipline in credit unions in international settings: Arnold et al. (2016) or Murata and Hori (2006).

[11] One example is Bertay et al. (2013), who show that big systemic banks are subject to higher market discipline. Indeed, size is generally assumed by default to have a potential impact on bank risk and returns (see, e.g., Berger and Mester, 1997, Demsetz and Strahan,1997, Deng et al. 2007) and therefore most of the literature on depositor discipline has used size or asset growth as a control (see Arnold et al., 2016; Barajas and Steiner, 2000; Berger and Turk-Ariss, 2015; Maechler and McDill, 2006, Goldberg and Hudgins, 2002, among others) but without attempting to go further in the analysis of whether indeed depositors actively discipline the strategies followed by banks in order to grow.

shocks to design quasi-experimental analyses which show causal evidence that CU members discipline the CU for increasing its business loan activity.

### 1.3. Data

In order to examine depositor reaction to business loans, we collected quarterly data from the CU call reports available from the NCUA. These call reports contain detailed financial information for each CU that operates in the United States. We selected credit unions with assets greater than 50 million dollars (peer groups 4, 5 and 6). This subsampling strategy is based on data availability, since before 2002Q3 only CUs in these groups reported quarterly financial statements, while smaller CUs reported semiannually. Our sample period covers 1994Q1-2014Q4, yielding a maximum of 152,761 quarterly observations which correspond to 2,248 CUs. The list of variables we collect is shown in Appendix A. Our main dependent variables of interest throughout most of the analyses are the growth rates of shares and of total shares and deposits, the distinction being that "total shares and deposits" includes also non-member deposits, which some CUs are allowed to accept.[12] The other variables we use are CU balance-sheet and income statement characteristics which describe the investment strategies and performance of the CU. We describe these variables as we include them in our analyses. In order to avoid problems with outliers, CU variables which are continuous are winsorized at the 0.5% level in each tail. Given that several mergers and acquisitions occurred during our sample period, and the accounting numbers are affected by these transactions, we exclude the CU-quarter observations which correspond to the quarter in which a merger or acquisition took place. This reduces our sample to 141,276 CU-quarter observations. In addition to CU-specific variables, we collect information on macroeconomic variables that may affect deposit growth (Arnold et al., 2016; Barajas and Steiner, 2000; Maechler and McDill, 2006). Considering that most CUs concentrate their operations in one state, we use macroeconomic data at the state level: information on state-level personal income and unemployment was obtained from the Federal Reserve of Saint Louis (FRED). For inflation, we collected inflation rates at the regional level extracted from the Bureau of Labor Statistics.

Additional information that we collect or process for specific analyses is:

- Data on location of CU branches (available from the NCUA since 2010). This information is used to establish a proxy for the CUs that operate in more than one state.

[12] Note that under the generic name "shares" the following items are included: share drafts, regular shares, money market shares, share certificates, IRA/KEOGH accounts and all other shares contributed by CU members.

- Information on CU field of membership and whether the CU has the low-income designation. These two characteristics allow us to control for the possibility of expansion through multiple field of membership and to design our LIDI experiment analyses.

Table 1 shows descriptive statistics and correlations of the main variables used in our analyses. We do not comment on these statistics, which are mostly self-explanatory.

### 1.4. Business loans as a risky growth strategy

The first step in our analysis requires us to show evidence that indeed business loans are a type of asset which increases the risk profile of the credit union's loan portfolio. Given that expanding into business loans is part of the growth process of the credit union, we first show that business loans are a growth strategy which tends to be a substitute to other strategies (mostly, to expanding the field of membership, which gives access to the CU to a larger pool of members). We then show that expansion of business loan activity leads to higher overall risk of the loan portfolio.

#### 1.4.1. Business loans versus multiple field of membership as alternatives to growth

If we want to understand whether growth through business loans lead to higher loan risk of the credit union, we want to control for other sources of growth which can also contribute to increasing the risk profile of the credit union. Given that the potential customers (members) of the CU are limited by the definition of the field of membership, an alternative strategy that leads to future growth is the expansion of the pool of potential members by requesting a multiple field of membership. We first show whether these two strategies are complements or substitutes –our evidence seems to indicate that they are substitutes- and we leave for Section 4.2 the analysis of whether the two strategies imply significant increases in the credit risk of the CU (so discipline is justified).

We first collect some basic statistics on business loan activity, so we can better understand how business loans are related to growth. Table 2 panel A shows the mean value of several CU characteristics for portfolios of CUs formed on the basis of the proportion of business loans over total loans. Some interesting results arise. First, note that the proportion of CUs with a low income designation (LID) is higher the larger the percentile. This is to be expected, given the increased flexibility of LID CUs to grant business loans. Second, size is also increasing through the portfolios, suggesting that the focus on business loans is indeed positively related to size. Interestingly, the standard deviation of ROA is also increasing in the proportion of business loans, giving us a first hint that *BL*s may correlate with higher performance risk. Finally, and more importantly, note that as the percentage of *BL* increases, the proportion of CUs with a *MFOM*

decreases quite noticeably. This suggests that expansion of field of membership may be a substitute of (or an alternative to) growth through business loans. We formalize the results of Panel A by estimating a selection model where we first setup a selection equation for *HASBL* (i.e., we look at the factors which influence the decision to grant business loans) and, subsequently, we analyze the determinants of the amount of *BL* granted. The results of this model are tabulated in Panel B. Note that larger CUs are significantly more likely to grant business loans and to grant larger amounts of such loans. On the other hand, the coefficients of *MFOM* quite clearly suggest that there is a negative relationship between business loans and being a multiple field of membership CU: note the negative and significant coefficients both in the selection equation (-0.323, t-stat of -35.83) and the observation equation (-0.005, t-stat of -4.90). Thus, CUs with a multiple field of membership are both less likely to have moved into business loan activity and, if they have, they offer significantly lower amounts than similar but single FOM CUs. Given the regulation of LID CUs, the effects of having a LID are aligned with our expectations and provide us with a motivation for our analysis in Section 6.1.

In Table 3 we look more explicitly at the relationship between multiple field of membership and business loans with size. Panel A shows descriptive statistics of *BL*, *BL/loansta* and *loansta* for the groups of CUs determined by *MFOM*. The panel also includes a significance test for the difference, although given our sample sizes all these tests reject the null. The results show that the average of business loans is between 64% and 71% higher for CUs with a single field of membership (columns *BL* and *BL/loansta*), when in fact these CUs only have around 0.5% more loans in their balance sheets (column of *loansta*). In order to show that this negative relationship with *MFOM* is not a consequence of size, we take another indicator of growth, namely *Mstate*. This variable (which we can only compute from 2010 on) is a one for CUs which operate in more than one state, and therefore it also proxies for size and expansionary strategies of the CU. Contrary to *MFOM*, CUs which operate in more than one state indeed tend to have significantly higher proportions of business loans (around 20% more than single state CUs), a result which contrasts with the fact that the amount of total loans is only higher by 0.4%. In other words, CUs that grow in size seem to offer higher proportions of business loans, except if they follow a MFOM strategy. We further formalize these results and show in Panel B of Table 3 the results of regression models where we use *BL* as dependent variable and focus only on the sample of CUs with *HASBL* = 1. As regressors, apart from our specific set of controls (see table caption) we include *MFOM* and its interaction with *size* in columns 1-2 (the columns differ in the inclusion of controls) and, for comparison, we include the alternative proxy for growth *Mstate* and its interaction with *size* in columns 3-4. The results in columns 1-2 suggest that when *MFOM* credit unions grow, the

importance of *BL* in their loan portfolios goes down (note the negative and significant coefficient of the interaction in both columns, -0.003 with t-stats of -4.12 and -8.14). Given the minimum value of *size* in our sample (50 million in assets) the results also can be taken to mean that *MFOM* credit unions have lower levels of *BL* to begin with. These results contrast with those in columns 3-4, where we find the opposite result (although less clearly, given our relatively smaller sample) for the alternative proxy for growth *Mstate*.

Even though descriptive, the results we have just shown are highly suggestive that growth in CUs is achieved through expanding membership via a MFOM or through expanding the range of services (business loans), but these two strategies seem to be somewhat substitutes. The fact that in Section 5 below we find significant differences in how members react to (discipline) both strategies seems to suggest that their implications for the risk profile of the CU are different. We show evidence along those lines in the next subsection.

### 1.4.2. Business loans, MFOM and the credit risk of the loan portfolio.

We examine now whether the strategy of growing through business loans significantly increases the credit risk of the CU. Given that CUs are heavily specialized in loan activity, we construct a measure of risk of the loan portfolio by constructing two variables *CRISK3Y* and *CRISK5Y* which measure the quality of the loan portfolio of the CU three and five years into the future. In particular, the two credit risk indicators measure the average proportion of quarterly non-performing loans and of charge-offs over total loans (so, in our notation, the sum of our variables *NPL* and *ch-offs*) three and five years into the future.[13] We use these two indicators as dependent variables in predictive models where the explanatory variables are the current levels of business loans as well as two additional variables we construct:

(1) *BLG* is a dummy equal to one when business loan growth is positive and higher than the growth rate of total loans for a specific quarter, zero otherwise. This variable is capturing CUs which are expanding their business loans faster than their other types of loans.

(2) *LOWBL* is a dummy equal to 1 when the value of *BL* is lower than the median of the sample in the quarter prior to that in which growth is measured. This variable captures CUs which start

[13] Alternatively, we computed *CRISK3Y* and *CRISK5Y* by subtracting from *NPL+ch-offs* the amounts of loans recovered. This did not change the results at all, but since it leads to a measure of risk less parallel to our analyses in Section 5 we offer these results upon request. Note that our measure is the average risk over all future quarters, so in our regressions we need to adjust the standard errors for this overlap: we use Driscoll-Kraay (1998) standard errors with lag length equal to the horizon of the risk measure.

from low levels of business loans, so that they are "in the process of expanding into business loan activity".

As controls in the predictive regressions we include our regular set of controls (in particular, note that we are controlling for *loansta*) and whether the CU has an MFOM denomination. The results in the two panels of Table 4 are pretty straightforward. The baseline models (column 1 in both panels) show significant evidence that the level of *BL* is positively related to future risk measures. Note that the regression already controls for the level of loans of the CU, so the coefficient on *BL* refers to the additional effect of having a high proportion of business loans: indeed, business loans seem to have three to four times larger rates of failure (as measured by the sum of both *NPL* and charge offs) than regular loans: compare the estimated coefficients of *loansta*, 0.010 in Panel A and 0.012 in Panel B, with those of *BL*, 0.043 in column 1. There is, on the other hand, little evidence that having a multiple field of membership increases significantly the risk of the assets (although some of the coefficient estimates at the five year horizon are significant at the 10% level: see columns 2 and 4 in Panel B). The specifications in columns 2-4 show models which include *BLG*, *LOWBL* and interactions of the two variables and with *BL*. We run these models to see whether the increased future risk stems from CUs where business loans grow too fast or which start from low business loan levels and, therefore, are "expanding via business loans". The results suggest, mainly, that business loans lead to an additional increase of future risk for CUs which start their expansion into business loans and do so very fast: note that the results in columns 2 and 3 seem to suggest that fast *BL* growth (column 2) or starting from a low level of *BL* (column 3) do not add significantly to the future credit risk. However, the estimates in column 4 do show a significant increase in risk for CUs which both start from a low level of *BL* and grow very fast. The coefficient of the triple interaction $BL_{t-1} \times BLG_{t-1} \times LOWBL_{t-1}$ in panel B implies that the level of business loan risk in the longer run increases by approximately threefold for CUs which start with low levels of business loans and increase the importance of business loans as a proportion of total loans. This result comes from the sum of the baseline coefficient of *BL*, 0.034, the coefficient of the two interactions -0.003 and -0.080 and the coefficient of the triple interaction, 0.143: the net effect is a coefficient of 0.094 on *BL* for CUs which start expanding into business loans and grow very fast (as a proportion of total loans) this part of their loan portfolio.

All in all, the results in Table 4 support the conclusion that business loans increase significantly the credit risk of the loan portfolio of the CU, especially for those CUs that start their business loan activity and increase such activity significantly. This result is in line with the concerns that CUs are less experienced in the analysis of business loans: a desire to grow the business loan activity fast may lead to both lower quality thresholds for the granting of these loans, to lower

capacity of discriminating good from bad applicants and, indirectly, to a lower overall quality of the pool of applicants (a "lemon" problem). In any case, these results motivate our analysis on discipline in Sections 5-6. The results of these analyses will suggest that CU members are aware of this relative disadvantage of the CU (compared to other financial intermediaries) and act accordingly by disciplining the CU.

### 1.5. A descriptive look at discipline in credit unions

We have shown evidence that business loans significantly increase the risk of the loan portfolio of the credit union. Given this evidence, we now attempt to answer our second question: are credit union members aware of this risk and do they discipline the credit union for significant increases in business loan levels? The answer to this question has important implications for the interplay of market-based discipline and regulation-based discipline of the credit union. We proceed in two steps. First, we show some baseline results –parallel to those in the depositor discipline literature- on the reaction of CU deposits to business loans and to other CU fundamentals which reflect the performance and risk taking of the CU. Second, we look at the effect of some proxies of asymmetric information on the intensity of member discipline. These descriptive results are, to our knowledge, new and serve to motivate our subsequent causal analyses and to offer some comments on potential differences in the behavior of depositors in CUs relative to banks.

#### 1.5.1. The relationship between CU deposits and fundamentals: initial evidence of discipline and reaction to business loans

Evidence of market discipline in the US banking system suggests that depositors react to bad bank fundamentals and to the bank's risk-taking indicators. Since the CU financial statements are publicly available and easy to obtain, a similar reaction should be expected of CU members, especially given two factors which reduce even more the potential asymmetry of information: a) the closeness of members to their CU (stemming from field of membership restrictions); b) the unique character of CUs, where depositors are also shareholders. However, the regulation of credit unions, especially that which is aimed at limiting risk-taking, seems to be based on the assumption that CU members are less responsive to risk and, therefore, need to be further protected. In order to give a first descriptive look at whether there is significant member discipline in CUs and, if so, how this discipline works, we use regressions similar to those in the literature (see, e.g., Maechler and McDill, 2006; Martinez Peria and Schmukler, 2001) and relate growth in CU shares and deposits to CU fundamentals (including business loans) which reflect the risk-taking and performance of the CU. One of our main regressors of interest is the amount of business loans over total assets (*BL*): given our results in Section 4, significant increases in such loans can be

interpreted as the CU attempting to grow by expanding the loan portfolio into riskier assets. We also include in the regression a set of additional risk indicators, some of which have been previously used in the literature of discipline in banks (Barajas and Steiner, 2000; Berger and Turk-Ariss, 2015; Calomiris and Powell, 2001; Martinez Peria and Schmukler, 2001) and some of which are specific to credit unions (Bauer et al., 2009; Frame et al. 2003). These indicators are: net worth over assets of the CU (*NWA*), non-performing loans (*NPL*), charge-offs over loans (*ch-offs*), loans over assets (*loansta*), net interest margin (*NIM*), return on assets (*ROA*) and the standard deviation of past ROAs (*sdROA*), a measure of past losses (*PL*) and its interaction with *sdROA* and, lastly, disposable reserves (*DRES*).[14] We also include a measure of size (*size*, natural log of assets). In order to account for CU reaction to shocks (i.e., the "tools" the CU may implement to prevent depositor flight) we include two final variables: first, we control for interest rates on deposits (*intrates*), measured as the average interest rate that the credit union paid on shares and deposits (Maechler and McDill, 2006);[15] second, we include the (lagged) quarter-on-quarter growth of average salaries paid by the CU, *chsalary*: this variable controls for alternative adjustment mechanisms available to owners which may affect the strength of deposit-based discipline.[16] In order to ameliorate problems of endogeneity, in our regressions we use one-quarter lagged values of the risk indicators.[17] Appendix A describes all our variables in more detail. Our baseline regression is as follows:

$$\Delta S\&D_{it} = \beta_1 BL_{it-1} + \beta_2{}' RISK_{it-1} + \beta_3{}' tools_{it-1} + \beta_4{}' ST_{it} + u_i + d_t + \varepsilon_{it,} \quad (1)$$

where $\Delta S\&D$ is the quarter-on-quarter growth in total shares and deposits (in some specifications, only total shares or subsets that include only those CUs that grant business loans), *BL* is the amount of business loans over total assets, *RISK* is the vector which collects other fundamentals and risk indicators and *tools* is the vector which contains *chsalary* and *intrates*, the two variables which may be used by the CU as a reaction to shocks. $ST_{it}$ is a vector which contains macroeconomic

[14] The NCUA rules and regulations allow CUs to use undivided earnings to pay dividends. However, if this account is depleted a well-capitalized CU may use regular reserves as long as the amount of dividends paid does not cause the net worth classification to fall below the "adequately capitalized" category (*NWA* between 6% and 6.99%; see: 702.403 Payment of Dividends). Hence, given that total reserves (undivided earnings + regular reserves + other reserves) is part of Net Worth, we calculate *DRES* as the amount of total reserves that exceeds the 6% of the Net Worth over assets ratio (scaled by total assets). We subtract this amount from the NW/assets ratio and measure *NWA* = NW/assets – *DRES*.

[15] Interest rates on shares and deposits = (ACCT_380 (Dividends on shares) + ACCT_381 (Interest on deposits)) / ACCT_018 (Total shares and deposits). See Bauer (2008).

[16] Pencavel and Craig (1994) showed that the owner-worker duality in cooperatives makes them more inclined to respond to shocks by adjusting wages. This adjustment could be seen as a fitting response to bad fundamentals and, therefore, could lead to reduced discipline from owner-depositors.

[17] Our analyses in this section use "precedence in time" to uncover the reaction of depositors to fundamentals. In Section 6, however, we use quasi-experimental methods and try to isolate exogenous variation in the determinants of depositor behavior.

variables of the state or region in which credit union *i* operates. Finally, $u_i$ and $d_t$ are CU and time (quarter) effects, respectively.

Results from our regression model are reported in Table 5 along with our predicted signs for the response coefficients. Panel A contains the baseline results for both shares growth (*Δshares*, columns 1-2) and total shares and deposits growth (*ΔS&D*, columns 3-4). The results for both dependent variables are pretty similar, so we comment on them jointly. Columns 1 and 3 estimate the baseline model with the full sample. The results show that shares and total shares and deposits react positively to indicators of financial health: note the positive and significant coefficients of *ROA*, *NWA*, *NIM* and *DRES*. Interestingly, note the much larger magnitude of the coefficient on *NWA* compared to that of *DRES*: CU members give much more importance to the minimum required levels of net worth than to disposable reserves. Estimates of the coefficients on "bad fundamentals" are also consistent with depositor discipline: the estimated coefficients on both delinquent loans and charge-offs are negative and significant. This suggests that when CU members observe signs of negative performance, they withdraw (or increase at a lower rate) their shares and deposits. For the standard deviation of ROA (*sdROA*) we expected a negative coefficient but obtain a non-significant positive coefficient. However, the coefficient on the interaction of *sdROA* with past losses (*PL*) is indeed negative and significant: depositors penalize (discipline) the volatility which comes from bad news, a result which makes intuitive sense. Regarding the *tools* variables, the results are consistent with our expectations: first, higher interest rates lead to higher deposit growth; second, wage changes are negatively related to depositor discipline. This latter result suggests that, indeed, wage adjustment reduces the strength of depositor discipline.[18] Large CUs have lower share growth rates: possible interpretations of this negative coefficient are that larger CUs have a harder time growing (as they are limited in their growth strategies by field of membership and business loan restrictions: see our results in Section 4) or that growth is penalized by depositors. The results for *BL* are noteworthy: we find a negative and significant coefficient (-0.010, -0.007, -0.009,-0.007, t-stats of -2.06, -1.89, -1.84, -1.73), which suggests, as hinted above, that business loans are considered by depositors as a risk-taking growth strategy. It is interesting to note that, while reacting negatively to business loans, members and depositors react positively to loans (*loansta)* in all the specifications (coefficients of 0.036, 0.034, 0.038 and 0.037 with t-stats of 13.55, 12.99, 14.57 and 14.25). Our expectation (and findings in the prior literature for banks: see Barajas and Steiner, 2000; Calomiris and Powell, 2001) was to find a negative coefficient. The result, however, is consistent with theoretical studies

[18] An alternative explanation for this result would suggest that wage increases are penalized by depositors. Given the owner-depositor character of CU members, we believe the explanation is not conceptually different.

on CUs. Given that CU members benefit directly from loans granted by the CU, it is reasonable to expect that they do not punish the CU for the amount of loans granted. On the contrary, they expect an active behavior by CU managers in terms of granting loans without taking too much risk (thus the penalization of business loans and of bad loan indicators). The positive estimated coefficient of *loansta* may stem from this borrower orientation preference by CU members.[19] The negative coefficients of *NPL* and *ch-offs* show that, although high levels of loans are viewed positively, members still expect that the CU has the ability to select and monitor the loans granted. The results in columns 2 and 4 of Panel A correspond to re-estimation of the baseline regressions using only the sample of CUs with positive business loans (condition *HASBL* = 1). Note that the size of the sample is reduced by almost 40%, since many CUs do not offer business loans. Most of the estimates are similar, except that the reaction to *BL* seems somewhat diminished (the estimated reaction coefficients go down slightly, as do the t-stats).

In order to understand why this may be the case, we go one step further and in Panel B we estimate a selection model where we first explain the decision to offer business loans as a function of some of the CU fundamentals including two indicators of whether the CU has a multiple FOM and the low income designation (low income-designated CUs are not subject to the 12.25% limit on business loans). The observation equations we estimate relate shares and shares and deposit growth to the CU fundamentals used in Panel A. The results on the selection equation are all reasonable: size, volatility, a low net worth and a bad loan portfolio (*NPL*) are all positive determinants of the decision to grant business loans. Also, having a low income designation increases significantly the probability of granting business loans. Note that multiple FOM CUs are less likely to grant business loans, a result we uncovered in Section 4. Once we account for selection, the results on share reaction to business loans are again significant and negative, and of higher magnitude than in the baseline regressions of Panel A. Thus, business loans seem to be penalized by CU members even (or, better, especially) after accounting for the determinants of the expansion of CU activities to business loans.[20]

### 1.5.2. Some drivers of the intensity of depositor behavior

In this section we complement our previous results and examine some factors which might affect the intensity of depositor (member) discipline of business loans. These results have independent interest but also allow us to develop some of our subsequent analyses. Specifically, we look at variables which are related to the capacity of the CU to grow and diversify (see Goddard et al.,

[19] This terminology comes from Smith (1984) and Smith et al. (1981).
[20] Note that the coefficient on the Mills ratio suggests that CUs who grant business loans tend to have lower deposit growth rates.

2002; Leggett and Strand, 2002) but also at variables which represent an increase in the asymmetry of information between CU managers and members regarding the CU's risk-taking. We construct several variables which are potential determinants of the strength of depositor discipline:

(1) *MFOM* (multiple field of membership) is the dummy which takes value one if the CU has a multiple field of membership. Frame et al. (2003) suggest two effects of adopting a MFOM, both of which may lead to a reduction of the disciplining of the CU (and of its business loan activity). First, expansion of the field of membership represents a growth strategy which may be seen as reducing concentration risk (we also used this implication in Section 4). Second, adopting a MFOM may lead to lower informational advantages stemming from a common bond.

(2) *com* (community) identifies CUs that operate in a "geographically well-defined local community or neighborhood" or in a rural district.[21] Community CUs are geographically less dispersed. This physical proximity leads to potential informal links between members and managers (who are probably also residents) which may reduce the asymmetry of information and lead to higher discipline.

(3) Finally, given the importance of informational issues, we expect that more sophisticated investors will exercise higher levels of discipline.[22] We proxy for financial sophistication using two alternative measures of personal income.[23] *pcincome* is a weighted average of the percentile of the income of the states where the CU operates; *hi* (high income) is a dummy which takes value one if the state where the CU is located is above the median in terms of personal income, zero otherwise.

We introduce each of these variables and their interaction with *BL* separately in our baseline regressions. The results are shown in Table 6, where for simplicity we omit the coefficients on the rest of controls. Panel A shows the results of regressions which use the full sample whereas Panel B uses only the set of CUs with positive business loans and accounts for the selection implicit by using a sample selection correction: the results are, in any case, quite comparable. The evidence in Table 6 is in line with our predictions. The estimates in column 1 (*MFOM*) show that when a CU has a multiple field of membership the discipline of business loans is significantly reduced or

[21] https://www.ncua.gov/Legal/Documents/Regulations/FIR20100617FOM.pdf.

[22] The literature has shown that higher financial literacy increases the ability of people to make sound financial decisions (Campbell, 2006; Lusardi and Mitchell, 2011; Klapper et al. 2013; Van Rooij et al. 2011). Also, Davenport and McDill (2006) found that more sophisticated depositors (those with uninsured deposits) react more intensely and faster to signals of bank failure. Widdowson and Hailwood (2007) suggest that financial literacy reduces risk-taking in the financial system since people with higher financial knowledge exercise higher depositor discipline.

[23] Dhar and Zhu (2006) find a relation between income level and financial decisions; specifically, they show that high-income individuals display a lower disposition effect. This result, along with the evidence in Davenport and McDill (2006), suggests that income might be used as a proxy for financial literacy.

eliminated (the sum of the coefficients on *BL* and on the interaction is not significantly different from zero in either of the two panels). The results in column 2 (*com*), on the other hand, suggest that the disciplining of business loans is much larger in community CUs (note the negative and significant coefficient on the interaction $com \times BL_{t-1}$). Regarding the two proxies for financial sophistication, the estimates in columns 3 and 4 suggest that CUs which operate in higher income states are subject to higher depositor (member) discipline: note the negative and significant coefficients on the interactions between *pincome* and *BL* (-0.045 and -0.080, t-stats of -3.26 and -2.64) and, less robust, between *hi* and *BL* (-0.011 and -0.007, t-stats of -2.20 and -0.59).

All in all, the results in Sections 5.1 and 5.2 have shown evidence that CU members react negatively to business loans, a result which is suggestive of discipline. We interpret the specific results on business loans as implying that members perceive that the risk profile of the assets of the CU increases when the CU engages in growth through business loans. The analyses in Tables 5 and 6 are descriptive in nature: the correlations we show between CU fundamentals (especially the levels of business loans) and depositor behavior are only suggestive of depositor (member) discipline. It is true that some of these correlations (in particular, the negative coefficient on *BL*) are difficult to justify as being purely mechanical or the result of the automatic effect of a common factor which generates a correlation between the fundamental and deposit growth. However, if we want to provide convincing evidence of causality (from business loans to depositor behavior) we need an alternative empirical analysis where we can isolate variation in business loans that may be exogenous to depositor behavior. We do that in the next section, where we take advantage of two regulatory "shocks" to the capacity of CUs to grant business loans which credibly are unrelated to depositor behavior.

### 1.5.3. Do CU deposits really react to increased levels of business loans? Looking for causal links

In Section 5 we have shown evidence that CU members react to CU fundamentals, and to business loans in particular, in manners suggestive of discipline: not only the baseline analyis in Table 5 but also the qualifications from Table 6 are in line with disciplining mechanisms and some of the correlations we show (especially related to our main interest, namely, the disciplining of business loans) do not necessarily arise as mechanical relationships stemming from the effect of common factors. However, these analyses are correlational in nature and our only control for endogeneity was to use a time lag between risk indicators and depositor behavior. In this section we attempt to show that our results are suggestive of a causal mechanism from risky growth of the loan portfolio of the CU (i.e. initiation or expansion of the business loan activity) to lower deposit growth. In

order to do that, we carry out two semi-experimental analyses around two "exogenous regulatory shocks" in the US credit union sector which led to higher capacity of CUs to move into riskier loan strategies by granting larger levels of business loans. The first of these shocks increased significantly the number of CUs subject to the exemption of the business loan limits; the second corresponds to an explicit regulatory change which significantly relaxed the requirements and conditions for granting business loans. We believe both shocks provide us with valid contexts in which to uncover whether growth by riskier loan portfolios leads to a negative response of deposit growth which signals discipline by credit union members.

### 1.5.4. The LIDI "experiment"

Our first "shock" corresponds to the Low Income Designation Initiative (LIDI) carried out by the NCUA in the third quarter of 2012.[24] This initiative consisted in expediting and pre-approving the low-income designation for eligible credit unions and contacting CUs which were eligible but had not applied for the designation in order to inform them of this approval.[25] This initiative led to a sharp increase in the number of low-income CUs in the quarter of implementation: within our sample, the number of low-income CUs rose from 218 at the end of June 2012 to 425 at the end of September 2012 (Figure 2). As mentioned above, the low-income designation gives greater flexibility to CUs and, among other measures, it exempts CUs from the statutory limits to grant business loans and allows them to accept nonmember deposits. This provides us with a unique exogenous shock to the ability of those CUs to increase the size (and risk) of the business loan portfolio. We estimate the effects of the LIDI shock using two alternative empirical strategies.

We first construct a quasi-matching estimator where we define our treatment group as the CUs that, as a consequence of the LIDI, adopted the low-income designation between June and September 2012 (207 CUs) and as control groups we use those CUs that already had the low-income designation and maintained it for some time (specifically, CUs that had the designation in March 2011 and kept it at least until December 2013: this corresponds to a total of 194 CUs). This design gives treatment and control groups that are similar in size and that, in fact, are directly comparable: note that the CUs that adopted the designation because of the LIDI were already eligible and, therefore, should be similar in their fundamentals to those that had the designation. Given this definition of treatment and control groups, we use simple t-tests and compare the differences in total shares and deposits growth between the treatment and the control group around

[24]http://www.cdcu.coop/ncuas-low-income-designation-initiative-brings-new-capacity-focus-to-building-financially-independent-communities-through-cus.

[25] NCUA regulation states that "a credit union serving predominantly low-income members *may* be designated as a low-income credit union." (Section 701.34 of NCUA's Rules and Regulations.).

the moment of the change in designation. First, however, since the low income designation implies more flexibility to grant business loans, we test that indeed the CUs who changed their designation because of the LIDI took advantage of this flexibility and increased their business lending. To that end, we conduct tests of the difference in *BL* growth between the treatment and control groups at the periods around the designation change. In particular, we examine *BL* growth in t, t+1, t+2, t+3 and t+4, where *t* is the LIDI quarter. We also look at cumulative growth between quarters t and t+1 to t+4. The results are reported in Table 7, panel A, and, indeed, they suggest that CUs affected by LIDI reacted to the new condition and increased business lending faster than the control group. Note that the coefficients are positive and significant for t and t+2 as well as for 0 and 2 to 4 cumulative quarters.[26] Given this evidence that LIDI led to significant increases in business loans for the CUs affected by the initiative, we examine next the difference in deposit growth between the treatment and control groups. Table 7, panel B, reports the results. As expected, total shares and deposits growth around LIDI is significantly lower in the treatment group with respect to the control group (despite the fact that the LID in principle should lead to higher deposit growth, given that, among other things, it allows the CU to receive nonmember deposits). We find a significant negative difference in deposit growth in t+1 (-0.0038, p-value of 0.046). We also find significant negative differences in the cumulative growth at quarters t+1 and t+2 (-0.0054 and -0.0061, p-values of 0.046 and 0.082).[27] These results suggest that CU members react negatively (the effect is estimated at around 0.4%-0.6% lower growth of deposits) to the adoption of the low-income designation at the moment of the change compared to what could be considered the most similar control group of CUs.

As an alternative empirical strategy, we control for the effect of possible differences in CU characteristics by using diff-in-diffs estimators. We use the same definition of treatment and control groups as before, but estimate regressions that control for our baseline risk indicators while including a treatment dummy *TA* (defined as one for the CUs which change designation at the LIDI), a "post" treatment dummy (*pt*) defined as a one for the quarters after the LIDI initiative and the interaction of *TA* with *pt*, which is intended to capture the treatment effect. We show in Table 8, panel A, the results using three different windows around the treatment period: column (1) uses only the quarters 2012Q3 (so *pt*=1 for 2012Q4); column (2) uses quarters 2012Q2-2012Q3 (so *pt*= 1 for 2012Q4-2013Q1); column (3) uses quarters 2012Q1-2012Q3 (so *pt*=1 for 2012Q4-2013Q2).

[26] The other major implication of the LID is the capacity to accept nonmember deposits. We replicated the analyses in Table 7 Panel A using nonmember deposit growth as dependent variable but did not obtain any significant results: note that the CUs which adopted the LID at the time of the LIDI started with zero nonmember deposits, so growth measures on the quarter of impact of the regulation are statistically very poorly behaved.

[27] For the cumulative quarters in t+3 and t+4 we obtain negative but not significant coefficients.

The results of these regressions, which control for CU characteristics, are consistent with those of the matched t-tests: we find a negative coefficient for the interaction terms in all three regressions, although the coefficient is only significant for the sample which includes the two quarters after the treatment (coefficient -0.004, representing an effect of -0.4% on deposit growth, and t-stat -1.74). In Panel B, we build on our evidence in Section 5.2 and qualify the results in Panel A by including the possibility that the income level of the state may affect the treatment effect: as seen in Table 6, higher income members exercise more intense discipline. We use our proxies for financial sophistication *pcincome* and *hi* and interact these variables with the *TA* and *pt* dummies. Our coefficients of interest are now those of the interactions *TA* × *pt*, *TA* × *pt* × *pcincome* and *TA* × *pt* × *hi*, where the two triple interactions measure the difference in treatment effect in high-income states. When we use *pcincome* as a proxy for state income the effect is only clear in column 2 and marginally significant (panel B). However, when we split the states by median income (Panel C) the effect of the adoption of a low-income designation is much more noticeable and significant in high-income states. The effect amounts to a decrease in deposits of CUs in high income states around 1.4% larger than in low income states, where we find no significant effect (see the coefficients in columns 1 and 2). This evidence suggest that the effects found in Tables 7, panel B, and Table 8, Panel A, stem mostly from the high-income states, a result in line with asymmetric information (or member sophistication) arguments.

### 1.5.5. The relaxation of business loan requirements

We use a second regulatory change as additional evidence of a negative reaction of depositors to CU risky growth of loan portfolios into higher amounts of business loans. In particular, we focus on the introduction of regulation 68 FR 56552 by the NCUA in October 1st 2003. This was the first major change in business loan regulation, and made it easier for federal CUs to grant business loans. The new rules generated a sustained increase in the business loans to assets ratio of federal CUs, a trend which lasted until the onset of the financial crisis around 2008Q3 (see Figure 3).[28]

In order to test for the effects of this regulatory change, we need to define a treatment and a control group which can be adequately compared. We do these in two ways. First, we devise a matching estimator where we take as treatment group the 10% CUs which experienced a higher increase in business loans in 2003Q4 and 2004Q1 (i.e. in the two quarters after the regulatory change). For the control group we use nearest-neighbor matching where we extract the nearest neighbor from the rest of federal credit unions. In the matching process we require exact matches for the state and

[28] The other major change to the requirements for business loans (81 FR 13530 of March 14. 2016, applicable from January 1, 2017 on) is too recent to allow for a meaningful analysis.

field of membership and closest matches based on the same quarter value of *BL*, *size*, *ROA*, *NWA*, *DRES*, *NPL*, *ch-off*s, *loansta*, *chsalary* and *intrates*. In order to control for differences in the matched groups we use the bias-adjusted estimator of Abadie and Imbens (2011). We look at significant differences in the growth in total shares and deposits in t+1 to t+4 as well as for 1, 2, 3 and 4 cumulative quarters after the regulatory change. The results from these matching estimators are reported in Table 9. These results show evidence that total shares and deposits growth is significantly lower for the treatment group in the quarter after the "shock" (1% lower deposit growth) and cumulatively for one, two and three quarters (1%, 1.2% and 1.6% lower deposit growth, respectively).

Second, we use a diff-in-diffs regression where we take the treatment group (*TB*=1) to be the same used in the previous analysis, namely the 10% CUs which had higher increases in business loans. For the control groups (*TB*=0), we use two alternatives. Panel A of Table 10 shows the results of using all other federal CUs (i.e. those below the 10% highest increase in business loans). Panel B of Table 10 shows the results of using as control group the federal CUs with changes in business loans below the 10% lowest, i.e., the CUs which least increased their business loans over the same period. We use four different sampling periods: results in column (1) use a window of one quarter around the change, so *pt*=0 for 2003Q3 and *pt*=1 for 2003Q4; results in column (2) use a window of two quarters, so *pt*=0 for 2003Q2-2003Q3 and *pt*=1 for 2003Q4-2004Q1; results in column (3) use a window of three quarters, so *pt*=0 for 2003Q1-2003Q3 and *pt*=1 for 2003Q4-2004Q2; results in column (4) use *pt*=0 for 2002Q4-2003Q3 and *pt*=1 for 2003Q4-2004Q3. In both panels we find that the treatment effect (estimated coefficient on the interaction between *TB* and *pt*) is negative and statistically significant in columns 3 and 4. This suggests that indeed there is a negative effect on deposit growth which appears in the two-three quarters after the change in regulation. The magnitude of the effect fluctuates between a 0.4% and a 1.6% decrease in deposits, depending on the horizon and control group chosen.

We believe the takeout from these two experimental settings is that indeed the increase in business loans by CUs has a direct effect on depositor behavior: CU members react to CUs increasing their business loan activity by withdrawing their deposits or by favoring other CUs (or other financial institutions) as a destination for their deposits. This result is similar in spirit to the traditional results on depositor discipline, but in this case CU members seem to be penalizing the explicit decision to increase the levels of a type of assets which is perceived to be riskier or where the CU has less of a comparative advantage.

The results in Sections 5 and 6 are, in our view, indicative that credit union members are aware of the risks involved in the activities of the credit union and actively discipline the credit union by withdrawing their funding (or increasing it at lower rates) via deposits. Our analyses have focused on the specific example of business loans, which we have shown significantly increase the risk implicit in the balance sheet's assets. This example is especially relevant not only because of the strict regulatory limits to which they have traditionally been subject but also because the recent evolution is toward more lenient regulation. The finding that credit union members exercise active discipline of these loans is of high relevance and suggests that there exist market-based mechanisms, alternative to regulation, which contribute to keeping risk-taking of credit unions in check.

### 1.6. Concluding remarks

In this paper we have focused on examining two questions which are quite relevant to our understanding of the interplay between regulation and financial stability. We have examined the consequences of regulatory business loan limits on credit unions. We posit that both the consideration that CUs are at a disadvantage in the granting of business loans and that credit union members might not understand this risk and exercise discipline over the credit union were implicit in this regulation. In view of these arguments, we first offer evidence that business loans are indeed an asset which significantly increases the credit risk of the loan portfolio of the CU. This result provides a justification for the regulatory limits, but it also motivates the second part of our analysis, where we explore whether credit union members actively monitor such loans and penalize the credit union for expanding the business loan portfolio. We provide the first analysis we are aware of which links business loans to depositor behavior. More importantly, our use of two regulatory changes which occurred in 2003 and 2012 allows us to show results suggestive of causality: CU members indeed react negatively to an expansion of the CU's activity into business loans.

We believe our paper significantly contributes to the literature on credit union regulation, by suggesting that credit union members are sufficiently aware of the risk of the credit union operations, and exercise a disciplining mechanism which is complementary to regulation and supervision. Also, we contribute to the broader literature on depositor discipline by, first, giving the first broad description of the mechanisms through which this discipline works in CUs and, second, by placing the focus on a particular aspect of discipline, namely, the penalization of risky strategies such as the expansion of business loans.

Apart from the contribution to the literature, out results have important policy implications. Knowing the channels through which market discipline works is key for regulators, given that higher levels of discipline act as stabilizers of the financial system and lead to a reduced probability of systemic episodes. Our results show that different financial institutions are likely to be subject to different discipline mechanisms, depending on the type of stakeholders (depositors) and their relationship with the depository institution. Also, we show evidence that even the apparently less sophisticated depositors seem to understand the potential risks of expansionary strategies and actively discipline these strategies. These two sets of results have immediate positive implications for the stability of the financial system, since they point at the presence of strong and sophisticated automatic stabilizers, but also have quite far reaching implications for regulation design. First, regulation of different depository institutions may have to diverge significantly and adapt to the differences in depositor behavior and sophistication. Second, some regulations intended to expand the range of services offered by financial institutions may have negative risk implications. Depositors, however, seem to be able to understand the risk implications of these expansions and behave in a manner that reduces such negative externalities.

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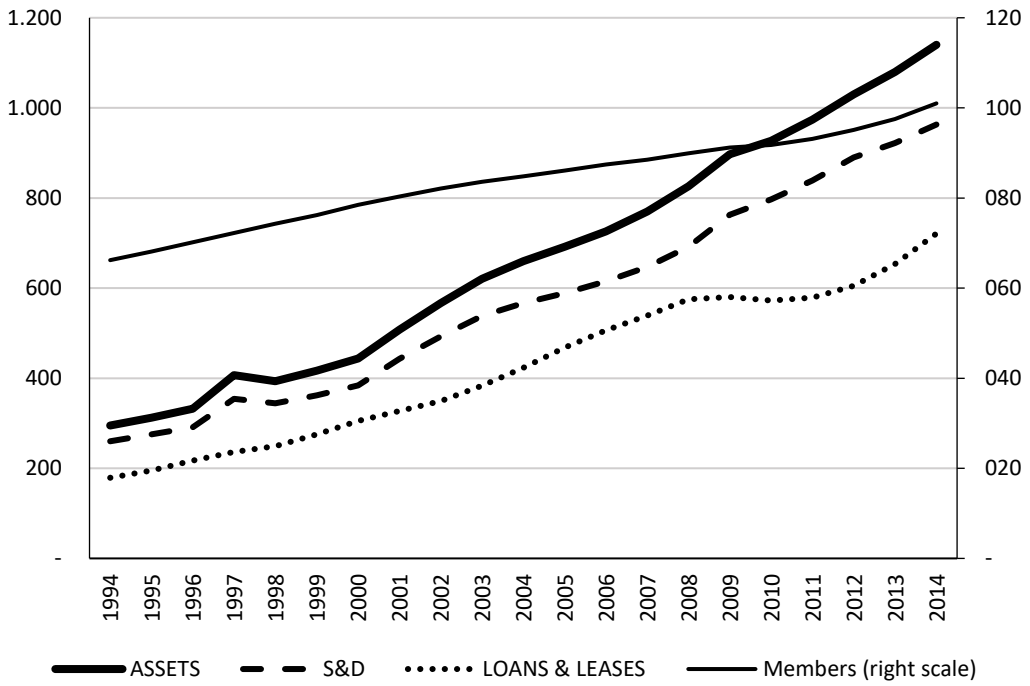
## Appendices, figures and tables chapter 1

### Appendix A: Variable Definitions

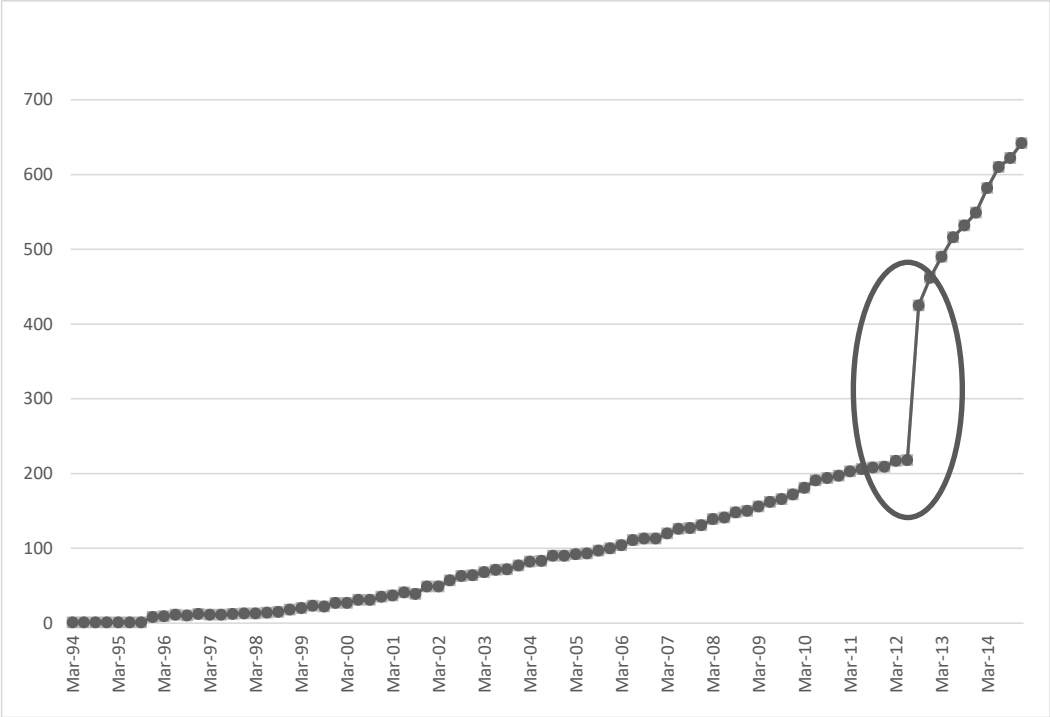
| | Variable | Definition |
|---|---|---|
| *Main dependent variables* | *Δshares* | Quarter-on-quarter growth of shares of the CU. |
| | *ΔS&D* | Quarter-on-quarter growth of shares and deposits of the CU. |
| | *CRISK* | Future credit risk (3years or 5years) measured as NPL + *ch-offs* |
| *Credit union variables: risk-taking indicators and other characteristics* | *BL* | Business loans over total assets of the CU. |
| | *loansta* | Total loans and leases over total assets of the CU. |
| | *ROA* | Return on assets of the CU. |
| | *sdROA* | Standard deviation of *ROA* (calculated over 12 quarters, from t-1 to t-12). |
| | *PL* | Past losses of the CU computed as natural logarithm of 1 plus the number of quarters in which the CU obtained losses (from t-1 to t-12). |
| | *NWA* | Net worth over total assets of the CU minus *DRES*. |
| | *NPL* | Total amount of delinquent loans over total loans and leases of the CU. |
| | *ch-offs* | Charge offs over total loans and leases of the CU. |
| | *NIM* | Net interest margin of the CU. |
| | *DRES* | Reserves (regular reserves, other reserves and undivided earnings) in excess of the 6% of Net Worth over total assets of the CU. |
| | *chsalary* | Quarter-on-quarter change in average salary per employee. |
| | *size* | Natural logarithm of total assets of the CU. |
| | *intrates* | Average interest rates on total shares and deposits paid by the CU computed as (Dividends on shares + Interest on deposits)/Total shares and deposits. |
| | *Mstate* | Dummy that takes value 1 when the CU operates in more than one state, 0 otherwise. |
| | *com* | Dummy that takes value 1 when the CU is community-based, 0 otherwise. |
| | *MFOM* | Dummy that takes value 1 when the CU has a multiple field of membership, 0 if community or single field of membership, 0 otherwise. |
| | *HASBL* | Dummy that takes value 1 when the CU has positive business loans, 0 otherwise. |
| | *BLG* | Dummy that takes value 1 when business loan growth is positive and higher than loan growth for a specific quarter, 0 otherwise. |
| | *LOWBL* | Dummy that takes value 1 when BL is lower than the median of the sample in the quarter prior to that in which growth is measured by BLG, 0 otherwise. |
| *Macro variables* | *chinc_s* | Change in quarterly personal income in the state where CU headquarters are located. |
| | *unemp_s* | Unemployment rate in the state where CU headquarters are located. |
| | *inf_s* | Quarterly inflation rate in the census region where CU headquarters are located. |
| | *pcincome* | Weighted average of the income percentile of the states where the CU operates. |
| | *hi* | Dummy that takes value 1 if the state where the CU is located is above the median in terms of personal income, 0 otherwise. |

**Figure 1. Credit union growth, 1994-2014**



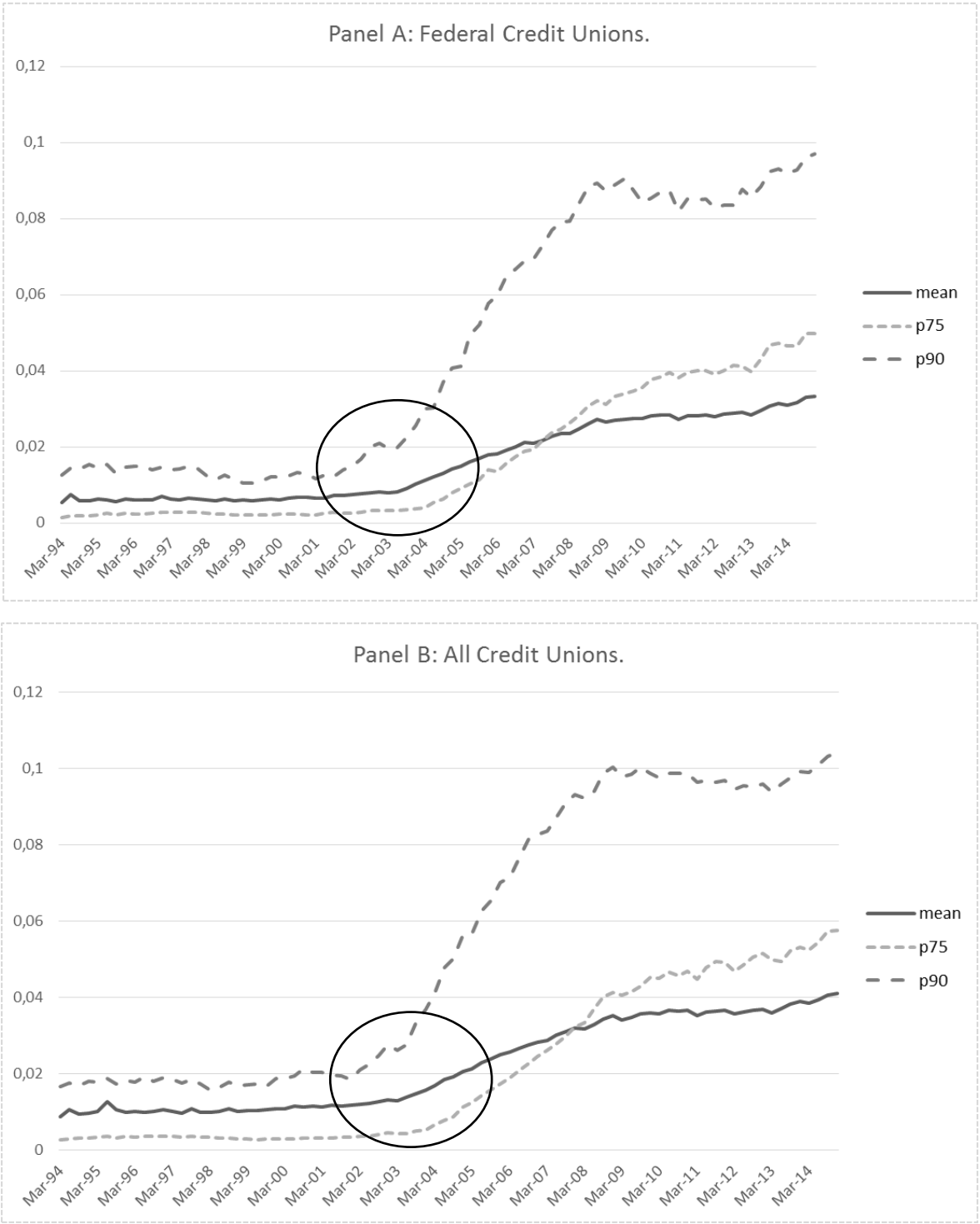

Source: Own calculation from call reports extracted from NCUA (1994 – 2014). Assets, S&D and Loans and Leases are in $billion. Members (right scale) is measured in millions of people.

**Figure 2. Number of CUs with the Low-Income Designation**




Source: Own calculation from call reports extracted from NCUA (1994 – 2014). The ellipse shows the impact of the LID initiative (Sept-2012).

**Figure 3. Ratios of business loans over total assets**




Source: Own calculation from call reports extracted from NCUA (1994 – 2014). The circles show the moment of introduction of regulation 68 FR 56552 by the NCUA (October 1st, 2003).

**Table 1: Descriptive statistics**

| *Panel A: basic descriptive statistics of the main variables* | | | | |
|---|---|---|---|---|
| **Variables** | | **Mean** | **Median** | **StdDev** |
| *Main dependent variables* | *Δshares* | 0.015 | 0.012 | 0.033 |
| | *ΔS&D* | 0.015 | 0.012 | 0.033 |
| | *CRISK3Y* | 0.010 | 0.008 | 0.008 |
| | *CRISK5Y* | 0.010 | 0.008 | 0.007 |
| *Credit union variables: risk-taking indicators and other CU characteristics* | *BL* | 0.024 | 0.001 | 0.069 |
| | *loansta* | 0.623 | 0.639 | 0.152 |
| | *sdROA* | 1.239 | 0.857 | 0.999 |
| | *ROA* | 0.002 | 0.002 | 0.005 |
| | *PL* | 0.482 | 0.000 | 0.664 |
| | *NWA* | 0.060 | 0.060 | 0.001 |
| | *NPL* | 0.010 | 0.007 | 0.009 |
| | *ch-offs* | 0.003 | 0.002 | 0.004 |
| | *NIM* | 0.009 | 0.009 | 0.002 |
| | *DRES* | 0.048 | 0.042 | 0.030 |
| | *chsalary* | 0.014 | 0.008 | 0.108 |
| | *size* | 18.896 | 18.660 | 0.953 |
| | *intrates* | 0.005 | 0.005 | 0.003 |
| | *Mstate* | 0.144 | 0 | 0.351 |
| | *com* | 0.192 | 0 | 0.394 |
| | *MFOM* | 0.550 | 1 | 0.497 |
| | *HASBL* | 0.556 | 1 | 0.497 |
| | *BLG* | 0.387 | 0 | 0.487 |
| | *LOWBL* | 0.532 | 1 | 0.499 |
| *Macro variables* | *chinc_s* | 1.101 | 1.130 | 1.188 |
| | *unemp_s* | 6.161 | 5.700 | 2.068 |
| | *Inf_s* | 0.561 | 0.600 | 0.977 |
| | *pcincome* | 0.563 | 0.580 | 0.259 |
| | *hi* | 0.593 | 1 | 0.491 |

**Table 1 (continued):**

*Panel B: correlation matrix*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *ΔS&D* | 1.00 | -0.06 | -0.08 | 0.03 | 0.01 | 0.01 | -0.03 | -0.07 | 0.00 | -0.07 | 0.26 | -0.10 | -0.10 | 0.02 | 0.10 |
| *CRISK3Y* | -0.04 | 1.00 | 0.92 | 0.15 | 0.11 | -0.21 | 0.22 | 0.24 | 0.00 | 0.78 | 0.13 | 0.14 | -0.02 | -0.02 | -0.12 |
| *CRISK5Y* | -0.06 | 0.93 | 1.00 | 0.17 | 0.12 | -0.21 | 0.20 | 0.22 | 0.00 | 0.66 | 0.11 | 0.10 | -0.01 | -0.01 | -0.10 |
| *BL* | 0.02 | 0.16 | 0.17 | 1.00 | 0.25 | -0.05 | 0.07 | 0.07 | 0.00 | 0.08 | 0.01 | -0.11 | -0.09 | 0.00 | 0.21 |
| *loansta* | 0.01 | 0.07 | 0.09 | 0.20 | 1.00 | 0.00 | 0.06 | 0.01 | 0.00 | 0.04 | -0.01 | 0.38 | -0.31 | 0.01 | 0.07 |
| *ROA* | -0.03 | -0.23 | -0.19 | 0.03 | -0.01 | 1.00 | -0.15 | -0.31 | 0.01 | -0.20 | -0.15 | 0.20 | 0.14 | -0.06 | 0.07 |
| *sdROA* | -0.04 | 0.25 | 0.20 | 0.04 | 0.03 | -0.17 | 1.00 | 0.63 | -0.01 | 0.24 | 0.08 | 0.10 | -0.02 | -0.02 | -0.06 |
| *PL* | -0.07 | 0.27 | 0.22 | 0.02 | 0.02 | -0.31 | 0.66 | 1.00 | -0.01 | 0.24 | 0.07 | -0.01 | -0.10 | -0.02 | -0.06 |
| *NWA* | 0.02 | -0.04 | -0.02 | 0.00 | -0.03 | 0.05 | -0.10 | -0.07 | 1.00 | 0.00 | 0.00 | -0.01 | 0.02 | 0.00 | 0.00 |
| *NPL* | -0.06 | 0.77 | 0.65 | 0.11 | 0.01 | -0.23 | 0.30 | 0.29 | -0.07 | 1.00 | 0.12 | 0.19 | -0.04 | -0.01 | -0.15 |
| *ch-offs* | 0.19 | 0.16 | 0.13 | -0.01 | -0.01 | -0.22 | 0.13 | 0.14 | -0.03 | 0.18 | 1.00 | 0.03 | -0.05 | 0.00 | 0.01 |
| *NIM* | -0.08 | 0.07 | 0.04 | -0.03 | 0.42 | 0.17 | 0.05 | 0.00 | -0.04 | 0.10 | 0.05 | 1.00 | -0.13 | 0.02 | -0.25 |
| *DRES* | -0.10 | 0.01 | 0.03 | 0.05 | -0.32 | 0.15 | -0.03 | -0.10 | 0.13 | -0.01 | -0.05 | -0.10 | 1.00 | 0.00 | -0.08 |
| *chsalary* | 0.02 | -0.01 | -0.01 | 0.00 | 0.00 | -0.06 | -0.02 | -0.02 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 1.00 | 0.00 |
| *size* | 0.08 | -0.05 | -0.04 | 0.10 | 0.06 | 0.04 | -0.05 | -0.06 | 0.01 | -0.10 | 0.03 | -0.28 | -0.10 | 0.00 | 1.00 |

Panel A: See Appendix A for variable definitions. Sample comprises credit unions with total assets higher than $50,000,000 observed through the period Q1 1994 to Q4 2014, excluding the quarter-CU observations in which a CU went through a merger. This yields a total of 149,363 credit union-quarter observations. Credit union variables were winsorized at the 0,5% level in each tail. MFOM information is available for federal and State CUs before 2002; since 2002 it is only available for federal CUs. Panel B: Spearman (Pearson) correlation coefficients of the variables as included in the regression models are shown above (below) the diagonal. Only correlations between CU-level variables are included. All correlations are significant at the 1% level. (1): *ΔS&D*; (2) *CRISK3Y*, (3) *CRISK5Y*, (4): *BL*; (5): *loansta*; (6): *ROA*; (7): *sdROA*; (8): *PL*; (9): *NWA*; (10): *NPL*; (11): *ch-offs*; (12): *NIM*; (13): *DRES*; (14): *chsalary* ; (15): *size*.

**Table 2: Business loan activity and CU characteristics**

*Panel A: mean value of CU characteristics as a function of the BL percentile*

| *BL percentile* | *BL* | *LID* | *MFOM* | *com* | *Mstate* | *size* | *loansta* | *ROA* | *sdROA* | *PL* |
|---|---|---|---|---|---|---|---|---|---|---|
| 0-50% | 0 | 0.070 | 0.562 | 0.195 | 0.132 | 18.601 | 0.565 | 0.0013 | 1.340 | 0.616 |
| 50%-75% | 0.005 | 0.090 | 0.521 | 0.223 | 0.124 | 18.842 | 0.595 | 0.0013 | 1.388 | 0.632 |
| 75%-90% | 0.059 | 0.115 | 0.419 | 0.281 | 0.150 | 19.377 | 0.655 | 0.0013 | 1.511 | 0.728 |
| >90% | 0.182 | 0.205 | 0.413 | 0.204 | 0.185 | 19.426 | 0.705 | 0.0013 | 1.521 | 0.652 |

*Panel B: the determinants of BL*

| Dependent variable | *HASBL* (*Selection equation*) | | *BL* (*Observation equation*) | |
|---|---|---|---|---|
| | (1) | | (2) | |
| Variables | Coefficient | z-statistic | Coefficient | z-statistic |
| $ROA_{t-1}$ | 5.889** | (2.41) | -0.156 | (-1.57) |
| $sdROA_{t-1}$ | 0.046*** | (8.37) | 0.001*** | (2.94) |
| $NWA_{t-1}$ | -45.186*** | (-5.99) | -1.798*** | (-7.12) |
| $NPL_{t-1}$ | 11.565*** | (20.17) | 0.443*** | (13.29) |
| $NIM_{t-1}$ | 17.401*** | (7.33) | 2.369*** | (15.51) |
| $DRES_{t-1}$ | -3.779*** | (-24.47) | -0.114*** | (-6.98) |
| $size_{t-1}$ | 0.416*** | (76.16) | 0.030*** | (23.54) |
| *LID* | 0.473*** | (28.50) | 0.017*** | (13.06) |
| *MFOM* | -0.323*** | (-35.83) | -0.005*** | (-4.90) |
| $intrates_{t-1}$ | -27.688*** | (-17.78) | | |
| $chinc\_s_{t-1}$ | -0.025*** | (-6.21) | -0.001*** | (-3.81) |
| $unemp\_s_{t-1}$ | 0.001 | (0.39) | -0.000 | (-1.40) |
| $inf\_s_{t-1}$ | -0.007 | (-1.56) | | |
| Observations | 87,993 | | 46,669 | |

Panel A: Mean value of CU characteristics. *BL*: Business loans/Total assets. *LID*: Dummy that takes 1 when the CU has the low income designation. *MFOM*: Dummy that takes value 1 when the CU has a multiple field of membership and 0 when it has a single field of membership or when it is a community CU. *com*: Dummy that takes value 1 when the CU is a community CU, 0 otherwise. See Appendix A for other variable definitions. Panel B: Heckman-s two-step selection model. *HASBL*: Dummy that takes value 1 when the CU has business loans, 0 otherwise. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level. Observation equation includes CU fixed effects and time effects.

**Table 3: Multiple FOM, multiple state and business loans as growth alternatives**

| *Panel A: descriptive statistics of BL and loans of CUs* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *BL* | | | *BL / loansta* | | | *loansta* | |
| | *Mean* | *P50* | *P75* | *Mean* | *P50* | *P75* | *Mean* | *P50* |
| *MFOM* = 0 | 0.023 | 0.002 | 0.025 | 0.036 | 0.003 | 0.040 | 0.619 | 0.638 |
| *MFOM* = 1 | 0.014 | 0 | 0.007 | 0.021 | 0 | 0.011 | 0.614 | 0.630 |
| *t-test* (p-value) | 0.000 | | | 0.000 | | | 0.000 | |
| *Mstate* = 0 | 0.023 | 0.001 | 0.020 | 0.035 | 0.002 | 0.032 | 0.622 | 0.638 |
| *Mstate* = 1 | 0.028 | 0.001 | 0.027 | 0.042 | 0.001 | 0.044 | 0.626 | 0.637 |
| *t-test* (p-value) | 0.000 | | | 0.000 | | | 0.000 | |

| *Panel B: the relationship of BL with size* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | *BL* | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
| | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *size* | 0.005*** | (11.69) | 0.022*** | (16.34) | 0.006*** | (11.92) | 0.016*** | (7.56) |
| *MFOM* | 0.037*** | (3.20) | 0.063*** | (8.63) | | | | |
| *size × MFOM* | -0.003*** | (-4.12) | -0.003*** | (-8.14) | | | | |
| *Mstate* | | | | | 0.026 | (1.06) | -0.042*** | (-4.34) |
| *size × Mstate* | | | | | -0.001 | (-0.93) | 0.002*** | (4.85) |
| Observations | 47,733 | | 46,420 | | 28,253 | | 27,952 | |
| CU and Time FE | YES | | YES | | YES | | YES | |
| *HASBL* = 1 | YES | | YES | | YES | | YES | |
| Macro and CU controls | NO | | YES | | NO | | YES | |
| Adj. R-squared | 0.009 | | 0.257 | | 0.007 | | 0.071 | |

Panel A: Descriptive statistics of *BL*, *BL/loansta* and *loansta*. P50: Median; P75: Percentile 75%. MFOM: Dummy that takes value 1 when the CU has a multiple field of membership, 0 when the CU has a single field of membership or when it is a community CU. *Mstate*: Dummy that takes value 1 when the CU operates in more than one state, 0 otherwise. See Appendix A for other variable definitions. Panel B: Fixed-effects panel regressions of *BL* on indicators of growth strategies. t-statistics are based on standard errors clustered by CU and time. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level. Columns 1 and 3 show the results of models with no additional control variables. Columns 2 and 4 show the results of models with the following macro and CU controls: $ROA_{t-1}$, $sdROA_{t-1}$, $PL_{t-1}$, $NWA_{t-1}$, $NPL_{t-1}$, $NIM_{t-1}$, $DRES_{t-1}$, $chsalary_{t-1}$, $intrates_{t-1}$, $chinc\_s_{t-1}$, $unemp\_s_{t-1}$ and $inf\_s_{t-1}$. All columns in the table include the condition HASBL=1 (the regression is run only for CUs with BL>0).

**Table 4: Business loans and credit risk**

| *Panel A: levels of loan risk (NPL+ch-offs) three years forward* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | | *CRISK3Y* | | | | | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| Variables | Pred. | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| *loansta* | + | 0.010*** | (5.53) | 0.010*** | (5.24) | 0.012*** | (5.49) | 0.010*** | (5.29) |
| $BL_{t-1}$ | + | 0.043*** | (4.25) | 0.038*** | (4.34) | 0.041*** | (4.20) | 0.034*** | (4.24) |
| $MFOM_{t-1}$ | ? | 0.000 | (1.26) | 0.000 | (1.46) | 0.000 | (1.25) | 0.000 | (1.39) |
| $BLG_{t-1}$ | + | | | -0.001*** | (-4.09) | | | -0.001*** | (-6.09) |
| $LOWBL_{t-1}$ | - | | | | | -0.001** | (-2.13) | -0.002*** | (-3.29) |
| $BLG_{t-1} \times LOWBL_{t-1}$ | + | | | | | | | 0.001*** | (3.19) |
| $BL_{t-1} \times BLG_{t-1}$ | + | | | -0.005*** | (-4.77) | | | -0.004*** | (-4.82) |
| $BL_{t-1} \times LOWBL_{t-1}$ | + | | | | | -0.004 | (-0.30) | 0.026 | (0.26) |
| $BL_{t-1} \times BLG_{t-1} \times LOWBL_{t-1}$ | + | | | | | | | 0.017 | (0.16) |
| Observations | | 67,875 | | 33,817 | | 67,505 | | 33,817 | |
| Adj. R-squared | | 0.319 | | 0.338 | | 0.323 | | 0.341 | |
| CU and Time FE | YES | YES | | YES | | YES | | CU and Time FE | |
| CU and Macro controls | YES | YES | | YES | | YES | | CU and Macro controls | |

**Table 4 (continued):**

| *Panel B: levels of loan risk (NPL+ch-offs) five years forward* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | | *CRISK5Y* | | | | | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| Variables | Pred. | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| *loansta* | + | 0.012*** | (6.81) | 0.012*** | (6.75) | 0.012*** | (6.73) | 0.012*** | (6.66) |
| $BL_{t-1}$ | + | 0.043*** | (4.10) | 0.035*** | (3.41) | 0.042*** | (4.01) | 0.034*** | (3.28) |
| $MFOM_{t-1}$ | ? | 0.000 | (1.43) | 0.001* | (1.86) | 0.000 | (1.40) | 0.001* | (1.83) |
| $BLG_{t-1}$ | + | | | -0.001*** | (-2.89) | | | -0.001*** | (-4.63) |
| $LOWBL_{t-1}$ | - | | | | | -0.001* | (-2.14) | -0.001 | (-1.50) |
| $BLG_{t-1} \times LOWBL_{t-1}$ | + | | | | | | | 0.000** | (2.09) |
| $BL_{t-1} \times BLG_{t-1}$ | + | | | -0.003*** | (-3.10) | | | -0.003*** | (-3.14) |
| $BL_{t-1} \times LOWBL_{t-1}$ | + | | | | | 0.011 | (0.84) | -0.080* | (-1.96) |
| $BL_{t-1} \times BLG_{t-1} \times LOWBL_{t-1}$ | + | | | | | | | 0.143*** | (2.89) |
| Observations | | 58,383 | | 27,823 | | 33,817 | | 27,823 | |
| Adj. R-squared | | 0.332 | | 0.346 | | 0.333 | | 0.346 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |

Fixed-effects panel regressions with Driscoll-Kraay standard errors. *CRISK3Y* is the average measure of credit risk (NPL + Charge offs) over the following 3 years. *CRISK5Y is* the average measure of credit risk over the following 5 years. Control variables in both panels: $Mstate_{t-1}$, $ROA_{t-1}$, $NWA_{t-1}$, $NIM_{t-1}$, $DRES_{t-1}$, $loansta_{t-1}$, $size_{t-1}$, $chinc\_s_{t-1}$, $unemp\_s_{t-1}$ and $inf\_s_{t-1}$. *BLG* is a dummy equal to 1 when *BL* growth is positive and higher than loan growth for a specific quarter, zero otherwise. *LOWBL* is a dummy equal to 1 when the value of *BL* is lower than the median of the sample in the prior quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 5: Baseline models of member discipline: the response of shares and deposits to credit union fundamentals**

| *Panel A: baseline specification not accounting for selection* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | | *Δshares* | | | | *ΔS&D* | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $BL_{t-1}$ | - | -0.010** | (-2.06) | -0.007* | (-1.89) | -0.009* | (-1.84) | -0.007* | (-1.73) |
| $loansta_{t-1}$ | - | 0.036*** | (13.55) | 0.034*** | (12.99) | 0.038*** | (14.57) | 0.037*** | (14.25) |
| $ROA_{t-1}$ | + | 0.622*** | (7.41) | 0.675*** | (7.49) | 0.646*** | (7.47) | 0.715*** | (7.58) |
| $sdROA_{t-1}$ | - | 0.001 | (1.40) | 0.000 | (1.27) | 0.001 | (1.48) | 0.000 | (1.35) |
| $PL_{t-1}$ | - | -0.000 | (-0.63) | -0.001 | (-1.40) | -0.000 | (-0.63) | -0.001 | (-1.53) |
| $PL_{t-1} \times sdROA_{t-1}$ | - | -0.001*** | (-3.99) | -0.001*** | (-3.28) | -0.001*** | (-4.09) | -0.001*** | (-3.38) |
| $NWA_{t-1}$ | + | 0.974*** | (5.61) | 1.017*** | (5.63) | 0.986*** | (5.52) | 0.995*** | (5.38) |
| $NPL_{t-1}$ | - | -0.196*** | (-11.77) | -0.192*** | (-11.25) | -0.205*** | (-12.75) | -0.203*** | (-12.00) |
| $ch\text{-}offs_{t-1}$ | - | -0.374*** | (-5.19) | -0.296*** | (-3.86) | -0.393*** | (-5.51) | -0.313*** | (-4.09) |
| $NIM_{t-1}$ | + | 0.449*** | (2.86) | 0.309** | (2.06) | 0.435*** | (2.69) | 0.266* | (1.67) |
| $DRES_{t-1}$ | + | 0.152*** | (13.03) | 0.171*** | (11.31) | 0.157*** | (13.16) | 0.178*** | (11.28) |
| $size_{t-1}$ | ? | -0.013*** | (-12.23) | -0.002** | (-2.14) | -0.013*** | (-12.10) | -0.002** | (-2.17) |
| $chsalary_{t-1}$ | - | -0.001** | (-1.99) | -0.014*** | (-11.27) | -0.001** | (-2.03) | -0.014*** | (-11.00) |
| $intrates_{t-1}$ | + | 3.078*** | (10.12) | 2.635*** | (8.05) | 2.972*** | (9.87) | 2.449*** | (7.49) |
| $chinc\_s_{t-1}$ | + | 0.001*** | (3.33) | 0.001*** | (3.10) | 0.001*** | (3.29) | 0.001*** | (3.07) |
| $unemp\_s_{t-1}$ | - | -0.001*** | (-3.20) | -0.001*** | (-3.26) | -0.001*** | (-3.18) | -0.001*** | (-3.26) |
| $inf\_s_{t-1}$ | + | -0.002 | (-1.52) | -0.001 | (-1.09) | -0.002 | (-1.51) | -0.001 | (-1.02) |
| Observations | | 141,276 | | 80,061 | | 141,276 | | 80,061 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| *HASBL* = 1 | | NO | | YES | | NO | | YES | |
| Adj. R-squared | | 0.369 | | 0.358 | | 0.365 | | 0.353 | |

**Table 5 (continued):**

| *Panel B: accounting for selection (HASBL=1)* | | | | | | |
|---|---|---|---|---|---|---|
| Dependent variable | *HASBL (Selection equation)* | | *Δshares (Observation equation)* | | *ΔS&D (Observation equation)* | |
| | (1) | | (2) | | (3) | |
| Variables | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| $BL_{t-1}$ | | | -0.013** | (-2.12) | -0.015** | (-2.33) |
| $loansta_{t-1}$ | | | 0.037*** | (11.78) | 0.040*** | (12.71) |
| $ROA_{t-1}$ | 5.486* | (1.70) | 0.614*** | (4.79) | 0.641*** | (5.23) |
| $sdROA_{t-1}$ | 0.049*** | (7.19) | 0.001 | (1.31) | 0.001 | (1.25) |
| $PL_{t-1}$ | | | -0.000 | (-0.84) | -0.001 | (-1.01) |
| $PL_{t-1} \times sdROA_{t-1}$ | | | -0.001*** | (-3.19) | -0.001*** | (-3.35) |
| $NWA_{t-1}$ | -47.296*** | (-7.73) | 1.376*** | (6.07) | 1.372*** | (5.84) |
| $NPL_{t-1}$ | 11.462*** | (18.05) | -0.207*** | (-9.24) | -0.212*** | (-9.53) |
| $ch\text{-}offs_{t-1}$ | | | -0.251*** | (-3.05) | -0.280*** | (-3.42) |
| $NIM_{t-1}$ | 18.349*** | (3.64) | 0.203 | (0.93) | 0.176 | (0.78) |
| $DRES_{t-1}$ | -3.792*** | (-32.99) | 0.168*** | (9.17) | 0.175*** | (9.30) |
| $size_{t-1}$ | 0.418*** | (32.93) | -0.019*** | (-13.75) | -0.019*** | (-13.42) |
| $chsalary_{t-1}$ | | | -0.002* | (-1.94) | -0.002* | (-1.80) |
| $intrates_{t-1}$ | -27.948*** | (-6.36) | 3.042*** | (8.43) | 2.886*** | (8.13) |
| *LID* | 0.475*** | (17.42) | | | | |
| *MFOM* | -0.323*** | (-50.28) | | | | |
| *Lambda (Mills)* | | | -0.0012*** | (3.58) | -0.0013*** | (3.28) |
| Observations | 85,995 | | 45,399 | | 45,399 | |
| Macro controls | YES | | YES | | YES | |
| CU and time FE | NO | | YES | | YES | |

Panel A: FE panel regressions of *Δshare*s and *ΔS&D* on CU characteristics. Columns 2 and 3 include the condition that *HASBL*=1. *HASBL* is a dummy that takes value 1 when the CU has business loans, 0 otherwise (the regression is run only for CUs with BL>0). Panel B: Heckman two-step selection models. Column 1 - Selection equation: Probit model for *HASBL* as a function of *CU* characteristics. Column 2 - Observation equation for *Δshares*: FE panel regressions of *Δshares* on CU characteristics accounting for selection into offering business loans. Column 3 - Observation equation for *ΔS&D*: Fe panel regressions of *ΔS&D* on CU characteristics accounting for selection into offering business loans. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 6: The response of shares and deposits to business loans**

| *Panel A: not accounting for HASBL=1* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | | *ΔS&D* | | | | | | | |
| CU characteristic / Income measure | | *MFOM* | | *com* | | State income (percentile) | | High-income state | |
| | | (1) | | (2) | | (3) | | (4) | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $BL_{t-1}$ | - | -0.022*** | (-3.01) | -0.006 | (-1.18) | 0.018* | (1.73) | -0.001 | (-0.18) |
| $loansta_{t-1}$ | + | 0.044*** | (13.42) | 0.038** | (14.59) | 0.038*** | (14.30) | 0.038*** | (14.57) |
| *MFOM* | + | -0.001 | (-1.00) | | | | | | |
| $MFOM \times BL_{t-1}$ | - | 0.016* | (1.70) | | | | | | |
| *com* | + | | | 0.001** | (2.31) | | | | |
| $com \times BL_{t-1}$ | - | | | -0.018*** | (-3.61) | | | | |
| *pcincome* | + | | | | | -0.003 | (-1.16) | | |
| $pcincome \times BL_{t-1}$ | - | | | | | -0.045*** | (-3.26) | | |
| *hi* | + | | | | | | | 0.001 | (1.53) |
| $hi \times BL_{t-1}$ | - | | | | | | | -0.011** | (-2.20) |
| Observations | | 86,240 | | 141,276 | | 131,216 | | 141,276 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |
| Adj. R-squared | | 0.375 | | 0.365 | | 0.370 | | 0.365 | |

**Table 6 (continued):**

| *Panel B: accounting for selection into HASBL=1* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | | *ΔS&D (Observation equation)* | | | | | | | |
| CU characteristic / Income measure | | *MFOM* | | *com* | | State income (percentile) | | High-income state | |
| | | (1) | | (2) | | (3) | | (4) | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $BL_{t-1}$ | - | -0.023* | (-3.18) | -0.007 | (-0.90) | 0.032 | (1.58) | -0.010 | (-0.98) |
| $loansta_{t-1}$ | - | 0.040*** | (12.73) | 0.040*** | (12.71) | 0.040*** | (12.79) | 0.040*** | (12.70) |
| *MFOM* | + | -0.001* | (-1.78) | | | | | | |
| $MFOM \times BL_{t-1}$ | - | 0.019** | (2.04) | | | | | | |
| *com* | + | | | 0.002** | (2.50) | | | | |
| $com \times BL_{t-1}$ | - | | | -0.016* | (-1.87) | | | | |
| *pcincome* | + | | | | | 0.002 | (0.54) | | |
| $pcincome \times BL_{t-1}$ | - | | | | | -0.080*** | (-2.64) | | |
| *hi* | + | | | | | | | 0.001 | (0.80) |
| $hi \times BL_{t-1}$ | - | | | | | | | -0.007 | (-0.59) |
| Observations | | 45,399 | | 45,399 | | 42,951 | | 45,399 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |

Panel A: Fixed-effects panel regressions of shares and shares and deposit growth on CU characteristics. Panel B: Selection models. Selection equations (not shown): Probit model for *HASBL* as a function of *CU* characteristics. *HASBL*: Dummy that takes value 1 when the CU has business loans, 0 otherwise. Columns 1-4 - Observation equation for *ΔS&D*: Fixed-effects panel regressions of shares and deposits growth on CU characteristics accounting for selection into offering business loans. *MFOM*: Dummy that takes value 1 when the CU has a multiple field of membership, and 0 when it has a single field of membership or when it is a community CU. *com*: Dummy that takes value 1 when the CU is a community CU, 0 otherwise. *pcincome* is a weighted average of the percentile of the income of the states where the CU operates. The dummy *hi* (high income) is a 1 if the state where the CU is located is above the median in terms of personal income, 0 otherwise. CU and Macro controls are the same as in Table 2. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level. Results for the selection equations are similar to those obtained in table 2: they are not shown given space constraint but they are available from the authors upon request.

**Table 7. The change to a low-income designation: effect on growth in business loans and total shares and deposits of the LIDI "experiment"**

| *Panel A: growth in Business Loans* | | | | | | |
|---|---|---|---|---|---|---|
| Quarter | Prediction | Difference | p-value | Quarter | Difference | p-value |
| Quarter by quarter effects | | | | Cumulative effects | | |
| t | + | **0.0656** | **0.014** | 0q | **0.0656** | **0.014** |
| t+1 | + | -0.0297 | 0.148 | 1q | 0.0339 | 0.214 |
| t+2 | + | **0.0821** | **0.009** | 2q | **0.1212** | **0.025** |
| t+3 | + | -0.0027 | 0.475 | 3q | **0.1427** | **0.040** |
| t+4 | + | -0.0308 | 0.361 | 4q | **0.1516** | **0.070** |
| *Panel B: growth in Total Shares and Deposits* | | | | | | |
| Quarter | Prediction | Difference | p-value | Quarter | Difference | p-value |
| Quarter by quarter effects | | | | Cumulative effects | | |
| t+1 | - | **-0.0038** | **0.046** | 1q | **-0.0054** | **0.046** |
| t+2 | - | -0.0005 | 0.422 | 2q | **-0.0061** | **0.082** |
| t+3 | - | 0.0018 | 0.256 | 3q | -0.0045 | 0.190 |
| t+4 | - | -0.0015 | 0.212 | 4q | -0.0060 | 0.154 |

Panel A: t-tests of the difference in growth in business loans between treatment and control groups; Treatment group: CUs that change to low-income designation at the LIDI (June and September 2012); Control group: CUs that were low-income in 2011Q1 and continue to be low-income in 2013Q4. t: present quarter; 0q: effect on the quarter of impact. 1q, 2q, 3q, 4q cumulative effect (3 months, 6 months, 9 months, 12 months ahead). Panel B: t-tests of the difference in growth in Total Shares and Deposits between treatment and control groups; Treatment group: CUs that change to low-income designation at the LIDI (June and September 2012); Control group: CUs that were low-income in 2011Q3 and continue to be low-income in 2013Q4. t: present quarter; 1q, 2q, 3q, 4q cumulative effects (3 months, 6 months, 9 months, 12 months ahead).

**Table 8: The change to a low-income designation: diff-in-diffs estimators of the impact on growth in total shares and deposits of the LIDI "experiment"**

| *Panel A: Baseline specification* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent variable | | *ΔS&D* | | | | | |
| | | (1) | | (2) | | (3) | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| *TA* | | 0.000 | (0.10) | 0.002 | (1.09) | 0.001 | (0.65) |
| *pt* | | 0.005 | (1.08) | -0.011*** | (-5.18) | -0.006*** | (-3.74) |
| *TA × pt* | - | -0.001 | (-0.31) | -0.004* | (-1.74) | -0.002 | (-0.76) |
| Control variables | | YES | | YES | | YES | |
| Observations | | 801 | | 1,599 | | 2,395 | |
| Adj. R-squared | | 0.069 | | 0.350 | | 0.276 | |
| *Panel B: controlling for income level* | | | | | | | |
| Dependent variable | | *ΔS&D* | | | | | |
| | | (1) | | (2) | | (3) | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| *TA* | | -0.003 | (-0.66) | -0.004 | (-1.06) | 0.000 | (0.03) |
| *pt* | | 0.006 | (1.02) | -0.014*** | (-3.53) | -0.007** | (-1.98) |
| *pcincome* | | -0.004 | (-0.59) | -0.011** | (-2.04) | 0.002 | (0.31) |
| *TA × pt* | - | 0.007 | (1.05) | 0.004 | (0.77) | 0.001 | (0.12) |
| *TA × pcincome* | | 0.008 | (0.86) | 0.013* | (1.79) | 0.003 | (0.43) |
| *pt × pcincome* | | 0.000 | (0.04) | 0.008 | (1.09) | 0.001 | (0.20) |
| *TA × pt × pcincome* | - | -0.018 | (-1.46) | -0.019* | (-1.88) | -0.005 | (-0.62) |
| Control variables | | YES | | YES | | YES | |
| Observations | | 801 | | 1,599 | | 2,403 | |
| Adj. R-squared | | 0.072 | | 0.352 | | 0.276 | |

**Table 8 (continued):**

| *Panel C: controlling for income level (2)* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent variable | | *ΔS&D* | | | | | |
| | | (1) | | (2) | | (3) | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| *TA* | | -0.003 | (-1.09) | -0.001 | (-0.59) | -0.000 | (-0.18) |
| *pt* | | 0.005 | (1.05) | -0.013*** | (-5.03) | -0.007*** | (-3.05) |
| *hi* | | -0.005 | (-1.38) | -0.006** | (-2.15) | -0.000 | (-0.08) |
| *TA* × *pt* | - | 0.004 | (0.96) | 0.000 | (0.07) | -0.000 | (-0.11) |
| *TA* × *hi* | | 0.010** | (2.07) | 0.010** | (2.55) | 0.005 | (1.60) |
| *pt* × *hi* | | 0.003 | (0.63) | 0.006 | (1.48) | 0.000 | (0.08) |
| *TA* × *pt* × *hi* | - | -0.014** | (-2.12) | -0.014*** | (-2.64) | -0.005 | (-1.01) |
| Control variables | | YES | | YES | | YES | |
| Observations | | 801 | | 1,599 | | 2,403 | |
| Adj. R-squared | | 0.074 | | 0.352 | | 0.276 | |

Panel A: regressions of shares and deposit growth around the LIDI experiment. Regression specifications include only the treatment variable *TA* and "post" variable *pt*. Panel B: regressions of shares and deposit growth around the LIDI experiment the variable. The regression specification distinguishes the effect of *pcincome*, which is a weighted average of the percentile of the income of the states where the CU operates. Panel C: regressions of shares and deposit growth around the LIDI experiment the variable. The regression specification distinguishes the effect of the dummy *hi* (high income), which is a 1 if the state where the CU is located is above the median in terms of personal income, 0 otherwise. Panels A-C: TA: Treatment group, CUs that change to low-income designation at the LIDI 2012Q3); *pt*: post treatment. Column (1): *pt*=1 for 2012Q4, 0 for 2012Q3; column (2): *pt*=1 for 2012Q4-2013Q1, 0 for 2012Q2-2012Q3; column (3): *pt*=1 for 2012Q4-2013Q2, 0 for 2012Q1-2012Q3. Control variables in all panels include $ROA_{t-1}$, $sdROA_{t-1}$, $PL_{t-1}$, $PL_{t-1} \times sdROA_{t-1}$, $NWA_{t-1}$, $DRES_{t-1}$, $NPL_{t-1}$, $ch\text{-}offs_{t-1}$, $NIM_{t-1}$, $BL_{t-1}$, $loansta_{t-1}$, $size_{t-1}$, $chsalary_{t-1}$, $intrates_{t-1}$, $chinc\_s_{t-1}$, $unemp\_s_{t-1}$ and $inf\_s_{t-1}$. See Appendix A for variable definitions*, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 9. The change in business loans regulation: effect on growth in total shares and deposits**

| *Growth in Total Shares and Deposits* | | | | | | |
|---|---|---|---|---|---|---|
| Quarter | Prediction | Difference | p-value | Quarter | Difference | p-value |
| Quarter by quarter effects | | | | Cumulative effects | | |
| t+1 | - | **-0.0106** | **0.016** | 1q | **-0.0106** | **0.016** |
| t+2 | - | -0.0033 | 0.268 | 2q | **-0.0123** | **0.038** |
| t+3 | - | 0.0035 | 0.265 | 3q | **-0.0159** | **0.031** |
| t+4 | - | 0.0010 | 0.718 | 4q | -0.0127 | 0.124 |

Matching estimators of the difference in growth in Total Shares and Deposits between treatment and control groups; Treatment group: 10 % federal credit unions with higher increase in business loans between October 1st 2003 and March 31st 2004; Control group: matched CUs from the 90% federal credit unions with lower increase in business loans between October 1st 2003 and March 31st 2004. (Number of matches = 1). t: Present quarter; 1q, 2q, 3q, 4q cumulative effects (3 months, 6 months, 9 months, 12 months ahead). Matching variables: $BL_t$, $size_t$, $ROA_t$, $NWA_t$, $DRES_t$, $NPL_t$, $ch\text{-}offs_t$, $loansta_t$, $chsalary_t$, $intrates_t$. Exact matching: State, FOM (Field of Membership). Estimates shown correspond to the bias-adjusted estimator of the Average Treatment Effect on the Treated of Abadie and Imbens (2011).

**Table 10: The change in business loans regulation: diff-in-diffs estimators of the effect on growth in total shares and deposits**

| *Panel A: control group are all federal CUs not in treatment group* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | *ΔS&D* | | *ΔS&D* | | *ΔS&D* | | *ΔS&D* | |
| Variables | Prediction | Coefficient | t-statistic | Coefficient | Coefficient | Coefficient | t-statistic | Coefficient | t-statistic |
| *TB* | | 0.000 | (0.17) | 0.001 | (0.71) | 0.017*** | (18.34) | 0.009*** | (12.48) |
| *pt* | | -0.004 | (-1.38) | 0.005*** | (5.96) | -0.002*** | (-2.99) | -0.005*** | (-7.34) |
| *TB × pt* | - | -0.000 | (-0.01) | -0.002 | (-0.75) | -0.016*** | (-10.28) | -0.008*** | (-6.08) |
| Controls included | | YES | | YES | | YES | | YES | |
| Observations | | 3,385 | | 6,706 | | 10,092 | | 13,389 | |
| Adj. R-squared | | 0.075 | | 0.090 | | 0.241 | | 0.226 | |
| *Panel B: control group are the federal CUs with growth in business loans below the 10% lower* | | | | | | | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | *ΔS&D* | | *ΔS&D* | | *ΔS&D* | | *ΔS&D* | |
| *TB10* | | -0.005* | (-1.80) | -0.002 | (-1.25) | 0.007*** | (4.98) | 0.004*** | (3.66) |
| *pt* | | -0.011* | (-1.79) | 0.001 | (0.59) | -0.009*** | (-5.01) | -0.010*** | (-6.20) |
| *TB10 × pt* | - | 0.004 | (1.11) | 0.002 | (0.60) | -0.006*** | (-2.93) | -0.004** | (-2.14) |
| Controls included | | YES | | YES | | YES | | YES | |
| Observations | | 680 | | 1,354 | | 3,237 | | 5,017 | |
| Adj. R-squared | | 0.072 | | 0.091 | | 0.337 | | 0.298 | |

Panel A: regressions of shares and deposit growth around the 2003 change in business loan regulation. Regression specifications include the treatment variable TB, the "post" variable *pt* and their interaction, along with a set of controls. Treatment group (*TB*=1): Federal CUs with change in business loans higher than 90% of the population. Control group (*TB*=0): Federal CUs with change in business loans in the 90% lower. Panel B: regressions of shares and deposit growth around the 2003 change in business loan regulation. Regression specifications include the treatment variable TB10, the "post" variable *pt* and their interaction, along with a set of controls. Treatment group (*TB10*=1): equal to *TB*. Control group (*TB10*=0): Federal CUs with a growth in business loans below the 10% lower. Panels A and B: *pt*: post treatment. Column (1): *pt*=1 for 2003Q4, 0 for 2003Q3; column (2): *pt*=1 for 2003Q4-2004Q1, 0 for 2003Q2-2003Q3; column (3): *pt*=1 for 2003Q4-2004Q2, 0 for 2003Q1-2003Q3; column (4): *pt*=1 for 2003Q4-2004Q3, 0 for 2002Q4-2003Q3. Control variables in both panels: $ROA_{t-1}$, $sdROA_{t-1}$, $PL_{t-1}$, $PL_{t-1} \times sdROA_{t-1}$, $NWA_{t-1}$, $NPL_{t-1}$, $ch\text{-}offs_{t-1}$, $NIM_{t-1}$, $BL_{t-1}$, $loansta_{t-1}$, $size_{t-1}$, $chsalary_{t-1}$, $intrates_{t-1}$, $chinc\_s_{t-1}$, $unemp\_s_{t-1}$, and $inf\_s_{t-1}$. See Appendix A for variable definitions*, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

# Chapter 2:

## 2. The borrower orientation of credit unions and earnings management: evidence and real effects


### Abstract

The credit union sector has undergone considerable growth in recent years. However, given the relative low sophistication of credit union operations and of their depositor/member base, little attention has been paid to issues of financial transparency and, more specifically, to the use of accounting (earnings) discretion by credit unions. In this paper we provide the first comprehensive evidence of the use of earnings management strategies by credit unions through the use of discretionary charges to the loan loss provision. We show that credit unions carry out strategies of income smoothing, big baths and loss avoidance similar to those of other financial institutions. We then go one step further and show how this earnings discretion may be, at least partly, explained by their particular maximization problem, which leads to a saver/borrower orientation. Specifically, we analyze the effects of earnings discretion on the supply of loans and on dividend payments. We also examine a local exogenous shock and show how those credit unions which managed (increased) their earnings through discretion were able to achieve significantly higher rates of growth of their loan portfolio without significantly affecting their financing through a loss of members or deposits.



**Keywords:** credit unions, earnings management, real effects.
**JEL Classification:** M41, G12.

## 2.1. Introduction

The credit union sector has gone through a period of steady growth in recent years. However, our understanding of the way these financial cooperatives work has not evolved in a parallel manner. The early literature on credit unions (going back more than thirty years: see below) focused on the main implications of their peculiar organizational and governance mechanisms but, given the relative low sophistication of credit union operations and of their depositor/member base, little attention was paid to issues of financial transparency and, more specifically, to the use of accounting (earnings) discretion by credit unions. In this paper we provide the first comprehensive analysis of the use of earnings management strategies by credit unions (CUs) through discretionary charges to the loan loss provision. We first show that credit unions carry out strategies of income smoothing, big baths and loss avoidance similar to those of other financial institutions. We then go one step further and look at possible motivations for the use of such accounting strategies by CUs. In particular, we postulate that this earnings discretion may be, at least partly, explained by the peculiar maximization problem in which CUs maximize value for their owners (members) by offering them better financial services, mainly higher remuneration in their deposits (saver orientation) and better access to and rates on loans (borrower orientation). Specifically, we analyze the relationship between earnings discretion and deposits, dividends and the supply of loans by credit unions in a set of descriptive analyses and show how earnings management seems to be related to a higher supply of loans and higher remuneration on CU deposits. These descriptive results suggest that the use of EM strategies by CUs may have real effects in the economy through the potential impact on the local supply of loans. In order to provide some evidence of these real effects, we finally examine the use of EM strategies around a local exogenous shock and show how those credit unions which managed (increased) their earnings through discretion were able to achieve significantly higher rates of growth of their loan portfolio without losing members or deposits and, therefore, without generating tensions on the financing side of their balance-sheets.

The (relatively mature) literature on CUs focused on the implications of the particularities of the credit union mechanisms and regulations and the implications of such differential features, emphasizing the issues that set CUs apart from other financial institutions. Examples of these differentiating issues were the peculiar maximization problem of credit unions (given the dual character of depositors as owners), including the saver and/or borrower orientation or “bias” of CU operations (Frame et al.,2003; Fried et al., 1993, 1999; Smith et al., 1981; Smith, 1984), the consequences of the tax exemption and cooperative character on competition and interest rates (Feinberg, 2001; Hannan, 2003), the implications of the field of membership restrictions on CU behavior (Black and Dugger, 1981; Ely, 2014; Goddard et al., 2002) or the peculiarities of the

analysis of CU performance (Bauer, 2008; Fried et al., 1993; Goddard et al., 2008; Wilcox, 2005, 2006) and risk-taking strategies (Bauer et al., 2009; Ely, 2014; Fiordelisi and Mare, 2014). This emphasis on the idiosyncrasies of CUs may have led to a certain neglect of some topics which seemed to be less relevant for CUs than for other financial institutions, for example, the pressure or discipline exercised by financial markets or the financial transparency of CUs. In particular, we are not aware of analyses centered on whether, and how, CU managers exercise discretion over their accounting information and, more specifically, on the motivations which might be behind this discretionary use of accounting. In this paper we examine both issues and show evidence of the use of EM strategies by CU managers and link these strategies to the potential motivations that may be behind the use of accounting discretion. Our paper has significant implications for our understanding of the overall financial system since it contributes in three main areas. First, to our knowledge, we provide the first comprehensive analysis of how CUs carry out strategies of earnings management (EM) similar to those used by other financial institutions. Second, our descriptive evidence raises the question of the motivations that CUs may have to manage (distort) their accounting information. Indeed, given their peculiar maximization problem, CUs are less subject to the pressures of discipline stemming from the financial markets. Also, the level of asymmetries between CU management and CU members/shareholders is probably significantly lower than in commercial banks. These factors suggest that CUs could have significantly lower incentives to manage their earnings. We contribute to this discussion by providing a tentative motivation based on the saver and/or borrower orientation of CUs. This leads us to design a set of analyses which show that the savings rates and the loan granting behavior of the CU may be affected by the use of EM practices. Third, our evidence of the effectiveness of EM to affect the amount of loans granted by the CU contributes to the literature on the real effects of accounting. We show how accounting discretion (EM) can have a direct effect on the economy through increasing the loan granting capacity of the financial intermediaries. This latter contribution, we believe, makes our results significantly far reaching in terms of policy and regulatory implications.

In order to carry out these ambitious research objectives, we put together a large database of US credit union accounting information. Our quarterly data cover all CUs with assets greater than $50M and a sample period from 1994 to 2015. We identify EM practices in CUs with the use of discretionary levels of the loan loss provision (LLP), which we justify is the main tool available for CUs to apply accounting discretion.

We offer two main sets of results. The first set of results relies on descriptive and regression analyses, which allow us to describe the EM behavior of CUs and link the reaction of share dividends (or dividends on deposits) and of loans and deposits to accounting information. In

particular, these results suggest that CUs use the discretionary part of the LLP to carry out EM strategies similar to those identified for banks: we show evidence of income smoothing, loss avoidance and big baths when earnings before discretion are positive, negative but close to zero and negative but large in absolute value, respectively.

Our second set of results focuses on the analysis of the effectiveness of the use of discretionary income (EM) to affect dividends (saver orientation) and the supply of loans (borrower orientation). For this purpose, we start with two descriptive analyses which serve as a motivation. First, we show that loans, deposits and membership in the CUs react to the volatility of earnings (thus justifying income smoothing) and to the presence of losses (thus justifying loss avoidance and, based on an intertemporal argument, earnings baths). Second, we show that the use of earnings discretion is correlated with growth in the loan portfolio and with higher remuneration of deposits. Tentatively, these results suggest that indeed the saver/borrower orientation of the CU may be behind the use of EMs and that such EM strategies might have real effects on the local economy. We then use matching estimators around a local exogenous shock which affected CU behavior at the time of Hurricane Katrina. The use of these estimators allows us to alleviate the concerns of endogeneity of EM practices and to offer evidence suggestive of the effectiveness of EM in affecting the loan portfolio of the CU without affecting the financing side. We focus our analysis on CUs located in the counties affected by the hurricane and show how the CUs which increased their earnings (and, consequently, net worth) through the use of low values of the discretionary part of LLP (hereafter, DLLP) managed to achieve rates of growth of their loan portfolio 5%-10% higher than those CUs which did not increase (rather, decreased) their earnings through discretion. This evidence of the effectiveness of EM to affect the loan granting activity of the CU provides a link from accounting discretion into the real economy.

Taken as a whole, our results contribute significantly to our understanding of the behavior of a particular type of financial intermediary (CUs) along a dimension that had been relatively overlooked by the previous literature. However, and more importantly, the quasi-experimental evidence we provide has relevant policy implications related to the supervision and regulation of the financial system, in general, and to the interplay between accounting regulation and the real economy, in particular. This latter conclusion rests on what we believe is the key result in our paper, namely that accounting discretion by CUs allows them to increase significantly their loan granting activity and, consequently, to have a direct impact on the real economy.

The remainder of the paper is organized as follows. In section 2.2 we describe credit unions and analyze the motivations CUs may have to engage in EM or capital management strategies. This

section motivates the analyses in the paper. In Section 2.3, we briefly describe our data. In Section 2.4 we show a first set of results where we uncover evidence of how credit unions follow similar earnings management strategies to those documented for banks. In this section we also offer some descriptive motivation for these strategies based on loan, deposit and member reaction to volatility and losses. In Section 2.5 we describe the results of an analysis designed around an exogenous shock which allows us to draw conclusions indicative of the effectiveness of earnings management to affect positively the loan granting activity of credit unions without affecting the financing side. In Section 2.6 we summarize and offer some concluding comments.

## 2.2. The peculiar features of credit unions and earnings management

Credit unions are financial cooperative associations which serve a limited group of members according to a defined "field of membership". This restriction, which can be relaxed by applying for a multiple field of membership, constitutes their most salient feature and it limits the possibility of the CU to grow. Thus, it is especially important for CUs to be able to attract and keep the largest amount of members possible within the restricted potential membership. Apart from these membership restrictions, credit unions have other specific characteristics that also set them apart from commercial banks: (1) given their cooperative nature CUs benefit from a tax exemption; (2) CUs have strict restrictions to the type of services they can offer to their members: for example, most CUs are subject to a limit regarding the amount of business loans that they can grant (Chapter one); (3) CUs have a unique structure of ownership where members are at the same time owners and customers (depositors and loan recipients); (4) members are subject to a one-member-one-vote rule;[29] (5) shares are not listed in the stock market: instead, shares are treated as deposits for which members receive an interest rate (also called a dividend rate).

The unique ownership structure of CUs implies a peculiar maximization problem. Instead of having shareholder value maximization as the main objective, which gets accomplished by paying traditional dividends as a participation of net income or via capital gains, credit unions maximize the value for their owners/members by offering them better financial services via both quantity and price.[30] According to Smith et al (1981) CUs maximize the value of their members by (1) paying higher saving rates (called "dividends on shares"), (2) facilitating the granting of loans by implementing lower credit constraints and (3) setting lower interest rates on loans (see, also, Bauer, 2008; Smith, 1984; Smith, 1988). CUs may typically emphasize one of these channels to reward the members: CUs which emphasize the dividends on shares are considered to be saver oriented

[29] The one-member-one-vote rule implies that all members of a CU have the same control rights regardless of the amount of shares (deposits) they have in the CU.
[30] Under specific conditions CUs may pay traditional dividends (See §1763 of The Federal Credit Union Act).

while those which emphasize lower credit constraints or lower loan rates are considered to be borrower oriented. The literature has shown abundant evidence of this different emphasis on behavior of CUs relative to banks and how it affects the real strategies followed by CU managers (see, e.g., Frame et al., 2003; Fried et al., 1993, 1999). However, there is, to our knowledge, no study which examines the implications of this maximization problem on the accounting strategies used by CU managers and, more specifically, on earnings management. One possible reason for this lack of evidence may be the acknowledgement that CU managers do not share many of the motivations that banks have to manage earnings (and, as a consequence, capital): first, CU compensation plans tend not to be as strong and as frequently based on targets as in banks; second, CU shares do not trade in financial markets, thus reducing significantly the incentive to alleviate market reaction to earnings or capital information;[31] third, the information asymmetries within the CU are likely to be much less relevant than in banks, given both the dual character of owners/members as depositors and debtors and the closeness of the relationship implied by field of membership; finally, CUs are cooperative organizations where financial performance will be of secondary concern, especially given that most CUs will generally have net worth ratios (the measure used to gauge capital adequacy) well above the threshold to be considered well capitalized. All in all, it appears that typical earnings management strategies aimed at income smoothing or loss avoidance or at the management of capital ratios should be much less used by CUs, if at all.

We argue, however, that there are, at least, two mechanisms which give CUs incentives to use accounting earnings (and capital) management strategies. First, in chapter one it has been shown that CU members exercise market-based discipline (similar to that which owners and depositors exercise on banks) on the CU, and withdraw their shares or leave membership when the CU fundamentals deteriorate or the CU increases its risk-taking. Managing earnings and capital may help ameliorate this disciplining effect and, therefore, have a positive effect on the stability of the CU's financing base. Second, the saver/borrower orientation of the CU, along with some regulatory requirements specific to CUs, may lead to earnings management strategies aimed at affecting capital (net worth) ratios so that the CU can keep the ability to grant loans and reward shareholders. For example, the US Congress imposed in 1998 a ceiling on the amount of business loans CUs could grant. This limit, in its current wording, prevents a CU from making any member business loan that would result in a total amount of such loans outstanding equal to more than the

[31] We are aware that private banks may also engage in earnings and capital management strategies (Barth et al., 2017). Nevertheless, there is broad consensus that public banks have higher incentives to use such strategies than private banks (Beatty and Petroni, 2002; Nichols et al., 2009)

lesser of 1.75 times the actual net worth of the credit union or 1.75 times the minimum net worth required for a credit union to be well capitalized (7% of total assets).[32] Even though other regulatory conditions regarding business loans have been steadily relaxed, this limit is still applicable and it effectively restricts the loan granting capacity of the CU relative to the value of the CU's net worth. Under these two arguments, the use of earnings management strategies by CUs is justified, and indeed both arguments suggest that such strategies can have real economic effects, if it is the case that CUs use EM to be able to increase the supply of loans to their members while at the same time they prevent negative effects on the financing (deposit) side. This discussion serves to motivate our analyses. In the following sections we attempt, first, to examine whether there is significant evidence of earnings management behavior in CUs and, second, to link this behavior to the capacity of the CU to grant loans and keep a stable (and highly rewarded) base of depositors.

### 2.3. Data

Our main analyses use a large dataset of quarterly credit union balance-sheet and income statement information which covers the period between 1994Q1 and 2015Q4. These data were collected from the CU call reports available at the National Credit Unions Administration (NCUA). We selected CUs with assets greater than $50 million because before 2002Q3 only such CUs reported quarterly financial statements, while smaller CUs reported semiannually. This subsampling strategy yielded a maximum of 158,238 usable quarterly observations corresponding to a total of 2,293 CUs. Appendix A lists in full the main variables used throughout all our analyses, some of which we review more explicitly as we move ahead.[33] In order to avoid problems with outliers, continuous CU variables were winsorized at the 0.5% level in each tail. Tables 1 and 2 show some descriptive statistics and correlations of the main CU-level variables. We do not comment on these statistics, which are mostly self-explanatory. Finally, we also collected information on variables which allow us to control for macroeconomic conditions. In particular, given that most CUs concentrate their operations in one state we collect two economic variables, namely personal income per capita and the unemployment rate, measured at the state level. Given that in our regressions the time fixed effects control for macroeconomic factors of a national/global character, these two variables are intended to control for common economic factors of a local nature which may, in fact, be more relevant for the relatively local operations of CUs. Data on these variables

[32] This limit does not apply to CUs chartered for the explicit purpose of making business loans or to CUs with a low-income designation or which are community development financial institutions.
[33] Variables which are generated to be used in specific sections of our analysis are explained both in the text of that particular section and, if results are shown in a table, in the table caption.

were obtained from the Federal Reserve of Saint Louis (FRED) and from the Bureau of Labor Statistics.

In Section 5, which constitutes the second part of our analysis, we use the destruction caused by Hurricane Katrina in August 2005 as an exogenous shock which allows us to construct a matched sample and offer a set of quasi-experimental results. In order to establish which credit unions were affected by this local "shock" we use the county where the headquarters of the credit union is located, extracted from the "FOICU" files from the NCUA. For the list of counties affected by Katrina we consider those designated by FEMA (Federal Emergency Management Agency) as "Individual assistance areas".[34]

### 2.4. Earnings management in credit unions: a descriptive look

We first look for evidence of whether CUs engage in earnings management (EM) behavior. In order to show evidence of such behavior, we use a battery of graphical and statistical analysis, but we also take a descriptive look at the potential motivations for the use of EM by CUs. Thus, we first examine the discretionary strategies followed by CUs using the analyses that have traditionally been applied to banks. We then build on the arguments in Section 2 and examine evidence of the reaction of loans and members/deposits to earnings discretion and to the fundamentals affected by earnings discretion. We use this two-part breakdown of our descriptive work as an introduction and motivation to the analysis of EM effectiveness in Section 5, which is more causal in nature and attempts to show that EM activities by CUs can lead to an expansion of loans which may, therefore, have real effects on the local economy.

#### 2.4.1. The LLP as the EM tool for credit unions

The accounting literature on earnings and capital management in financial institutions, mainly banks, is quite large (see Beatty and Liao, 2014, for a review). One reason behind this interest on the banking sector is that banks have at their disposal a discretionary accrual (the loan loss provision, LLP hereafter) and several types of transactions (financial asset sales and asset securitizations) which are all natural candidates to be used as EM tools. In particular, an extensive part of the literature has focused on the analysis of the use of the LLP for income smoothing (Ma, 1988; Beatty et al., 1995; Collins et al., 1995; Ahmed et al., 1999; Laeven and Majnoni, 2006) or for non-linear strategies which suggest big-bath and loss avoidance behavior for banks reporting losses (Laeven and Majnoni, 2006; Bouvatier and Lepetit, 2008; Balboa et al., 2013). Securities sales (Beatty et al., 1995, or Barth et al., 2017), especially AFS securities, and asset securitizations

[34] https://www.fema.gov/disaster/1603/designated-areas

(Karaoglu, 2005, or Dechow and Shakespeare, 2009) have also been found to be effective tools which banks use for such earnings management strategies.

CUs present in their balance-sheets relatively low amounts of securities (the median of AFS securities in the CUs in our sample is only 2.74% of total assets, whereas they represent around 16% of total assets in banks: Nissim and Penman, 2007) and were not authorized to carry out securitizations during our sample period.[35] Consequently, we expect that the LLP is the most likely tool that CUs will use if they want to carry out EM strategies and we focus our analysis on the discretionary part of the LLP. The tax exemption that CUs enjoy, in fact, reinforces this argument: the LLP is deducted in full terms (not net of taxes) so the impact on net income of the discretionary part of the LLP is potentially higher than in commercial banks and, therefore, EM through the LLP may, in fact, be more effective in CUs. Panel B of Table 1 contains some descriptives of the LLP in our sample of CUs, including a split depending on whether pre-discretion earnings are positive or negative. We comment on these descriptives along with the results of the analyses of the next two subsections.

### 2.4.2. Evidence of earnings management strategies in CUs: income smoothing, big baths and loss avoidance

In order to show evidence of the use of EM strategies by CUs we start by using an approach similar to that in Burgstahler and Dichev (1997). In particular, we compare the (unconditional) distributions of net income (*NI*) and a measure of income before discretionary items (*NIBD*). Given the evidence in the literature applied to other types of firms and banks, we expect this comparison to uncover several features: if EM is used for income smoothing, the volatility of *NI* will be lower than that of *NIBD*; if EM is used for loss avoidance, we expect that the distribution of *NIBD* will be relatively normal, whereas the distribution of *NI* will show a "discontinuity" around zero (Burgstahler and Dichev, 1997); finally, if EM is used for big baths (loss decreasing strategies in the presence of large losses) we expect to observe a large asymmetry in the distribution of discretionary income, especially when focusing on CUs with negative *NIBD*.

We construct a proxy of discretionary earnings which allows us to compute income before discretion (or "core income"), *NIBD*. As explained in Section 4.1, we focus on the use of the loan loss provision (LLP) as the main tool which CUs can use for earnings management. We isolate the

[35] In June 2014, the NCUA proposed a rule that would allow qualified CUs to securitize loans: https://www.ncua.gov/newsroom/Pages/news-2014-june-ncua-proposes-allowing-credit-unions-securitize-own-assets.aspx. However, as of the end of our sample in December 2015, the rule had not been approved yet (See: https://www.ecfr.gov/cgi-bin/text-idx?SID=340ad1205fe7b94131975f1cef30df71&mc=true&tpl=/ecfrbrowse/Title12/12CVIIsubchapA.tpl).

discretionary part of the LLP using a regression-based approach similar to that used in the banking literature. In particular, we estimate a regression model for the LLP as a function of three main determinants:

$$LLP_i = \beta_0 + \beta_1 NPL_i + \beta_2 \Delta NPL_i + \beta_3 loans_i + \varepsilon_{i,} \qquad (1)$$

Throughout the paper we measure the LLP as a positive number, so a higher value implies a larger charge to the provision and, therefore, a reduction of earnings (and viceversa). The independent variables in equation (1) are non-performing loans, the change in non-performing loans and the total level of loans.[36] All variables used in this regression are deflated by total assets.[37] The regression was estimated cross-sectionally quarter by quarter in order to control for cyclical variations in the quality of the CUs' loan portfolio.[38] We then take the estimated residual $\hat{\varepsilon}_i$ from (1) as the quarter-by-quarter value of the discretionary LLP for each CU:

$$DLLP_{it} = \hat{\varepsilon}_i \text{ , from the regression of quarter } t, \qquad (2)$$

and calculate net income before discretionary earnings as

$$NIBD_{it} = NI_{it} + DLLP_{it}. \qquad (3)$$

We first compute *NIBD* and *NI* at both quarterly and annual frequencies and plot the unconditional distributions of the two variables in Figures 1-2. In order to make our analysis parallel with Burgstahler and Dichev (1997), the variables shown in the distributional graphs are scaled by total net worth instead of total assets. For more convenient visualization, we omitted from the distributions the winsorized observations in each tail (0.5%). For completeness, we also plot in Figure 3 the distribution of *DLLP*, along with its distribution for two different subsamples, one where we condition on the CU having negative *NIBD* ("core" losses) and one where we condition on the CU having positive *NIBD*. The distributions, and the results of additional untabulated statistical tests, show the following:

[36] NPLs, change in NPLs and total loans are widely used in the literature as proxies for credit risk and portfolio composition. We are aware that some models also use charge offs and the value of the loan loss allowance (see Beatty and Liao, 2014). We constructed an alternative measure of DLLP where we include charge offs in equation (1) for robustness and used this alternative definition for the histogram analysis in figures 1 to 3 and for the regressions in table 3. The results did not change significantly and are available upon request. With respect to the loan loss allowance, we include it as one of the main controls in equation (4).

[37] See Appendix A for more detailed variable definitions.

[38] Part of the nondiscretionary LLP arises as a consequence of provisioning reserves to cover the expected level of future credit losses in the bank's loan portfolio. This component of the provision is driven by company-specific characteristics and by the macroeconomic conditions that determine the credit quality. As a result, the LLP typically exhibits a strong cyclical component which is negatively correlated to business cycle indicators: see, e.g., Bikker and Metzemakers (2005) and Laeven and Majnoni (2006).

1) The variance of *NI* is significantly lower than that of *NIBD*, a finding suggestive of *income smoothing*. This result holds even though the range of the distribution (particularly in the left tail) is larger for *NI*; an un-tabulated test for the difference of variances of the two distributions allows us to reject the null hypothesis of equality of the variances at the 1% significance level both in the quarterly and in the annual distributions (quarterly unconditional variances are 1.6% and 1.7% for *NI* and *NIBD*, respectively; annual variances are 6.9% and 7.8%, respectively).

2) The distribution of *NI* shows a kink or discontinuity around zero, suggestive of *loss avoidance*; this can be seen in the distributions, especially in Figure 2 (annual measures), a finding which suggests that the loss avoidance behavior is spread out unevenly throughout the year. Un-tabulated chi-square tests constructed by using the expected frequencies in intervals around zero (we tried different widths for robustness and the results were consistent) always show that the frequency of observations of *NI* to the left of zero is lower than expected given the distribution of *NIBD* and the frequency of observations of *NI* to the right of zero is higher than expected. These tests are significant at the 1% level. Additionally, as we move away from zero on both sides these chi-square tests stop rejecting the null of equal distributions, suggesting that indeed the main difference between the shapes of the two distributions corresponds to the discontinuity around zero.[39]

3) *Big bath* behavior (loss decreasing strategies in the face of losses) is evident in the graphs by comparing the left tail of the distributions of *NI* and *NIBD*: note that, despite *NI* having a lower variance than *NIBD*, the left tail of its distribution is longer, suggesting that some CUs increase their losses by overcharging to the LLP. This behavior is also apparent in Figure 3, where we observe that the right tail (higher charges to the LLP) of the distribution of *DLLP* is thicker for the group of CUs with negative *NIBD* (panel B). Interestingly, the percentage of observations with positive *DLLP* (i.e., which overcharge to the LLP) is 31.42% conditional on having negative *NIBD* whereas it is 46.23% for observations with positive *NIBD*. However, as the descriptives of Table 1 Panel B showed, the average value of *DLLP* is significantly larger for the former (0.0013) than for the latter (0.0009). This suggests, indeed, that there is a strong right-asymmetry in the distribution of *DLLP* for CUs with pre-discretion losses compared to those with pre-discretion profits, a behavior we interpret to be highly suggestive of big bath strategies.

The previous analyses, though visually appealing, are unconditional in nature. We refine now our inferences by estimating regression models where we test more formally for the existence of the different EM strategies we have described above while controlling for relevant CU characteristics.

[39] All these chi-square-type tests are available upon request.

We set up a series of models where we use as dependent variable the discretionary part of the LLP identified above.[40] We then setup our baseline regression model as follows:

$$DLLP_{it} = \beta_{0i} + \beta_1 NIBD_{it} + CU\ controls + Macro\ controls + u_i + d_t + \varepsilon_{i,t,} \qquad (4)$$

CU controls include the lagged net worth over total assets as a proxy for the capital adequacy of the credit union, the lagged value of the loan loss allowance, a proxy for CU reserves for expected losses, a proxy for size (log of total CU assets), the proportion of securities over total assets, as a proxy for CU orientation, and a measure of unfunded commitments of credits as a proxy for the size of the riskiest assets.[41] We also include the lagged value of *DLLP* as a control for persistence of discretionary earnings and two macroeconomic variables measured at the state level that control for local cyclical effects: personal income and unemployment rates.[42] Finally, we include CU fixed effects, to control for unobserved idiosyncratic factors of the CU, and time effects to control for changes in general macroeconomic conditions.

We build up our analysis by starting with a baseline model which only includes *NIBD* (our main regressor of interest) along with controls and then estimate more elaborate models with additional terms which depend on the sign and size of *NIBD*. This strategy allows us to provide evidence of the different EM strategies. The different models estimated are shown in Table 3 panel A. Column (1) contains the results of the baseline model. We expect to find a positive and significant coefficient of *NIBD*. This would indicate that CUs charge a higher value of the discretionary LLP when "core" (pre-discretion) earnings are higher, which would suggest income smoothing behavior. Indeed, we obtain a positive, statistically significant coefficient (0.034, t-stat of 4.08) which suggests that CUs smooth 3.4% of their core earnings by over (under) charging to the LLP in quarters where core earnings are high (low). As a robustness check, in column (2) we estimate the same baseline model using an alternative measure of "core earnings", namely profit before the discretionary loan loss provision and before interest on shares and deposits. We use this alternative measure to control for the fact that CUs distribute earnings via dividends (interests) on shares and deposits (see Bauer, 2008). The results are comparable.

[40] Alternative models with the full value of the LLP as the dependent variable but which included NPL, the change in NPL and loans over assets as additional controls were also estimated for robustness. The results did not differ significantly.

[41] Net worth over total assets is used by the NCUA to establish the capital adequacy of Credit Unions see: 702.102 Statutory net worth categories https://www.law.cornell.edu/cfr/text/12/702.102. Net worth over total assets is also used commonly as a capital ratio in the literature (Ely, 2014; Goddard et al., 2008)

[42] Given the length of our panel the inclusion of the dynamic term has a negligible effect on our results (Wooldridge, 2002).

We next test for evidence of big bath behavior and loss avoidance. Column (3) shows the results of an expanded version of equation (4) where we include a dummy *NEG*, defined as a one for CUs with negative *NIBD*, and its interaction with *NIBD*. The coefficient estimate suggests that CUs with negative core earnings tend to use loss increasing strategies and overcharge to the LLP (note the negative and significant coefficient of the interaction *NEG* × *NIBD*). Specifically, now we observe that income smoothing is mostly a positive *NIBD* phenomenon (i.e. higher charges to the LLP are made when core earnings are positive: the estimated coefficient suggests that 8.2% of *NIBD* is reduced by using DLLP) whereas CUs with core losses tend to increase them by 6.2% (the sum of the two coefficients on *NIBD*). This big bath behavior is usually justified in the presence of a relatively large loss which cannot be reversed: by overcharging to the LLP in a "very bad quarter" the CU may save for the future and implement lower future charges to increase income when losses are lower. This suggests that the size of the loss may be relevant, since small losses may be reversed by using discretionary earnings (a negative discretionary charge to the LLP) whereas large losses may be increased. We examine this possibility in columns (4) and (5), where we now include two different dummies: *lowloss* is a one for the CUs with core losses (negative *NIBD*) in the upper 5% of the distribution (i.e., the smallest losses in absolute value); *highloss* is a one for the rest of observations of CUs with core losses (i.e., the CUs with larger losses in absolute value). In column (4) we include in the baseline model *lowloss* and its interaction with *NIBD*. Note that the estimated coefficient of the interaction *lowloss* × *NIBD* suggests that CUs with small losses reverse them by undercharging to the LLP: the coefficient is larger than one, suggesting a full reversal of the loss, and statistically significant. In column (5) we include both *lowloss* and *highloss*, and their respective interactions with *NIBD*. This specification gives us the full picture. We observe significant income smoothing (8.2% of the core earnings) for CUs with positive *NIBD*, loss avoidance of the CUs with small losses (97.1% of the core loss, which is not statistically different from full avoidance) and big bath behavior for CUs with large losses (6.0% increase of the core loss by overcharging to the LLP).[43]

The literature on bank earnings management has also used benchmarks to understand earnings management behavior (see, e.g., Barth et al., 2017): managers may have explicit or implicit benchmarks for earnings (Healey, 1985) or capital (Moyer, 1990) which generate incentives to manipulate earnings around the benchmark. In order to show additional evidence of the use of EM strategies by CUs, we set up two analyses where we describe the behavior of discretionary earnings

[43] We examined the possibility that our results might be affected by the financial crisis. As a robustness check, we re-estimated the regressions in Table 3 eliminating the period of the financial crisis (as defined by the NBER recession dating committee). The results, available upon request, remain unchanged.

around two possible benchmarks. We first take a closer look at loss avoidance, and use zero as a possible benchmark for cumulative earnings through the year. In particular, we examine whether CUs use discretionary earnings to avoid posting losses in their quarter-by-quarter earnings. We generate the variable *BENCH* which is equal to the pre-discretion cumulative income of each quarter. Specifically, *BENCH* is equal to $NIBD_t$ in the first quarter, ($NIBD_t + NI_{t-1}$) in the second quarter, ($NIBD_t + NI_{t-1} + NI_{t-2}$) in the third quarter and ($NIBD_t + NI_{t-2} + NI_{t-3} + NI_{t-4}$) in the fourth quarter. We then split *BENCH* into two variables: *NEG_BENCH* is the value of *BENCH* if *BENCH*<0, and 0 otherwise, and *POS_BENCH* is the value of *BENCH* if *BENCH*>0, and 0 otherwise. Panel B1 of Table 3 contains the results of regressing the value of *DLLP* on these two variables, along with a set of controls (see table caption) and CU and time fixed effects. We estimate three specifications, one which uses data for all quarters (column 1) and two where we split the data into observations corresponding to quarters 1-3 (column 2) and quarter 4 (column 3). This latter split allows us to understand if avoiding a loss in the last quarter of the year is especially relevant. The results for the overall sample (column 1) suggest the use of big baths when the CU is falling short of the benchmark, but there is no evidence of smoothing positive cumulative income. However, the split in columns (2) and (3) qualifies these results. During the year (quarters 1-3), there is some mild evidence of big baths (note the coefficient of *NEG_BENCH* in column 2, which is negative and insignificant, but borderline so) but strong evidence of positive income smoothing: the coefficient of *POS_BENCH* suggests that indeed when CUs have positive income, they smooth down some of it by overcharging to the LLP. The results of quarter 4, however, suggest that in this quarter there are significant income increasing strategies (undercharges to the LLP when income is positive: see the negative and significant coefficient of *POS_BENCH*) and large big baths (large negative and significant coefficient of *NEG_BENCH*). This last result suggests that CUs which are going to post a loss in the final quarter of the year, tend to increase such loss by overcharging to the LLP. This big-bath behavior may stem from the combined effect of the impossibility to revert a relatively large loss and the building of a hidden reserve in the overcharging to the LLP (see, e.g., Barth et al., 2017, for similar arguments). Interestingly, the results in these regressions (where the sign of some coefficients reverses depending on the quarter examined) provide a story in line with our expectations but also they give credibility to our proxy of discretionary income: if *DLLP* was just mechanically related to pre-discretion income *NIBD*, we would not observe such a sign reversal in the correlations.

In Panel B2 of Table 3 we use a second definition of a potential benchmark that CU managers may want to meet. We now generate a variable *BENCH2* which is the difference between pre-discretion cumulative income of each quarter and the previous year's cumulative income. More specifically,

*BENCH2* is $NIBD_t - NI_{t-4}$ in the first quarters, $(NIBD_t + NI_{t-1}) - (NI_{t-4} + NI_{t-5})$ in the second quarters, $(NIBD_t + NI_{t-1} + NI_{t-2}) - (NI_{t-4} + NI_{t-5} + NI_{t-6})$ in the third quarters and $(NIBD_t + NI_{t-1} + NI_{t-2} + NI_{t-3}) - (NI_{t-4} + NI_{t-5} + NI_{t-6} + NI_{t-7})$ in fourth quarters. As we did with *BENCH*, we split *BENCH2* into *NEG_BENCH2* and *POS_BENCH2*. Panel B2 of Table 3 shows the results of estimating models similar to those in panel B1 with these two regressors along with controls (see table caption) and CU and time fixed effects The results for the overall sample (column 1) now do not show a significant use of big baths when the CU is falling short of last year's benchmark, but show significant evidence of income smoothing relative to the benchmark. The split in columns (2) and (3) once again paints a clearer picture. During the year (quarters 1-3), there is no evidence of big baths relative to this second benchmark, but there is strong evidence of income smoothing: the coefficient of *POS_BENCH2* shows that when CUs have income which exceeds last year's benchmark, they smooth it down by overcharging to the LLP. This behavior seems to be consistent throughout the year, including in the last quarter (column 3). The results in column 3, however, suggest strongly that in this quarter there is significant big bath behavior (large negative and significant coefficient of *NEG_BENCH2*). Taken together, the results in panels B1 and B2 suggest that CUs perform income smoothing through the year, but leave big baths (relative to zero or to the previous year's income) and loss avoidance for the last quarter of the year. We believe this evidence aligns nicely with the motivations for earnings management we will examine in the following sections.

### 2.4.3. The reaction of loans and deposits to volatility and losses

The evidence shown so far suggests that CUs use EM strategies similar to those used by other financial institutions (Beatty and Liao, 2014), although with some qualifications regarding, especially, the timing of big baths. We now proceed to analyze these results in the light of the peculiar objectives of the CU. This analysis should shed light on the motivations CUs have for such accounting practices. In particular, the characteristics and operations of CUs suggest that the pressures from (equity) investors which are generally offered as the main justification for EM in banks may not be relevant for CUs for which the main pressures likely come from the members' expectations about the financial services provided by the CU. This, that Smith (1984) and Smith et al. (1981) called the "borrower" and "saver" orientation of CUs, suggests that CUs care about being able to provide loans and reward deposits at advantageous rates and to keep their member base. We examine now whether these objectives may be behind the EM behavior of CUs.

We start by performing some analyses similar in spirit to those in the literature on depositor discipline (Calomiris and Powell, 2001; Martinez Peria and Schmukler, 2001). CUs have an incentive to perform earnings smoothing and loss avoidance strategies (and, indirectly, big baths

so future losses can be avoided) if loans or deposits/membership in the CU react significantly to the volatility of CU fundamentals (earnings and capital/net worth) and to the presence of losses. We show evidence of such reactions by estimating several versions of the following model:

$$\Delta Y_{it} = \beta_{0i} + \beta_1 sdNI_{it-1} + \beta_2 sdNW_{it-1} + \beta_3 PL_{it-1} + Interactions + \text{CU controls} + \text{Macro controls} + u_i + d_t + \varepsilon_{it,} \quad (5)$$

where $\Delta Y_{it}$ is, alternatively, the growth rate in total loans (measured as total loans and leases plus charge-offs, minus recoveries and plus loans held for sale), in deposits (total shares and deposits) and in the number of members of the CU. The main explanatory variables are a measure of volatility of net income $sdNI_{it-1}$ and a volatility of net worth $sdNW_{it-1}$, computed as the standard deviation of *NI* and *NW* over the previous twelve quarters, respectively. We also include a measure of past losses of the credit union $PL_{it-1}$ (the natural logarithm of one plus the number of quarters in which the CU posted losses during the previous 12 quarters). In some specifications we interact the volatility measures with past losses to account for the fact that loans and deposits may only react to "bad volatility". We control for CU characteristics, such as return on assets, net worth, non-performing loans, size, shares and deposits and unfunded commitments, and for macroeconomic conditions at the state level (see table caption for the full list of controls). We also include in all specifications CU and time fixed effects.

Table 4, Panel A, shows the results of four specifications estimated for loan growth which contain an increasing number of volatility and losses variables. We restrict our focus to the estimated coefficients on these variables. Results on the volatility of net worth are not significant (columns 2-3) or show the opposite sign to what would be expected (interaction of column 4), so we interpret this result as evidence that the capital adequacy of the CU is not seen as a major determinant of loan growth. The results of the other three variables (*sdNI*, *PL* and the interaction *sdNI* × *PL*) suggest, however, that the loan granting activity of the CU reacts negatively to bad fundamentals (volatile income, losses or volatile income in the presence of losses). Panel B of the table shows the results for members and deposit growth, where we have only included two of the specifications of Panel A. The results, again, suggest that membership in the CU and deposits both react negatively to volatile income and to the presence of losses. The effect of net worth now is more aligned with our expectations and points at volatile net worth leading to a loss of members and deposits.

The results of these analyses are descriptive in nature, but we believe they suggest that a deterioration in some CU fundamentals (high volatility or losses) is negatively associated with the behavior of loans and deposits (including membership in the CU). We take these results as initial evidence that a motivation behind the earnings smoothing and loss avoidance behavior we have

documented in Section 4.2 may be the willingness to reduce this "disciplining" behavior: note that earnings management practices aimed at loss avoidance and earnings smoothing could be effective in reducing the flight of depositors and borrowers. In order to show further evidence along these lines, we link now the use of discretionary earnings to the behavior of loans, deposits and dividends.

#### 2.4.4. The reaction of loans, deposits and savings rates (dividends) to the discretionary use of the LLP.

Given the saver and/or borrower orientation of CUs, the negative reaction of loans and deposits to volatility and losses provides a motivation for the use of EM strategies of income smoothing and loss avoidance. This is particularly relevant given that the loan granting activity of the CU represents the main channel through which the CU contributes to the real economy. Thus, an interesting question arises which is the possibility of EM having a direct "real impact" on the economy, by allowing the CU to grant more loans while retaining its financing (depositors). This would represent a "positive externality" of non-transparent accounting practices. The remainder of the paper centers around the following question: are the CUs which manage (increase) their earnings through the LLP able to expand their loan portfolio significantly more than those which do not? Answering this question satisfactorily requires a more careful design of our econometric analysis, which has to be able to deal with the concerns of endogeneity of the use of *DLLP*. We attempt to do this in Section 5, where we take advantage of an exogenous shock which we believe allows us to draw causal inferences about the effectiveness of EM strategies. Before we do so, we provide some preliminary evidence that discretionary income may indeed allow the CU to expand loans. We show in Table 5, Panel A, the results of descriptive analyses where we regress, for our full sample of CUs, the changes in loans and deposits on the (lagged) value of the *DLLP*, which we have been using so far as a measure of earnings management activity, and on (lagged) *NIBD*, to control for the impact of pre-discretion earnings. These regressions also include a set of CU and macro controls (see table caption) along with CU and time fixed effects. Column 1 of the panel shows the results of estimation of the baseline model. The estimation results suggest that CUs which increase their earnings with discretionary income –by using low values of the discretionary LLP- manage to increase their loans by a larger amount. In particular, loans seem to be much more sensitive to *DLLP* than to *NIBD* (the negative and significant coefficient on the latter variable could be interpreted as a smoothing of the loan granting activity by the CU). The coefficients suggest that a 1% reduction in the discretionary charge to the LLP leads to a 3% impact on loans in the subsequent quarter. Column 2 expands on this result by controlling for the effect of the

economic cycle.[44] To that end, we introduce in the regression a proxy for economic conditions (the lagged change in state-level unemployment) and interact the cyclical proxy with the value of *DLLP*. The results suggest that in bad times (increasing unemployment) CUs which increase their earnings through discretion manage to achieve higher subsequent rates of growth in their loan portfolio. Columns 3-4 show results of the same two specifications using total shares and deposit growth as the dependent variable. The results are comparable to those in loans: CUs which use discretion seem to obtain higher rates of deposit growth (1.6% increase in deposits per 1% reduction in charges to the LLP). As with loans, this effect is reinforced in bad economic times (note the negative and significant coefficient of the interaction in column 4). These results are, admittedly, descriptive and suggest an association between the use of discretionary income (low charges to the LLP) and a higher loan granting and deposit activity. In order to provide stronger evidence of a causality link (i.e. of the effectiveness of EM to have real effects on the local economy by allowing the CU to expand its loans while not losing deposits) we use in Section 5 an exogenous shock to construct a matched sample analysis.

As a final analysis of the possible motivation provided by the saver orientation of the CU, we estimate in Panel B of Table 5 the same models in Panel A but using now *Divshares* as dependent variable. *Divshares* is measured as the average spread between the rates paid on total shares by the CU and the 3-month T-Bill. These rates, which are subject to authorization by the Board of Directors, can be different for different types of shares (members' deposits) and are, therefore, more similar to a dividend than to an interest rate on the deposit.[45] We regress the value of these dividends on the same main regressors used in Panel A, although we use a modified measure of core income, namely *NIBDD*, which is defined as net income before *DLLP* and before the dividend rate paid on shares.[46] These models should provide evidence of whether CU managers use discretionary earnings to maximize value for its member/owners via higher interest on deposits. The results are shown in Panel B of Table 5. Column 1 shows the results of the baseline analysis for quarterly data. We find a negative and significant coefficient for lagged *DLLP* (-0.037 with t-

[44] Jiménez et al. (2017) examine in a slightly different context, whether provisioning through the LLP helps to alleviate cyclical vulnerabilities. In particular, their results use the behavior of provisioning in a particular country (Spain) where the LLP contains two components (a *dynamic* and a *specific* provision). The evidence they present suggests that the dynamic component of the provision mitigates credit supply cycles and has strong positive effects on aggregate firm-level credit, employment and firm survival during crisis times. This interplay between the specific and dynamic parts of the LLP is similar to that of our nondiscretionary/discretionary components: our evidence in Section 4 suggests that CUs use the discretionary component of LLP to smooth out the impact of shocks, thus leading to potential real effects on the CU's capacity to grant loans.

[45] See: § 701.35 Share, share draft, and share certificate accounts; 12 U.S. Code § 1763 – Dividends.

[46] We have used the dividend rate on shares instead of interest and dividend rate on shares and deposits to isolate the effect of payments to members deposits. Also, we use *NIBDD* (net income before DLLP and dividend on shares) as the main regressor given that the dividend is treated as interest in the income statement. In an alternative, not tabulated, analysis we use interest on shares and deposits and the results remain unchanged.

stat of -7.67) and a positive and significant result for lagged *NIBDD* (0.126 with t-stats 6.00). These results suggest that a reduction in discretionary LLP (an increase in discretionary income) is associated with a subsequent increase in the average dividend rate paid on deposits. The sign on *NIBDD* is according to our intuition in that a higher value of core income is associated with larger subsequent dividends. We find no evidence of a cyclicality of dividends (column 2). For robustness, we run a second set of regressions using, instead, annual data. The results are reported in columns 3-4 of the panel and are comparable, although the sensitivity of dividends on deposits increases (twofold) for discretionary earnings *DLLP* (coefficient of -0.072, t-stat of -8.66 in column 3) when we look at annual data, a result which was not expected: note that for *NIBDD* the coefficient goes down by a factor of approximately four, consistent with the four quarter accumulation implied in annual data.

### 2.5. The real effects of earnings management: an analysis around the Katrina hurricane

In Section 4 we have shown evidence that CUs use EM strategies similar to those of other financial institutions and suggested that the saver/borrower orientation of the CU may be one of the motivations for the use of accounting discretion. However, the analyses we have shown so far on the motivational aspect of EM are correlational in nature and we omitted any discussion of the potential endogeneity of EM strategies beyond using time precedence in the descriptive regressions. In this section we show results which may be more suggestive of a causal mechanism from EM to higher loan growth and, therefore, which may show the effectiveness of EM strategies to improve CU (real) performance but, more importantly, to affect the real economy. In particular, we take advantage of an exogenous (and unexpected) large shock to credit union fundamentals and show how the CUs which used discretion in the aftermath of the shock to increase their earnings managed to obtain higher rates of loan growth without significantly losing members or deposits. The nature and size of the shock allows us both to construct a sample of CUs which are matched on fundamentals, so that the effect of CU heterogeneity is accounted for, but it also gives us a context in which the pre-existing heterogeneity may be less relevant, given the massive size of the shock.

Our analysis focuses on the aftermath of Hurricane Katrina, which hit the Gulf Coast of the US in August 2005. This hurricane is one of the costliest natural disasters in the history of the US and, by far, the costliest in the period for which we have local banking information. More importantly, the damage caused by the hurricane was relatively concentrated in four states (all counties in Louisiana and Mississippi, 22 counties in Alabama and 11 in Florida). This local character of the shock allows us to design an empirical strategy focused on the analysis of the response to the

hurricane of credit unions located in the counties affected. The small geographic spread of most CUs allows for a cleaner identification of the effects: the local CUs are likely to be similar enough and were all hit by a common negative shock to local economic conditions which was exogenous to the previous fundamentals of the CU. If EM is used as a tool which can have an impact on the loan granting activity of the CU, the Katrina shock gave CUs common exogenous incentives to manage earnings and reduce the shock's impact on their balance-sheets and income statement.

We use data from credit unions which have their headquarters located in the counties which, according to the information provided by FEMA, were most affected by Katrina.[47] For that set of CUs we construct an indicator variable *Treat* using our measure of discretionary LLP. This indicator variable works as a "treatment" variable: in particular, we define as "treated" (*Treat* = 1) those CUs with lowest DLLP in the last quarter of 2005 (which is also the quarter after Katrina), most specifically CUs with the value of their DLLP in the lowest decile.[48] The control group (*Treat* =0) includes the CUs with 2005Q4 value of the DLLP in the highest decile. Table 6 shows a comparison of the average value of our main control variables for the two groups defined by *Treat* in the semester before the "shock". As it can be seen, the two groups are quite similar in their observable characteristics, although there is some evidence of a lower quality of loans in the control group and a higher presence of losses in the treatment group. We believe the evidence in the table suggests that the two "matched" groups are sufficiently similar to rule out that pre-Katrina differences are behind the potential effects we may uncover in subsequent analyses but, in any case, we include a set of controls in our "matched regressions" to account for such differences. Figure 4 shows preliminary visual evidence that supports the existence of potential differences in loan growth between the CUs that used more and less positive discretion. Panel A shows the average quarter-on-quarter loan growth of the two groups defined by *Treat* in the full window that we use for our analysis, which is four quarters before and after the quarter when Katrina hit (2005Q3, identified by the vertical bar). The figure shows that in the "Pre" period both groups had similar (and parallel) average rates of loan growth, with the control group showing a slightly higher rate overall. After the shock, there is a clear divergence in the loan growth rates where the parallel trend breaks. Also, the treated group manages to keep positive rates of growth over the full "Post" period, while the control group experiences loan growth rates which are significantly lower and, in two quarters, even negative. Panel B shows the cumulative loan growth rates from the moment of the shock until the end of the sample window. Again, it is clear that that the two groups differ

[47] We consider those counties designated by FEMA (Federal Emergency Management Agency) as "Individual assistance areas".
[48] Values of DLLP in the lowest decile are negative, then those CUs are using their DLLP as an instrument to increase net income.

quite substantially in loan growth, with the treated group significantly outperforming the control group, which, in fact, experiences a net decrease in loans one year after the shock.

We turn now into regression analyses where we look not only at the effect on loans but also on dividends and on member and deposit growth of the "treatment", that is, of a significant increase in earnings via a low charge to the LLP. Note that this is not strictly a diff-in-diffs setting but, rather, our procedure allows us to construct a sample of matched CUs where CU characteristics and the economic environment, including a large shock with major impact on the banks' activity, are comparable to the fullest extent. In these regression analyses we use alternative window widths around the shock to define the "pre" and "post" periods in our matched regressions. We also control for the effect of the quarter of the shock by excluding data for that quarter (2005Q3) in alternative analyses.

### 2.5.1. Loans

We first examine the reaction of loan growth to the use of DLLP post-Katrina. The following equation shows the structure of our regressions:

$$Y_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post + \beta_3 Treat_i \times Post + \text{CU controls} + \varepsilon_{it}. \qquad (6)$$

Our baseline definition of the dependent variable $Y_{it}$ is the one-quarter change in loans *chloans* (the variable shown in Figure 4, Panel A). We also compute three additional variables, *chloans2Q*, *chloans3Q* and *chloans4Q*, which measure two-quarter, three quarter and four-quarter-ahead changes in loans respectively. These variables help us to capture an effect which may be spread out over a time period longer than a quarter.

*Treat* is the treatment variable, which takes value one for CUs with DLLP in the last quarter of 2005 lower than 10% of the population and zero for CUs with discretionary loan loss provision in the 10% higher percentile. Given that our measure of DLLP can take positive or negative values, our "treated" CUs correspond to those which used the largest negative DLLP (so they used their discretionary loan loss provision to increase income at the end of the year and precisely one quarter after Katrina), while the control group contains those CUs which use the largest positive DLLP (so their income at the end of the year was reduced). The "post" treatment variable (*Post*) takes value one in the quarters after Katrina and zero in the pre-Katrina quarters. We use two alternative specifications, which are shown in panels A and B of Table 7. In the first specification (panel A), we take 2005Q3 as the first quarter post-Katrina (Katrina hit the Gulf Coast at the end of August, 2005), while the pre-quarters are 2005Q2 and before. The four columns of the panel use different window widths around the shock of 2, 3 and 4 quarters: in column (1) *Post* = 1 for 2005Q3-2005Q4

and *Post* = 0 for 2005Q1-2005Q2; in column (2), *Post* = 1 for 2005Q3-2006Q1 and *Post* = 0 for 2004Q4-2005Q2; in column (3), *Post* = 1 for 2005Q3-2006Q2 and *Post* = 0 for 2004Q3-2005Q2. In the second specification (panel B) we exclude the specific quarter of Katrina, so we define our post variable as one for 2005Q4 and after, while it is equal to zero for 2005Q2 and before. The coefficient of the interaction between *Treat* and *Post* estimates the effect on loan growth of using high discretionary income (low values of DLLP) after the shock. The equation includes some CU-specific controls (see table caption) but no CU or time fixed effects. The results of these models are in line with our expectations. First, we obtain generally negative and significant estimated coefficients on *Post*, which suggests that the shock did have a negative impact on loans (for the control group). Our main result, however, is supportive of our expectation that CUs which increased their earnings through discretionary low charges to the LLP managed to achieve higher growth rates of their loans throughout the post-Katrina periods. Except in the one-quarter definition of loan growth, where estimates are positive but significance is mixed, we find consistently positive and significant coefficients of the *Treat* × *Post* interaction. The coefficient estimates suggest that the CUs which used more discretionary earnings (the *Treat* = 1 group) managed to obtain cumulative loan growth rates about 5%-10% higher than those which used less discretionary earnings (or larger charges to the LLP). In particular, in all cases the estimated coefficient on *Treat* × *Post* is larger in magnitude than the estimated coefficient on *Post*, suggesting that the CUs in our *Treat* group managed to counter the negative effect of the shock and achieved positive growth rates of loans. The weak results of the one-quarter specification suggest that the effect was spread out throughout the *Post* period.[49] Note, finally, that the results of the two panels do not differ noticeably, thus suggesting that the effect we uncover indeed spreads over several quarters.

Overall, we believe the results in the two panels of Table 7 credibly support that we are capturing a significant real effect of EM on loan growth. Of course, the extent to which these "real" effects on loans translated into the economy would depend on the mix of CUs located in each county and also on the presence of other financial institutions. In any case, in what our analysis is concerned, this result is of high interest in that it uncovers the existence of potential real consequences ("externalities") of accounting practices.

[49] Note that the way we construct our *chloans2Q-chloans4Q* dependent variables means that the last observations of the *Pre* period contain loan growth from the *Post* period. This variable construction works against our finding an effect, since it assigns to the *Pre*-quarters values of the dependent variable some of the effect from the *Post* quarters. We believe that the fact that we still find a consistent and significant positive effect on the *Treat* × *Post* interaction represents strong evidence of the positive impact of EM on the loan growth rate of the treated group. Furthermore, this overlap is reduced in Panel B by construction and the results do not change noticeably.

### 2.5.2. Dividends

CUs also tend to remunerate highly the deposits of their members ("saver" orientation). In order to check if the CUs that use more EM also manage to offer higher remuneration to their members, we replicate the analysis in Section 5.1 using now the growth in dividends as dependent variables. We use the same structure in the regressions as in (6) and define the *Treat* and *Post* variables in the same way. The dependent variable is now the average level of dividends on total shares and deposits paid over a horizon of three (*Div3Q*) and four (*Div4Q*) quarters. For simplicity, we show the results of only two window widths of *Post*, three and four quarters (columns 1 and 3 and 2 and 4, respectively). This is sufficient for the purposes of our analysis as the shorter window widths do not add significant results. CU controls are listed in the table caption. The results in the table are straightforward, as there is no evidence of a significant positive effect on dividends using three-quarter cumulative growth. Thus, we cannot provide strong evidence that CUs which use more income increasing strategies pass some of these earnings to their member/owners in terms of increased dividends. Note, however, that in general the estimated coefficient of *Post* is significantly negative and the estimated coefficient of *Treat* significantly positive. This suggests that the CUs which used more income increasing strategies were already paying slightly higher dividends before the shock, and the shock had no impact on this difference so, despite having to adjust their dividends down, they still kept paying higher dividends than those in the control group.

### 2.5.3. Members and deposits

We perform a final analysis to test whether there were significant effects on the financing side of the CU balance-sheets, namely on deposits and on the number of CU members, which are the main source of deposits. Our objective is to analyze whether earnings discretion led to a decrease in the financing sources of the CU in what would be a reaction akin to discipline of the accounting manipulation. In other words, we want to show that accounting discretion may have allowed the CU to grant more loans without having a significantly negative impact on the CU's financing. This analysis would provide evidence in the line of Cortes and Strahan (2014) which suggest that banks affected by a large local shock try to expand loans in the branches located in the area of the shock while they manage to keep the level of deposits (typically, by capturing deposits in branches located in the areas unaffected by the shock). Again, we use regressions with the structure in (6). The dependent variables are now the cumulative growth in total shares and deposits (Table 9, *ΔS&D3Q* and *ΔS&D4Q*) and in membership in the CU (Table 10, *Δmembers3Q* and *Δmembers4Q*). As in Subsection 5.2, we show the results of only two window widths of *Post*, three and four quarters (columns 1 and 3 and 2 and 4 of Tables 9 and 10, respectively), and only two

lengths of cumulative growth, three and four quarters. This is sufficient for the purposes of our analysis as the shorter window widths do not add significant results. The findings in the tables are not especially robust, which we believe is, in fact, a good result. With respect to changes in shares and deposits (Table 9) we find a negative and significant at the 10% in columns 1-2 of panel A, but not in columns 3-4. Also, we find a positive and significant reaction of deposits in three columns of panel B. These two findings may suggest a negative impact on deposits in the treated group in the quarter of Katrina, but one which is reversed afterwards. In any case, the evidence is not strong enough to suggest that the treated group suffered a significant decline in deposits. Regarding membership (Table 10), there is some more evidence of a negative reaction of membership on the CU in the treated group, especially when we include the quarter of Katrina (Panel A). The result, however, is qualified by the coefficient of *Post*, which is positive and significant and cancels out the estimated coefficient of the *Treat* × *Post* interaction (the sum of the two coefficients is not statistically different from zero). In a sense, this result can be interpreted as suggesting that it is the control CUs the ones which experience an increase in membership whereas the treated CUs experience no significant change in membership. Thus, all in all, the results in Tables 9 and 10 are (weak) evidence which suggests that the use of discretion did not affect the financing side of the CU after the negative shock. This lack of evidence is, in our opinion, in line with our main argument: CUs which increased their earnings through discretion after the exogenous shock of Hurricane Katrina managed to achieve higher rates of growth in loans compared to those CUs that did not increase earnings, and they managed to do so without their main financing sources being significantly affected.

### 2.6. Summary and concluding remarks

In this paper we have provided what we believe is the first comprehensive analysis of earnings management strategies and on the motivations and effects of such strategies in the credit union sector. Despite the relatively low sophistication of credit union operations and of their depositor base, we hypothesize that a potential motivation for earnings management may stem from the saver/borrower orientation of the CU. Our results show robust evidence that credit unions take advantage of earnings discretion following strategies similar to those of other financial institutions. In particular, credit unions use discretion in the quarterly charges to the loan loss provision and carry out smoothing of income, avoidance of losses and big baths. We then offer descriptive and causal evidence suggestive that indeed CUs which manage their earnings are able to achieve higher loan growth rates. In particular, we show, first, that both the loan activity and the financing side of the CU (deposits and membership) significantly react to volatility and losses. Also, the results of a set of descriptive regressions suggest that the use of discretion by CUs may be related to

subsequently higher dividends and growth rates of loans and deposits. Finally, we take advantage of a large macroeconomic shock to design a matched sample analysis where we show evidence that CUs which used discretion to increase their earnings after the shock managed to affect positively their loan growth rates (but not the levels of dividends paid on shares and deposits) without significantly suffering a loss of deposits or membership.

Our paper contributes to two streams of literature. First, we contribute to the literature on cooperative banking by showing comprehensive evidence that CUs carry out earnings management strategies similar to those of banks. We offer some potential motivations for such activities which are based on the saver/borrower orientation of CUs, and our empirical evidence aligns with this hypothesis. Second, we contribute to the literature on the effects of earnings management behavior by providing evidence of how earnings management practices may have real effects on the economy through an expansion of the loan activity of financial intermediaries. Our results also contribute to our understanding of the role of credit unions in the financial intermediation process and in the stability of the financial system as a whole.

The overall implications of our analysis are, however, much more far reaching. In particular, the policy implications of our results are noteworthy. By using a quasi-experimental setting in which we can alleviate the concerns of endogeneity of earnings management, we have shown the effectiveness of accounting discretion in allowing financial institutions to cope with a negative shock and expand their real activity. This sort of "positive externality" of accounting discretion should be kept in mind by the regulators in the design of both accounting and financial regulation: in turbulent times, it may be the case that flexibility in accounting can contribute to a faster recovery of the real economy without inducing significant distortions from the standpoint of the sources of financing.

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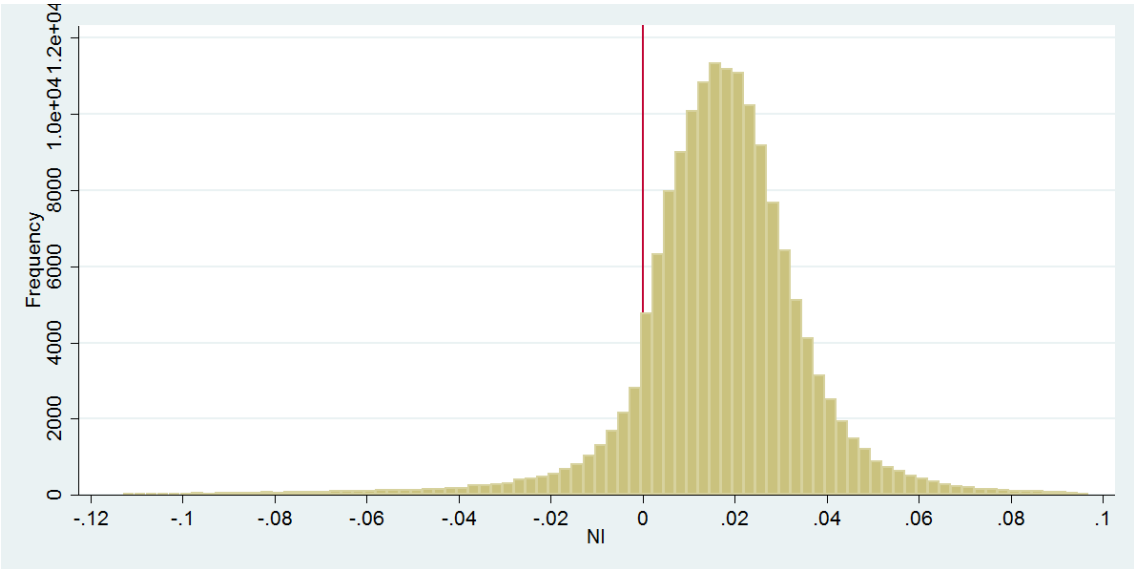
## Appendices, figures and tables chapter 2

### Appendix A: Main variable definitions

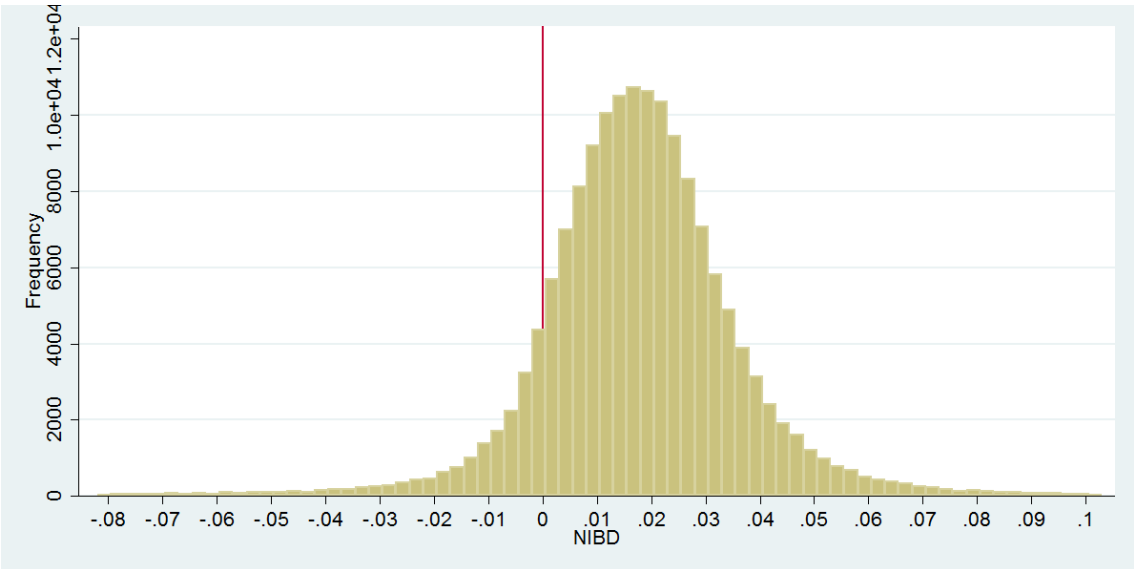
| | Variable | Definition |
|---|---|---|
| *Main dependent variables* | $DLLP_t$ | Quarterly discretionary loan loss provision (LLP) in quarter t. |
| | $chloans_t$ | Quarterly change in total loans and leases excluding charge-offs, recoveries and loans held for sale in quarter t. |
| | $Divshares_t$ | Average spread between dividend rates on total shares paid by the CU and the 3 Month Treasury Bill, in quarter t-1. (For federal CUs) |
| | $\Delta S\&D$ | Quarter-on-quarter growth of CU members in quarter t. |
| | $\Delta members_t$ | Quarter-on-quarter growth of CU members in quarter t. |
| *Determinants* | $NIBD_t$ | Net income before discretionary LLP in quarter t deflated by total assets. |
| | $NIBDD_t$ | Net income before discretionary LLP and dividend on shares, in quarter t, deflated by total assets. |
| | $NIBDI_t$ | Net income before discretionary LLP and interest on shares and deposits, in quarter t, deflated by total assets. |
| | $PL_{t-1}$ | Past losses of the CU: natural logarithm of 1 plus the number of quarters in which the CU posted losses during the previous 12 quarters (t-1 to t-12). |
| | $sdNI_{t-1}$ | Standard deviation of net income over total assets (t-1 to t-12). |
| | $sdNW_{t-1}$ | Standard deviation of net worth over total assets (t-1 to t-12). |
| *Controls* | $NW_{t-1}$ | Net worth over total assets in quarter t-1. |
| | $LLA_{t-1}$ | Loan loss allowance in quarter t-1. |
| | $size_{t-1}$ | Natural logarithm of total assets of the CU in quarter t-1. |
| | $SEC_{t-1}$ | (Trading securities + available for sale securities + held to maturity securities) over total assets in quarter t-1 |
| | $unfunded_{t-1}$ | (Revolving Open-End lines secured by 1-4 Family Residential Properties + Credit Card Lines + Unsecured Share Draft Lines of Credit) over total assets in quarter t-1. |
| | $loans_{t-1}$ | Loans over total assets in quarter t-1. |
| | $NPL_{t-1}$ | Non-performing loans over total assets in quarter t-1. |
| | $S\&D_{t-1}$ | Total shares and deposits of the CU in quarter t-1. |
| | $INT_{t-1}$ | Average spread between interest rates on total shares and deposits paid by the CU and the 3 Month Treasury Bill, in quarter t-1. (For federal and state CUs) |
| | $ROA_{t-1}$ | Return on Assets in quarter t-1. |
| *Macro variables* | $pinc\_s_t$ | Change in quarterly personal income in the state where the CU headquarters are located. |
| | $unemp\_s_t$ | Unemployment rate in the state where the CU headquarters are located. |

**Figure 1. Evidence on loss avoidance: quarterly income.**

**Panel A: Quarterly Net Income**



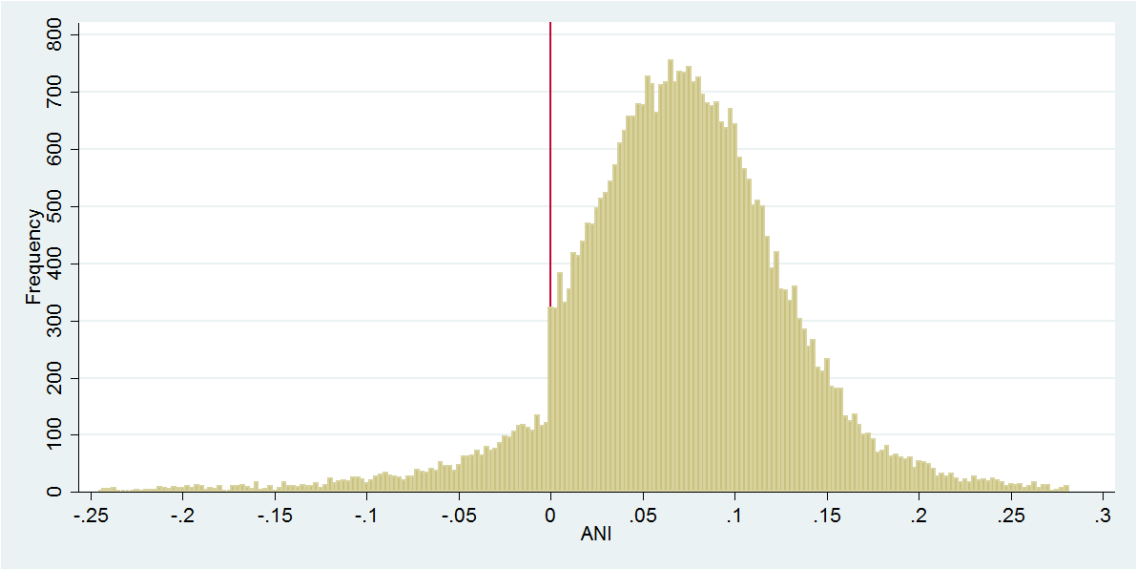

**Panel B: Quarterly Net Income before Discretionary Loan Loss Provision**



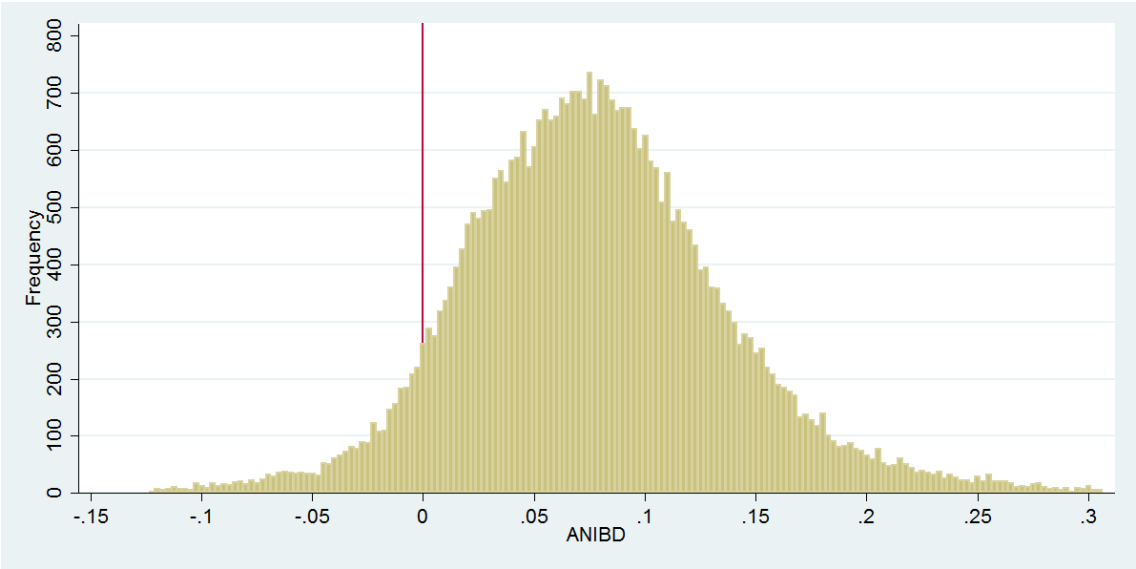

Panel A shows the distribution of quarterly net income. Panel B shows the quarterly net income before the discretionary loan loss provision.

## Figure 2. Evidence on loss avoidance: annual income.

**Panel A: Annual Net Income**



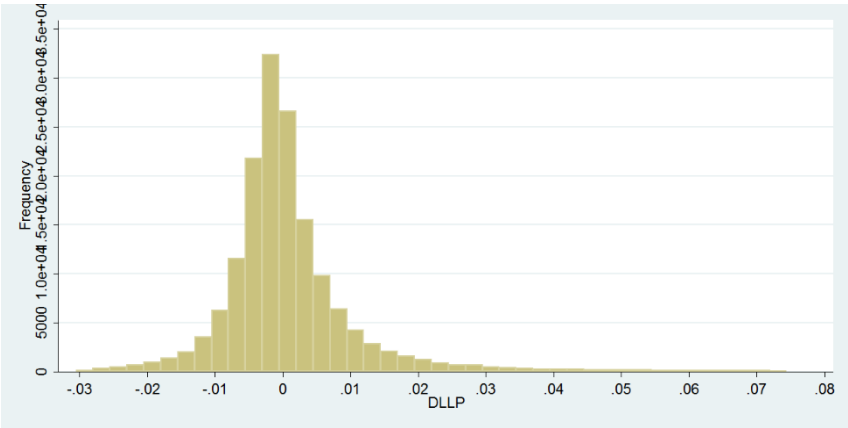

**Panel B: Annual Net Income before Discretionary Loan Loss Provision**



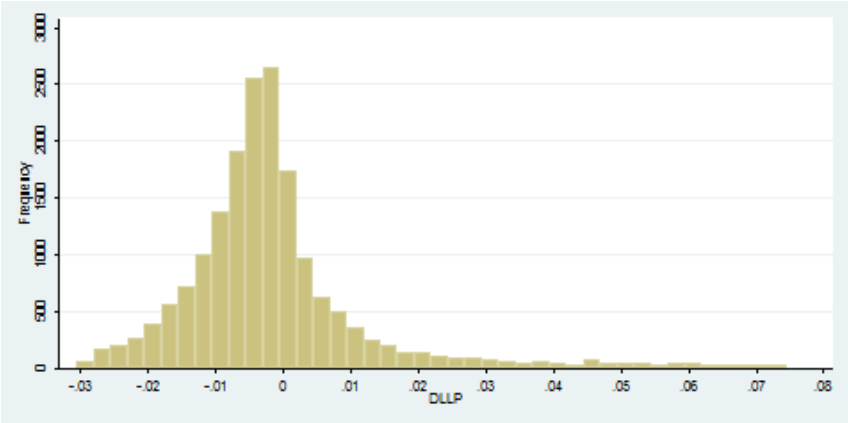

Panel A shows the distribution of annual net income. Panel B shows the distribution of annual net income before the discretionary loan loss provision.

## Figure 3. Distribution of the Discretionary Loan Loss Provision

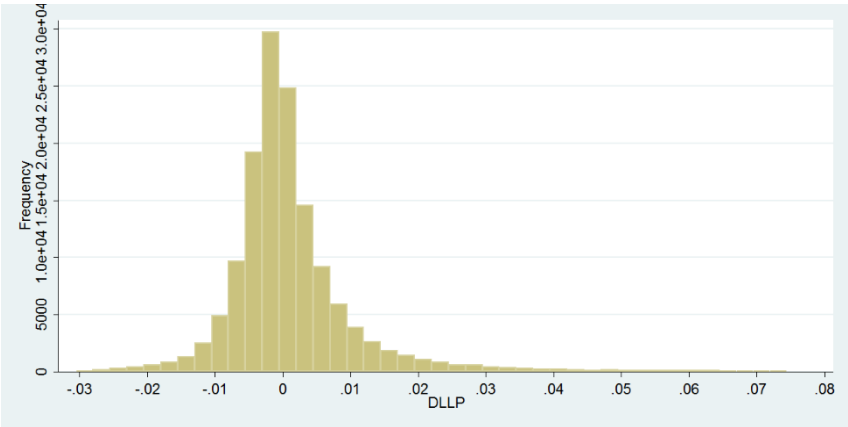
**Panel A: Quarterly Discretionary Loan Loss Provision**




**Panel B: Quarterly Discretionary Loan Loss Provision when NIBD is negative**



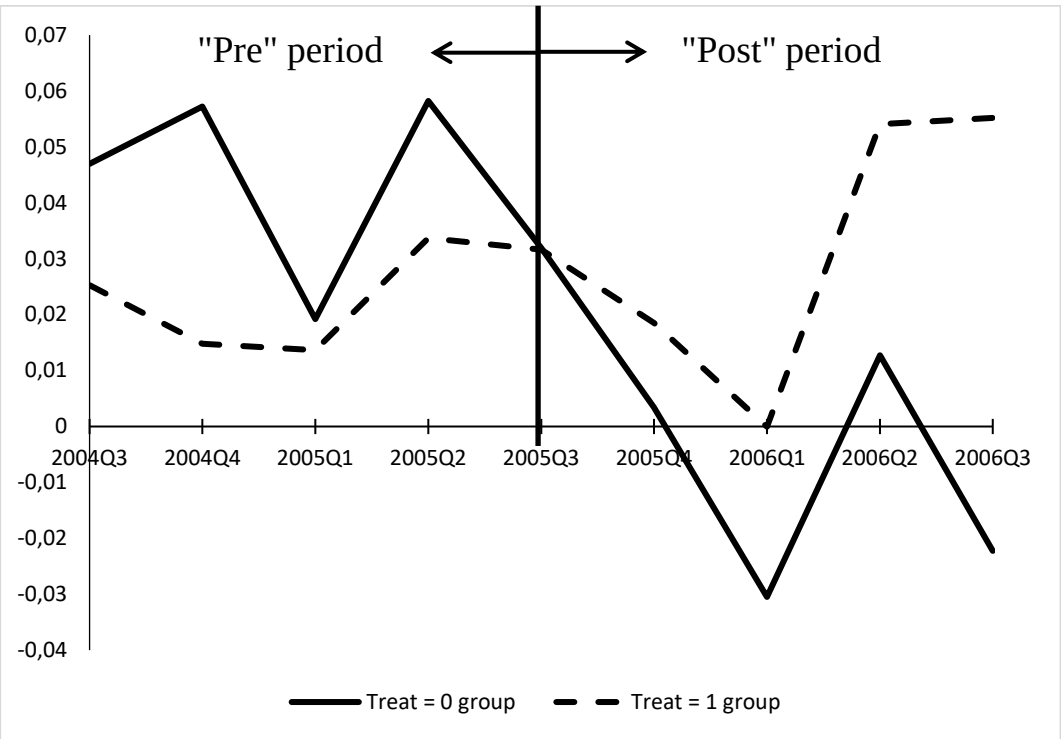

**Panel C: Quarterly Discretionary Loan Loss Provision when NIBD is positive**



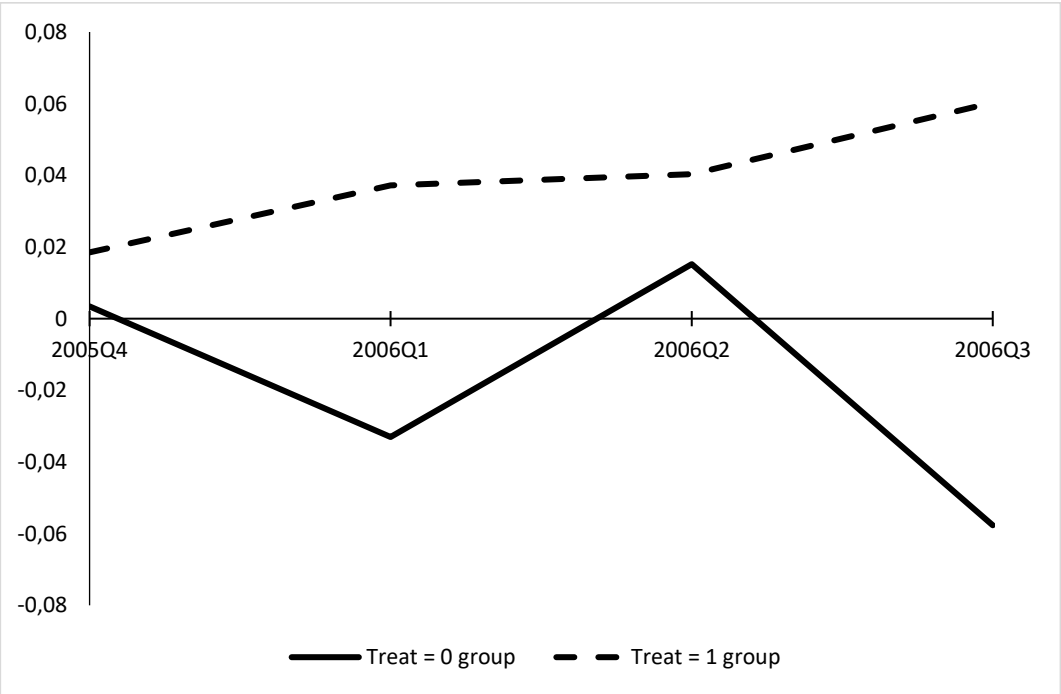

Panel A shows the distribution of quarterly discretionary loan loss provision. Panel B shows the distribution of quarterly discretionary loan loss provision when the net income before discretionary loan loss provision is negative. Panel C shows the distribution of quarterly discretionary loan loss provision when the net income before discretionary loan loss provision is positive.

**Figure 4. Loan growth of the "control" and "treated" groups defined by the Katrina shock**

**Panel A: quarter-on-quarter loan growth**




**Panel B: cumulative loan growth from the quarter after the shock**




Panel A plots the average quarter-on-quarter loan growth for the two groups of CUs ("control" and "treated") determined by *Treat* (see Section 5 for definition of *Treat*). The sample period is the largest window width used in the Katrina analyses (4 quarters around the shock). Panel B plots, for the same two groups, the cumulative loan growth from the quarter post-Katrina until the end of the window width.

**Table 1: Descriptive statistics**

| *Panel A: descriptives of the main variables* | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | | **Mean** | **Median** | **StdDev** | **Min** | **Max** |
| *Main dependent variables* | *DLLP* | 0.000 | -0.000 | 0.001 | -0.006 | 0.009 |
| | *Chloans* | 0.013 | 0.011 | 0.034 | -0.075 | 0.165 |
| | *ΔS&D* | 0.015 | 0.012 | 0.032 | -0.066 | 0.156 |
| | *Divshares* | -0.017 | -0.010 | 0.019 | -0.055 | 0.005 |
| | *Δmembers* | 0.008 | 0.005 | 0.184 | -0.968 | 45.23 |
| *Determinants* | *NIBD* | 0.002 | 0.002 | 0.002 | -0.016 | 0.016 |
| | *NIBDI* | 0.006 | 0.006 | 0.004 | -0.014 | 0.023 |
| | *NIBDD* | 0.006 | 0.005 | 0.004 | -0.014 | 0.024 |
| | $PL_{t-1}$ | 0.484 | 0.000 | 0.666 | 0 | 2.565 |
| | $sdNI_{t-1}$ | 0.001 | 0.001 | 0.001 | 0 | 0.012 |
| | $sdNW_{t-1}$ | 0.005 | 0.004 | 0.004 | 0 | 0.063 |
| *Controls* | $NW_{t-1}$ | 0.108 | 0.103 | 0.030 | 0.049 | 0.242 |
| | $LLA_{t-1}$ | 0.006 | 0.005 | 0.004 | 0.000 | 0.033 |
| | $size_{t-1}$ | 18.90 | 18.67 | 0.964 | 17.72 | 24.99 |
| | $SEC_{t-1}$ | 0.144 | 0.102 | 0.148 | 0 | 0.669 |
| | $unfunded_{t-1}$ | 0.126 | 0.109 | 0.090 | 0 | 0.494 |
| | $NPL_{t-1}$ | 0.010 | 0.007 | 0.010 | 0 | 0.353 |
| | $S\&D_{t-1}$ | 0.873 | 0.882 | 0.042 | 0.675 | 0.942 |
| | $INT_{t-1}$ | -0.017 | -0.010 | 0.019 | -0.051 | 0.005 |
| | $ROA_{t-1}$ | 0.002 | 0.002 | 0.002 | -0.010 | 0.008 |
| *Macro-state variables* | $pinc\_s_t$ | 0.011 | 0.011 | 0.012 | -0.071 | 0.117 |
| | $unemp\_s_t$ | 0.061 | 0.057 | 0.020 | 0.021 | 0.146 |

| *Panel B: Descriptives of the LLP* | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | | **Mean** | **Medi** | **StdDev** | **Q1** | **Q4** |
| *LLP* | $LLP_t$ | 0.001 | 0.000 | 0.001 | 0.000 | 0.001 |
| | $LLP_t$ $(NIBD>0)$ | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 |
| | $LLP_t$ $(NIBD<0)$ | 0.001 | 0.000 | 0.002 | 0.000 | 0.001 |

See Appendix A for variable definitions. Sample comprises credit unions with total assets higher than $50,000,000 observed through the period Q1 1994 to Q4 2015, excluding the quarter-CU observations in which a CU went through a merger. This yields a total of 155,283 credit union-quarter observations. Credit union variables which are continuous have been winsorized at the 0.5% level in each tail.

**Table 2: Correlation matrix**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *DLLP* | 1.000 | -0.040 | 0.017 | 0.000 | -0.002 | 0.267 | 0.195 | 0.180 | 0.041 | 0.090 | 0.074 |
| *chloans* | -0.082 | 1.000 | -0.094 | 0.327 | -0.010 | 0.174 | 0.136 | 0.135 | -0.247 | -0.201 | -0.128 |
| *Divshares* | 0.028 | -0.061 | 1.000 | 0.011 | 0.036 | -0.155 | -0.462 | -0.329 | 0.329 | 0.329 | 0.086 |
| *Δmembers* | -0.002 | 0.081 | 0.002 | 1.000 | 0.240 | 0.183 | 0.158 | 0.155 | -0.198 | -0.091 | -0.077 |
| *ΔS&D* | -0.034 | 0.076 | 0.047 | 0.078 | 1.000 | 0.065 | 0.104 | 0.097 | -0.134 | -0.041 | -0.028 |
| *NIBD* | 0.129 | 0.140 | -0.108 | 0.014 | 0.014 | 1.000 | 0.707 | 0.696 | -0.358 | -0.092 | 0.024 |
| *NIBDI* | 0.136 | 0.123 | -0.460 | 0.021 | 0.084 | 0.746 | 1.000 | 0.909 | -0.418 | -0.175 | 0.041 |
| *NIBDD* | 0.116 | 0.122 | -0.362 | 0.020 | 0.076 | 0.730 | 0.921 | 1.000 | -0.402 | -0.161 | 0.043 |
| $PL_{t-1}$ | 0.096 | -0.221 | 0.289 | -0.017 | -0.130 | -0.302 | -0.406 | -0.386 | 1.000 | 0.651 | 0.222 |
| $sdNI_{t-1}$ | 0.137 | -0.212 | 0.254 | -0.008 | -0.057 | -0.096 | -0.166 | -0.158 | 0.624 | 1.000 | 0.383 |
| $sdNW_{t-1}$ | 0.089 | -0.121 | 0.050 | -0.004 | -0.036 | -0.027 | -0.013 | -0.009 | 0.257 | 0.402 | 1.000 |

Spearman (Pearson) correlation coefficients of the variables as included in the regression models are shown above (below) the diagonal. Only correlations between dependent and continuous explanatory variables are included. All correlations are significant at the 1% level. (1): *DLLP* ; (2): *chloans*; (3): *Divshares*; (4): *Δmembers*; (5): *ΔS&D*; (6): *NIBD*; (7): *NIBDI*; (8): *NIBDD*; (9): $PL_{t-1}$; (10): $sdNI_{t-1}$; (11): $sdNW_{t-1}$.

**Table 3. The use of the discretionary loan loss provision: earnings management strategies**

| *Panel A: Income smoothing, big bath and loss avoidance.* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Income smoothing | | | | Big bath and loss avoidance | | | | | |
| | | (1) | | (2) | | (3) | | (4) | | (5) | |
| Dependent variable | | $DLLP_{it}$ | | $DLLP_{it}$ | | $DLLP_{it}$ | | $DLLP_{it}$ | | $DLLP_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-statistic | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| $NIBD_t$ | + | 0.034*** | (4.08) | | | 0.082*** | (9.89) | 0.034*** | (4.069) | 0.082*** | (9.88) |
| $NIBDI_t$ | + | | | 0.036*** | (5.10) | | | | | | |
| $lowloss_t$ | + | | | | | | | -0.000 | (-1.20) | 0.000 | (0.78) |
| $lowloss_t \times NIBD_t$ | + | | | | | | | 1.684*** | (7.75) | 0.889*** | (2.82) |
| $NEG_t$ | - | | | | | 0.000 | (0.40) | | | | |
| $NEG_t \times NIBD_t$ | - | | | | | -0.144*** | (-4.29) | | | | |
| *highloss* | - | | | | | | | | | 0.000 | (0.43) |
| $highloss_t \times NIBD_t$ | - | | | | | | | | | -0.142*** | (-3.99) |
| Observations | | 155,283 | | 155,283 | | 155,283 | | 155,283 | | 155,283 | |
| CU and Time FE | | YES | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | | YES | |
| Adj. R-squared | | 0.195 | | 0.196 | | 0.201 | | 0.196 | | 0.201 | |

**Table 3 (continued).**

| *Panel B1: Benchmarking behavior around zero* | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | All quarters | | Quarters 1-3 | | 4th Quarter | |
| | | (1) | | (2) | | (3) | |
| Dependent variable | | $DLLP_{it}$ | | $DLLP_{it}$ | | $DLLP_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *NEG_BENCH* | + | -0.049*** | (-3.81) | -0.026 | (-1.61) | -0.060*** | (-4.53) |
| *POS_BENCH* | + | 0.003 | (0.89) | 0.015*** | (3.94) | -0.008* | (-1.69) |
| Observations | | 154,955 | | 115,501 | | 39,454 | |
| CU and Time FE | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | |
| Adj. R-squared | | 0.197 | | 0.193 | | 0.231 | |
| *Panel B2: Benchmarking behavior around previous year's cumulative income* | | | | | | | |
| | | All quarters | | Quarters 1-3 | | 4th Quarter | |
| | | (1) | | (2) | | (3) | |
| Dependent variable | | $DLLP_{it}$ | | $DLLP_{it}$ | | $DLLP_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *NEG_BENCH2* | + | -0.011 | (-1.40) | 0.009 | (1.24) | -0.031*** | (-3.05) |
| *POS_BENCH2* | + | 0.025*** | (7.25) | 0.026*** | (5.85) | 0.018*** | (4.37) |
| Observations | | 147,825 | | 111,096 | | 36,729 | |
| CU and Time FE | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | |
| Adj. R-squared | | 0.198 | | 0.197 | | 0.228 | |

Panel A: FE regressions of the use of *DLLP* as a function of pre-discretion income NIBD. $NEG_t$: dummy that takes value 1 when $NIBD_t$ is negative, 0 otherwise; $lowloss_t$: dummy that takes value one when the loss is smaller (in magnitude) than 95% of the population of losses, 0 otherwise; $highloss_t$: dummy that takes value 1 when the loss is larger or equal (in magnitude) than 95% of the population of losses, 0 otherwise. Panel B1: Fixed-effects regressions of the use of *DLLP* as a function of earnings benchmarks. Benchmark is defined as follows: *BENCH* is $NIBD_t$ if quarter = 1; ($NIBD_t + NI_{t-1}$) if quarter = 2; ($NIBD_t + NI_{t-1} + NI_{t-2}$) if quarter = 3; ($NIBD_t + NI_{t-1} + NI_{t-2} + NI_{t-3}$) if quarter = 4. *NEG_BENCH:* value of benchmark when *BENCH<0*, *POS_BENCH:* value of benchmark, when *BENCH>0;* Panel B2: FE regressions of the use of *DLLP* as a function of earnings benchmarks. Benchmark is defined as follows: *BENCH2* is $NIBD_t - NI_{t-4}$ if quarter = 1; ($NIBD_t + NI_{t-1}$) – ($NI_{t-4} + NI_{t-5}$) if quarter = 2; ($NIBD_t + NI_{t-1} + NI_{t-2}$) – ($NI_{t-4} + NI_{t-5} + NI_{t-6}$) if quarter = 3; ($NIBD_t + NI_{t-1} + NI_{t-2} + NI_{t-3}$) – ($NI_{t-4} + NI_{t-5} + NI_{t-6} + NI_{t-7}$) if quarter = 4. *NEG_BENCH2:* value of *BENCH2* when *BENCH2<0*; *POS_BENCH2:* value of *BENCH2*, when *BENCH2>0*. All panels: CU controls: $NW_{t-1}$, $DLLP_{t-1}$, $LLA_{t-1}$, $size_t$, $SEC_t$ and $unfunded_t$. Macro controls: $pinc\_s_t$ and $unemp\_s_t$. See Appendix A for other variable definitions. *t*-statistics are based on standard errors clustered by CU and time. *, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level.

**Table 4. The impact of volatility and losses on loan growth and deposits**

| *Panel A: loans* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $chloans_{it}$ | | $chloans_{it}$ | | $chloans_{it}$ | | $chloans_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| $sdNI_{t-1}$ | - | -2.778*** | (-12.34) | -2.730*** | (-11.46) | -0.006 | (-0.06) | 0.317 | (0.80) |
| $sdNW_{t-1}$ | - | | | -0.053 | (-0.97) | 0.020 | (0.40) | -0.149** | (-2.20) |
| $PL_{t-1}$ | - | -0.002*** | (-4.66) | -0.002*** | (-4.57) | 0.001*** | (4.07) | 0.001** | (2.48) |
| $PL_{t-1} \times sdNI_{t-1}$ | - | | | | | -2.504*** | (-10.13) | -2.833*** | (-10.25) |
| $PL_{t-1} \times sdNW_{t-1}$ | - | | | | | | | 0.190*** | (3.87) |
| Observations | | 115,008 | | 115,008 | | 115,008 | | 114,115 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |
| Adj. R-squared | | 0.169 | | 0.169 | | 0.171 | | 0.171 | |

| *Panel B: membership and member shares (deposits)* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $\Delta members_{it}$ | | $\Delta members_{it}$ | | $\Delta S\&D_{it}$ | | $\Delta S\&D_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| $sdNI_{t-1}$ | - | -0.840*** | (-7.22) | 0.400** | (2.41) | -0.853*** | (-5.29) | 0.705** | (2.14) |
| $sdNW_{t-1}$ | - | -0.092*** | (-3.03) | -0.118*** | (-2.84) | -0.109*** | (-2.81) | -0.114** | (-1.97) |
| $PL_{t-1}$ | - | -0.002*** | (-10.91) | -0.001*** | (-2.76) | -0.002*** | (-6.79) | -0.000 | (-1.25) |
| $PL_{t-1} \times sdNI_{t-1}$ | - | | | -1.281*** | (-9.63) | | | -1.603*** | (-5.20) |
| $PL_{t-1} \times sdNW_{t-1}$ | - | | | 0.077** | (2.28) | | | 0.064 | (1.36) |
| Observations | | 154,846 | | 154,846 | | 154,846 | | 154,846 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |
| Adj. R-squared | | 0.0244 | | 0.0251 | | 0.342 | | 0.343 | |

FE regressions of the reaction of dividend rates and of loan and deposit growth to CU volatility and losses. Panel A: reaction of loan growth. CU controls: $NW_{t-1}$, $NPL_{t-1}$, $S\&D_{t-1}$, $size_{t-1}$ and $unfunded_{t-1}$. Loans and leases excludes charge-offs, recoveries and loans held for sale (only available from 2002Q1). Panel B: reaction of membership and member shares (deposits) growth. CU controls: $PL_{t-1}$, $NW_{t-1}$, $NPL_{t-1}$, $loans_{t-1}$, $size_{t-1}$, $SEC_{t-1}$, $unfunded_{t-1}$ and $INT_{t-1}$. Panels A and B: Macro controls: $pinc\_s_t$ and $unemp\_s_t$. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by CU and time. *, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level.

**Table 5. The behavior of dividend rates and CU loans and deposits relative to discretionary income and cyclical conditions**

| *Panel A: loans and deposits* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $chloans_{it}$ | | $chloans_{it}$ | | $\Delta S\&D_{it}$ | | $\Delta S\&D_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| $DLLP_{t-1}$ | - | -3.166*** | (-14.26) | -3.133*** | (-15.04) | -1.688*** | (-12.44) | -1.582*** | (-12.17) |
| $NIBD_{t-1}$ | | -0.362*** | (-3.53) | -0.369*** | (-3.49) | 0.362*** | (3.86) | 0.351*** | (3.80) |
| $\Delta unemp\_s_{t-1}$ | - | | | -0.011* | (-1.88) | | | 0.002 | (0.45) |
| $DLLP_{t-1} \times \Delta unemp\_s_{t-1}$ | - | | | -4.913*** | (-2.84) | | | -4.850* | (-1.92) |
| Observations | | 115,087 | | 115,087 | | 155,283 | | 155,283 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |
| Adj. R-squared | | 0.170 | | 0.172 | | 0.341 | | 0.341 | |
| *Panel B: dividend rate on shares and deposits* | | | | | | | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| | | Quarterly | | Quarterly | | Annual | | Annual | |
| Dependent variable | | $Divshares_{it}$ | | $Divshares_{it}$ | | $Divshares_{it}$ | | $Divshares_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| $DLLP_{t-1}$ | - | -0.037*** | (-7.67) | -0.038*** | (-7.91) | -0.072*** | (-8.66) | -0.070*** | (-6.98) |
| $NIBDD_{t-1}$ | + | 0.126*** | (6.00) | 0.126*** | (6.01) | 0.033** | (2.30) | 0.033** | (2.31) |
| $\Delta unemp\_s_{t-1}$ | | | | -0.000 | (-1.50) | | | 0.000 | (0.52) |
| $DLLP_{t-1} \times \Delta unemp\_s_{t-1}$ | - | | | 0.050 | (0.85) | | | -0.020 | (-0.76) |
| Observations | | 155,283 | | 155,283 | | 35,326 | | 35,326 | |
| CU and Time FE | | YES | | YES | | YES | | YES | |
| CU and Macro controls | | YES | | YES | | YES | | YES | |
| Adj. R-squared | | 0.993 | | 0.993 | | 0.944 | | 0.944 | |

Fixed effects regressions of the reaction of dividend rates and of loan and deposit growth to the use of discretionary income and cyclical conditions. Panel A: reaction of loan and shares and deposits growth. Columns 1-2: CU controls: $NW_{t-1}$, $NPL_{t-1}$, $S\&D_{t-1}$, $size_{t-1}$ and $unfunded_{t-1}$. Loans and leases excludes charge-offs, recoveries and loans held for sale (only available from 2002Q1). Columns 3-4: CU controls: $PL_{t-1}$, $NW_{t-1}$, $NPL_{t-1}$, $loans_{t-1}$, $size_{t-1}$, $SEC_{t-1}$, $unfunded_{t-1}$ and $INT_{t-1}$. Panel B: reaction of dividend rates on shares. CU controls: $NW_{t-1}$, $NPL_{t-1}$, $S\&D_{t-1}$, $size_{t-1}$, $unfunded_{t-1}$, and $Divshares_{t-1}$. Panels A and B: Macro controls: $pinc\_s_t$ and $unemp\_s_t$. $\Delta unemp\_s_{t-1}$: quarterly change in unemployment rate in the state where the CU headquarters is located. See Appendix A for other variable definitions. t-statistics are based on standard errors clustered by CU and time. *, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level.

**Table 6: Descriptives of the matched groups in the Katrina analysis**

| *Descriptive statistics of control variables for treatment and control before Katrina* | | | | | | |
|---|---|---|---|---|---|---|
| | *LLALOANS* | *NW* | *SIZE* | *unfunded* | *ROA* | *chloans* |
| *Treat* = 0 | 0.006 | 0.124 | 19.281 | 0.166 | 0.250 | 0.026 |
| *Treat* = 1 | 0.004 | 0.116 | 18.536 | 0.182 | 0.267 | 0.008 |
| *difference* | 0.002 | 0.007 | 0.744 | -0.015 | -0.017 | 0.018 |
| *t-test* (p-value) | 0.080 | 0.388 | 0.042 | 0.319 | 0.427 | 0.113 |
| | *SEC* | *INT* | *PL* | *DIV* | *NPL* | *S&D* |
| *Treat* = 0 | 0.121 | -0.024 | 0 | -0.024 | 0.014 | 0.860 |
| *Treat* = 1 | 0.099 | -0.023 | 0.462 | -0.023 | 0.008 | 0.877 |
| *difference* | 0.022 | -0.001 | -0.462 | -0.001 | 0.005 | -0.017 |
| *t-test* (p-value) | 0.359 | 0.306 | 0.087 | 0.361 | 0.023 | 0.209 |

Descriptive statistics of control variables. The table show the average value of each corresponding variable in the semester before Katrina (2005Q1-2005Q2) for CUs with headquarters located in counties affected by Katrina. Treatment group (*Treat*=1): CUs with discretionary loan loss provision lower than 10% of the population in the final quarter of 2005. Control group (*Treat*=0): CUs with discretionary loan loss provision in the 10% higher. The last row of each subpanel shows the p-value of a t-test of significance in the difference in means of the two groups.

**Table 7: The discretionary loan loss provision and Hurricane Katrina: diff-in-diffs estimators of the effect on loan growth**

| *Panel A: Including Hurricane Katrina quarter* | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | |
| Variables | Predictio | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Dependent variable: chloans$_{it}$* | | | | | | | |
| *Treat* | | 0.001 | (0.07) | 0.001 | (0.09) | -0.009 | (-0.58) |
| *Post* | - | -0.023 | (-1.63) | -0.019* | (-1.81) | -0.011 | (-0.77) |
| *Treat × Post* | + | 0.035* | (1.91) | 0.020 | (1.40) | 0.020 | (1.04) |
| R-squared | | 0.582 | | 0.436 | | 0.158 | |
| *Dependent variable: chloans2Q$_{it}$* | | | | | | | |
| *Treat* | | -0.009* | (-3.04) | -0.006 | (-1.38) | -0.018* | (-2.06) |
| *Post* | - | -0.075*** | (-9.16) | -0.032* | (-1.77) | -0.024 | (-1.57) |
| *Treat × Post* | + | 0.084*** | (7.41) | | (6.84) | | (7.10) |
| R-squared | | 0.745 | | 0.443 | | 0.274 | |
| *Dependent variable: chloans3Q$_{it}$* | | | | | | | |
| *Treat* | | -0.021 | (-1.72) | -0.002 | (-0.16) | -0.020 | (-1.44) |
| *Post* | - | -0.071*** | (-5.96) | -0.038** | (-2.17) | -0.032** | (-2.63) |
| *Treat × Post* | + | 0.105** | (5.13) | 0.084*** | (9.17) | 0.089*** | (8.45) |
| R-squared | | 0.684 | | 0.540 | | 0.397 | |
| *Dependent variable: chloans4Q$_{it}$* | | | | | | | |
| *Treat* | | 0.013 | (0.77) | 0.027** | (2.82) | 0.004 | (0.24) |
| *Post* | - | -0.025** | (-2.11) | -0.000 | (-0.03) | -0.022 | (-1.64) |
| *Treat × Post* | + | 0.100** | (3.38) | | (5.98) | | (5.02) |
| R-squared | | 0.837 | | 0.636 | | 0.414 | |
| CU controls | | YES | | YES | | YES | |
| Observations | | 20 | | 33 | | 46 | |

**Table 7 (continued)**

| *Panel B: Excluding Hurricane Katrina quarter* | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | |
| Variables | Predictio | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| | | *Dependent variable: chloans$_{it}$* | | | | | |
| *Treat* | | -0.005 | (-0.38) | -0.005 | (-0.28) | -0.011 | (-0.69) |
| *Post* | - | -0.032** | (-2.53) | -0.007 | (-0.37) | -0.011 | (-0.65) |
| *Treat × Post* | + | 0.036** | (2.18) | 0.023 | (0.96) | 0.022 | (1.03) |
| R-squared | | 0.575 | | 0.137 | | 0.217 | |
| | | *Dependent variable: chloans2Q$_{it}$* | | | | | |
| *Treat* | | 0.001 | (0.07) | -0.012 | (-1.02) | -0.021 | (-1.88) |
| *Post* | - | -0.040** | (-2.53) | -0.014 | (-0.81) | -0.022** | (-2.02) |
| *Treat × Post* | + | 0.058*** | (6.72) | 0.062*** | (5.61) | 0.055*** | (7.53) |
| R-squared | | 0.605 | | 0.322 | | 0.280 | |
| | | *Dependent variable: chloans3Q$_{it}$* | | | | | |
| *Treat* | | 0.021 | (1.28) | 0.010 | (0.75) | -0.013 | (-0.67) |
| *Post* | - | -0.018** | (-2.54) | -0.003 | (-0.40) | -0.031* | (-1.92) |
| *Treat × Post* | + | 0.076*** | (4.06) | | (5.18) | 0.091*** | (7.24) |
| R-squared | | 0.801 | | 0.550 | | 0.358 | |
| | | *Dependent variable: chloans4Q$_{it}$* | | | | | |
| *Treat* | | 0.055*** | (2.97) | 0.034* | (1.83) | 0.005 | (0.21) |
| *Post* | - | 0.015 | (1.05) | 0.000 | (0.01) | -0.035 | (-1.24) |
| *Treat × Post* | + | 0.051** | (2.41) | 0.086*** | (2.91) | 0.105*** | (4.90) |
| R-squared | | 0.839 | | 0.482 | | 0.334 | |
| CU controls | | YES | | YES | | YES | |
| Observations | | 23 | | 36 | | 49 | |

Panel estimators based on treatment and control groups designed on the set of CUs with headquarters located in counties affected by Katrina. Treatment group (*Treat*=1): CUs with discretionary loan loss provision lower than 10% of the population. Control group (*Treat*=0): CUs with discretionary loan loss provision in the10% higher. *chloans$_{it}$*: quarter *t* growth in loans; *chloans2Q$_{it}$*: cumulative growth in loans over quarters t to t+1; *chloans3Q$_{it}$*: cumulative growth in loans over quarters t to t+2; *chloans4Q$_{it}$*: cumulative growth in loans over quarters t to t+3.
Panel A: *Post*: post treatment. Column (1): *Post* = 1 for 2005Q3-2005Q4, 0 for 2005Q1-2005Q2; column (2): *Post* = 1 for 2005Q3-2006Q1, 0 for 2004Q4-2005Q2; column (3): *Post* = 1 for 2005Q3-2006Q2, 0 for 2004Q3-2005Q2.
Panel B: *Post*: post treatment. Column (1): *Post* = 1 for 2005Q4-2006Q1, 0 for 2005Q1-2005Q2; column (2): *Post* = 1 for 2005Q4-2006Q2, 0 for 2004Q4-2005Q2; column (3): *Post* = 1 for 2005Q4-2006Q3, 0 for 2004Q3-2005Q2.
Panels A and B: CU controls: $NW_{t-1}$, $NPL_{t-1}$, $S\&D_{t-1}$, $size_{t-1}$ and $unfunded_{t-1}$. See Appendix A for variable definitions*, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level. T-stats based on double clustered standard errors at the CU and quarter level (*chloans$_{it}$*), and on Driscoll-Kraay standard errors with lag lengths 2 (*chloans2Q$_{it}$*), 3 (*chloans3Q$_{it}$*) and 4 (*chloans4Q$_{it}$*).

**Table 8: The discretionary loan loss provision and Hurricane Katrina: diff-in-diffs estimators of the effect on dividends**

| *Panel A: including Hurricane Katrina quarter* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $Div3Q_{it}$ | | $Div3Q_{it}$ | | $Div4Q_{it}$ | | $Div4Q_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Treat* | | 0.003*** | (4.38) | 0.003*** | (5.57) | 0.003*** | (4.59) | 0.003*** | (5.85) |
| *Post* | ? | -0.013*** | (-6.41) | -0.017*** | (-4.89) | -0.012*** | (-7.59) | -0.015*** | (-5.56) |
| *Treat* × *Post* | ? | -0.000 | (-0.41) | -0.000 | (-0.31) | -0.000 | (-0.56) | -0.000 | (-0.50) |
| CU Controls | | YES | | YES | | YES | | YES | |
| Observations | | 36 | | 49 | | 36 | | 49 | |
| R-squared | | 0.845 | | 0.837 | | 0.842 | | 0.827 | |

| *Panel B: excluding Hurricane Katrina quarter* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $Div3Q_{it}$ | | $Div3Q_{it}$ | | $Div4Q_{it}$ | | $Div4Q_{it}$ | |
| | | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Treat* | | 0.002* | (2.49) | 0.003*** | (3.91) | 0.002* | (2.49) | 0.003*** | (3.91) |
| *Post* | ? | -0.016*** | (-8.80) | -0.019*** | (-6.37) | -0.016*** | (-8.80) | -0.019*** | (-6.37) |
| *Treat* × *Post* | ? | 0.000 | (0.07) | -0.000 | (-0.05) | 0.000 | (0.07) | -0.000 | (-0.05) |
| CU Controls | | YES | | YES | | YES | | YES | |
| Observations | | 39 | | 52 | | 39 | | 52 | |
| R-squared | | 0.909 | | 0.888 | | 0.897 | | 0.872 | |

Panel estimators based on treatment and control groups designed on the set of CUs with headquarters located in counties affected by Katrina. Dependent variable is the average level of dividends on shares and deposits paid throughout the quarter and the subsequent 2-3 quarters (columns 1-2: 9 months, columns 3-4: 12 months). Treatment group (*Treat*=1): CUs with discretionary loan loss provision lower than 10% of the population. Control group (*Treat*=0): CUs with discretionary loan loss provision in the 10% higher.

Panel A: *Post*: post treatment. Columns 1 and 3: *Post* = 1 for 2005Q3-2006Q1, 0 for 2004Q4-2005Q2; columns 2 and 4: *Post* = 1 for 2005Q3-2006Q2, 0 for 2004Q3-2005Q2.

Panel B: *Post*: post treatment. Columns 1 and 3: *Post* = 1 for 2005Q4-2006Q2, 0 for 2004Q4-2005Q2; columns 2 and 4: *Post* = 1 for 2005Q4-2006Q3, 0 for 2004Q3-2005Q2.

Panels A and B: CU controls: $NW_{t-1}$, $loans_{t-1}$, $NPL_{t-1}$, $ROA_{t-1}$, $size_{t-1}$, $SEC_{t-1}$, $unfunded_{t-1}$ and $INT_{t-1}$. See Appendix A for variable definitions*, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level. T-stats based on Driscoll-Kraay standard errors with lag lengths 3 (columns 1-2) and 4 (columns 3-4).

**Table 9: The discretionary loan loss provision and Hurricane Katrina: diff-in-diffs estimators of the effect on deposit growth**

| *Panel A: including Hurricane Katrina quarter* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $\Delta S\&D3Q_{it}$ | | $\Delta S\&D3Q_{it}$ | | $\Delta S\&D4Q_{it}$ | | $\Delta S\&D4Q_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Treat* | | -0.025 | (-0.48) | -0.022 | (-0.56) | -0.099*** | (-3.02) | -0.074 | (-1.56) |
| *Post* | ? | 0.101** | (2.22) | 0.099** | (2.13) | -0.038 | (-1.11) | -0.043 | (-1.23) |
| *Treat × Post* | ? | -0.112* | (-1.85) | -0.084* | (-1.70) | 0.011 | (0.36) | 0.003 | (0.07) |
| CU Controls | | YES | | YES | | YES | | YES | |
| Observations | | 36 | | 49 | | 36 | | 49 | |
| R-squared | | 0.718 | | 0.699 | | 0.888 | | 0.788 | |
| *Panel B: excluding Hurricane Katrina quarter* | | | | | | | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | $\Delta S\&D3Q_{it}$ | | $\Delta S\&D3Q_{it}$ | | $\Delta S\&D4Q_{it}$ | | $\Delta S\&D4Q_{it}$ | |
| | | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Treat* | | -0.066 | (-1.56) | -0.055* | (-1.67) | -0.134*** | (-4.86) | -0.108*** | (-2.76) |
| *Post* | ? | -0.020 | (-0.35) | -0.054 | (-1.03) | -0.153*** | (-8.68) | -0.184*** | (-5.89) |
| *Treat × Post* | ? | 0.029 | (0.73) | 0.057* | (1.88) | 0.110*** | (3.14) | 0.128*** | (3.71) |
| CU Controls | | YES | | YES | | YES | | YES | |
| Observations | | 39 | | 52 | | 39 | | 52 | |
| R-squared | | 0.716 | | 0.669 | | 0.900 | | 0.789 | |

Panel estimators based on treatment and control groups designed on the set of CUs with headquarters located in counties affected by Katrina. Dependent variable is the cumulative growth rate in shares and deposit (columns 1-2: 9 months, columns 3-4: 12 months). Treatment group (*Treat*=1): CUs with discretionary loan loss provision lower than 10% of the population. Control group (*Treat*=0): CUs with discretionary loan loss provision in the 10% higher.

Panel A: *Post*: post treatment. Columns 1 and 3: *Post* = 1 for 2005Q3-2006Q1, 0 for 2004Q4-2005Q2; columns 2 and 4: *Post* = 1 for 2005Q3-2006Q2, 0 for 2004Q3-2005Q2.

Panel B: *Post*: post treatment. Columns 1 and 3: *Post* = 1 for 2005Q4-2006Q2, 0 for 2004Q4-2005Q2; columns 2 and 4: *Post* = 1 for 2005Q4-2006Q3, 0 for 2004Q3-2005Q2.

Panels A and B: CU controls: $NW_{t-1}$, $loans_{t-1}$, $NPL_{t-1}$, $ROA_{t-1}$, $size_{t-1}$, $SEC_{t-1}$, $unfunded_{t-1}$ and $INT_{t-1}$. See Appendix A for variable definitions*, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level. T-stats based on Driscoll-Kraay standard errors with lag lengths 3 (columns 1-2) and 4 (columns 3-4).

**Table 10: The discretionary loan loss provision and Hurricane Katrina: diff-in-diffs estimators of the effect on membership**

| *Panel A: including Hurricane Katrina quarter* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | *Δmembers3Qs*$_{it}$ | | *Δmembers3Q*$_{it}$ | | *Δmembers4Qs*$_{it}$ | | *Δmembers4Q*$_{it}$ | |
| Variables | Prediction | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Treat* | | 0.031*** | (3.22) | 0.017** | (2.36) | 0.031*** | (3.86) | 0.023** | (2.14) |
| *Post* | ? | 0.014 | (0.76) | 0.021 | (1.20) | 0.056**** | (4.45) | 0.046*** | (5.12) |
| *Treat × Post* | ? | -0.030 | (-1.18) | -0.030* | (-1.70) | -0.047*** | (-3.09) | -0.035** | (-2.59) |
| CU Controls | | YES | | YES | | YES | | YES | |
| Observations | | 36 | | 49 | | 36 | | 49 | |
| R-squared | | 0.653 | | 0.635 | | 0.761 | | 0.676 | |
| *Panel B: excluding Hurricane Katrina quarter* | | | | | | | | | |
| | | (1) | | (2) | | (3) | | (4) | |
| Dependent variable | | *Δmembers3Q*$_{it}$ | | *Δmembers3Qs*$_{it}$ | | *Δmembers4Qs*$_{it}$ | | *Δmembers4Q*$_{it}$ | |
| | | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| *Treat* | | 0.022 | (1.64) | 0.016* | (1.82) | 0.012 | (1.28) | 0.018** | (2.62) |
| *Post* | ? | 0.066*** | (5.64) | 0.044** | (2.54) | 0.051*** | (4.30) | 0.031** | (2.38) |
| *Treat × Post* | ? | -0.064*** | (-4.12) | -0.042** | (-2.81) | -0.021 | (-1.10) | -0.017 | (-1.42) |
| CU Controls | | YES | | YES | | YES | | YES | |
| Observations | | 39 | | 52 | | 39 | | 52 | |
| R-squared | | 0.669 | | 0.609 | | 0.707 | | 0.627 | |

Panel estimators based on treatment and control groups designed on the set of CUs with headquarters located in counties affected by Katrina. Dependent variable is the cumulative growth rate in membership (columns 1-2: 9 months, columns 3-4: 12 months). Treatment group (*Treat*=1): CUs with discretionary loan loss provision lower than 10% of the population. Control group (*Treat*=0): CUs with discretionary loan loss provision in the 10% higher.

Panel A: *Post*: post treatment. Columns 1 and 3: *Post* = 1 for 2005Q3-2006Q1, 0 for 2004Q4-2005Q2; columns 2 and 4: *Post* = 1 for 2005Q3-2006Q2, 0 for 2004Q3-2005Q2.

Panel B: *Post*: post treatment. Columns 1 and 3: *Post* = 1 for 2005Q4-2006Q2, 0 for 2004Q4-2005Q2; columns 2 and 4: *Post* = 1 for 2005Q4-2006Q3, 0 for 2004Q3-2005Q2.

Panels A and B: CU controls: $NW_{t-1}$, $loans_{t-1}$, $NPL_{t-1}$, $ROA_{t-1}$, $size_{t-1}$, $SEC_{t-1}$, $unfunded_{t-1}$ and $INT_{t-1}$. See Appendix A for variable definitions*, **, *** denote significance (based on two-tailed tests) at 10%, 5% and 1% level. T-stats based on Driscoll-Kraay standard errors with lag lengths 3 (columns 1-2) and 4 (columns 3-4).

# Chapter 3:

## 3. Does religion affect credit union risk taking?


### Abstract

There is growing recent interest about the effect that local culture, social values and norms, derived from religion have on corporate risk taking. The growing literature on this topic has provided evidence of the effect of religious adherence in reducing risk taking. However, the effect of difference in religious faiths (Catholics and Protestants) is still a matter for discussion. Credit unions offer a perfect setting for this issue, given their cooperative nature and restricted field of membership. This paper also takes advantage of a particular group of credit unions, the so-called associational faith-based, for which data on religious affiliation is manually collected. Results show that Catholic credit unions take less risk than Protestant credit unions. Differences in risk taking may be partially explained by different attitudes in terms of trust, entrepreneurship and thrift, which may lead to lending differences between the two groups. While Protestant credit unions tend to grant higher amounts of unsecured and business loans, Catholic credit unions seem to grant more real estate and automobile loans. These results contribute to the discussion on the effect of differences in risk taking behavior among different faiths. This paper also contributes to the literature on credit unions and has policy implications.



**Keywords:** credit unions, religion, culture, risk taking.
**JEL Classification:** G21, G32, Z12.

## 3.1. Introduction

There is a growing body of literature that analyzes the effect of culture on firms' strategies and more specifically, the effect of religion on firms' risk taking behavior. The effects of religion on individual attitudes have been widely studied (Iannaccone, 1998). It is recognized that religious beliefs affect the way humans see the world, how they interact with others and their attitudes to risk taking (Miller and Hoffman, 1995; Osoba, 2003). It has also been pointed out that social norms which come from being part of (or at least being influenced by) a religious group affect the way managers and employees act, and therefore influence firms' risk taking. Indeed, Hilary and Hui (2009) document that local religiosity reduces firm risk taking. Later studies have confirmed this relationship: to mention some specific examples, Gao et al. (2017) find the same for hedge funds, Shu et al (2012) for mutual funds and Adhikari and Agrawal (2016b) for banks. In general, all these analyses have confirmed a positive link between religious affiliation and reduced risk taking in financial and non-financial firms. However, when the analysis converse to the type of religion, the results are mixed. Some authors argue that Protestants are more risk averse (Barsky et al., 1997; Benjamin et al., 2016; Kumar, 2009; Kumar et al.,2011) which reduce risk taking by firms located in mainly protestant counties (Hilary and Hui, 2009; Shu et al.,2012). Others suggest the contrary effect (See: Adhikari and Agrawal, 2016b; Baxamusa and Jalal, 2015; Gao el al.,2017). Most of these studies focused on non-financial firms, except for Adhikari and Agrawal (2016b), and used survey data on religion affiliation at the firm's headquarters location. To my knowledge, there are no studies that address the effect of religion on risk taking using a panel of specific faith-based data. However, credit unions, given their cooperative nature and restricted field of membership, constitute a perfect setting to analyze the effect of religiosity on firms' risk taking.

The unique characteristics of CUs offer an interesting opportunity to understand better the effect of religion on institutional behavior. First, given their cooperative nature and the closeness among members, because of their field of membership, it is to be expected that social norms and the values of members and employees should affect CUs risk taking. Second, the restriction on field of membership allows to isolate a particular group of CUs whose membership is defined by religious affiliations, the so-called associational faith-based CUs. These CUs are restricted to members of a specific parish or groups of people who share the same faith within a specific location, for example members of the Catholic church of St. James in Boston. Then, using this subsample, data on religious affiliation (Catholic or Protestant)[50] was manually collected via web searching. This

[50] Information on Jewish and Muslim credit unions was also collected. However, the number of such CUs is too small to allow for a meaningful statistical analysis.

provides a unique setting of institutions that allow to test the effects of religious affiliation on firm's risk taking.

Using county-level survey data about total religious adherence this study finds that, as expected, CUs with headquarters in highly religious counties take on less risk. Breaking down the data by adherence to the Catholic or Protestant faiths, the results show evidence of lower risk taking for Catholic CUs when ROA volatility or liquidity risk is considered. There is no evidence of differences between Catholics and Protestants on credit or solvency risk. However, the results change completely when using more granular, manually collected, data on CU religious affiliation. Catholic CUs have a higher level of solvency, lower ROA volatilities and lower credit risk and liquidity risk. Further analysis allows to build three potential explanations for the differences in risk taking. Documented differences in trust, entrepreneurship and attitudes to thrift between Catholics and Protestants (See Guiso et al.,2003; Inglehart, 1999; Laporta et al.,1997; Nunziata and Rocco, 2016, 2018; Putman, 1993; Renneboog and Spaenjers,2012; Stulz and Williamson, 2003; Weber, 1930) might lead to different business models, in which Catholic CUs seem to be more careful with members' savings and lending practices.

This paper contributes to the literature in several ways: First, it contributes to the literature on how religiosity influences firms. It contributes to solving the puzzle of the effect of differences in firms' behavior that come from differences in religious affiliations (and in that sense, differences in culture and social norms). This paper makes a special contribution given that it uses a unique setting of institutions that are clearly identified as Catholic or Protestant. Second, it contributes to the understanding of CUs' risk taking and lending profiles, exploring how culture affects CU managers' decisions. Finally, this paper has policy implications for CU supervisors, showing that differences in culture affect the lending decisions of CU managers and the risk profile of CUs.

The rest of the chapter proceeds as follows: section 3.2 briefly reviews the literature on religion and risk taking, section 3.3 describes the data, section 3.4 evaluates the effect of religion on CUs' risk taking using survey data, section 3.5 analyzes the effect of different religious affiliations on CUs' risk taking using the specific sample of faith-based CUs, section 6 analyzes why Catholic credit unions take less risk, section 3.7 reports robustness tests and section 3.8 concludes.

## 3.2. Literature review.

### 3.2.1. The effect of religion on risk taking.

The effect of religious beliefs on risk taking has been broadly documented. There is consensus that religion reduces risk taking behavior. For instance, Hilary and Hui (2009) study the effect of

religiosity at the county level on non-financial firms in the US, using the American Religion Data Archive (ARDA)[51]. These authors find that religiosity of the county where the firm operates reduces firms' risk exposure. Callen and Fang (2015) suggest that firms located in counties with high religiosity ratios have lower levels of future "stock price cash risk". In addition, Gao et al. (2017) provide evidence that local religiosity, at the county level, reduces total and idiosyncratic volatilities of Hedge funds. Finally, Adhikari and Agrawal (2016b) analyze the effect of religiosity on US banks' risk taking. They find that the religiosity in the county where the bank's headquarters are located affects bank risk taking: higher religiosity levels are negatively related to stock return volatility, tail risk, idiosyncratic risk and insolvency risk.

The arguments behind the influence of religion on firms' risk taking rely on the view that social norms, derived from religious beliefs, affect individual perceptions about risk (See: Barsky et al, 1997; Gao et al.,2017; Kumar et al.,2011) and therefore managers' decisions (Hilary and Hui, 2009; Callen and Fang, 2015). Indeed, McGuire et al. (2012) suggest that religious social norms affect managers' methods of earnings management, and they find that firms located in areas with strong religiosity report fewer financial irregularities and have lower accrual manipulation.

Although there is consensus about the effect of religious adherence on firms' risk taking, the effect of different religious affiliations, namely Protestants or Catholics,[52] is not clear. There are some authors who argue that Catholics are less risk averse than Protestants and therefore, firms influenced by Catholic culture would take higher risks. On the other hand, there are several studies that suggest the contrary: Catholics are more risk averse, and firms influenced by Catholics take less risk. Below there is a summary of both arguments.

### 3.2.2. How differences in religion affect risk taking.

Starting with Max Weber with his analysis of the Protestant ethic and its impact on the development of capitalism (Weber, 1930), there have been several studies that analyze how

[51] The use of ARDA files is quite common in the religion literature (Adhikari and Agrawal, 2016b; Callen and Fang, 2015; Gao et al.,2016; Hilary and Hui, 2009 between others). These files contain religiosity data on religious affiliations at the county, state and national level for US. Data come from surveys conducted by The Glenmary Research Center every 10 years (Hilary and Hui, 2009).

[52] Regarding differences in risk taking, or attitudes that may affect risk, several authors have analyzed the differences between Catholics and Protestants (Adhikari and Agrawal, 2016b; Baxamusa and Jalal, 2016; Kumar et al., 2011; Gao et al., 2016; Hilary and Hui, 2009; Renneboog and Spaenjers, 2012; Shu et al, 2012) and have found different results. Other studies also include major religions such as: Buddhism, Hinduism, Jews, Muslims as well as Catholics and Protestants (Guiso et al., 2003; Halek and Eisenhauer, 2011; Keister, 2003; Noland, 2003; La Porta et al., 1999). Most of the studies that consider major religions use cross-national surveys and tend to agree in their results when they compare differences between major religions: Buddhism, Hinduism, Judaism, Islam and Christianity.

differences in religion, and particularly differences between Catholics and Protestants[53], affect people's economic behavior. Weber suggests that dogmatic differences between Protestants and Catholics explain differences in economic development. He argues, for example, that Protestants are more entrepreneurship and risk tolerant than Catholics. Later, Stulz and Williamson (2003) also develop a deep analysis of differences in Catholic and Protestant dogma and tradition, suggesting that low levels of creditors' rights in Catholic countries are a consequence of the negative view on usury present in the Catholic tradition. La Porta et al. (1997) and Inglehart (1999) show evidence that Catholic religion has a negative effect on trust and institutions. A similar result, regarding trust, is found by Putman (1993) and Guiso et al. (2003). However, Guiso et al. (2003) also observe that Catholics value thrift more than Protestants, a result that in their words contradict Weber's (1930) arguments. Given the differences between Catholic and Protestant traditions and dogma, which affect people's economic attitudes, some authors have analyzed whether Catholics and Protestants differ in their attitudes to risk and how this impacts on firm behavior. However, the results appear to be contradictory.

#### 3.2.2.1. Catholics are less risk averse than Protestants.

There are several authors who argue that Catholics are less risk averse than Protestants: Barsky et al. (1997) using survey data, find that Catholics are more risk tolerant that Protestants. Also, Benjamin et al (2016), using a laboratory experiment, find that Catholic identity increases risk taking, although they do not find that Protestant identity has a similar association. Behind these differences in risk taking there is an argument related to tolerance of gambling: Kumar (2009) documents that investors who live in Catholic areas have a preference for "lottery-type stocks". According to Kumar et al. (2011), Catholics are tolerant of moderate gambling, while Protestants have a strong negative view of gambling and lotteries. This argument is shared by Halek and Eisenhauer (2011), who suggest that Catholics are more tolerant to speculative risk. Indeed, Adhikari and Agrawal (2016a), as well as Schneider and Spalt (2017), use the Catholic to Protestant ratio as a proxy for local gambling preferences. Consequently, if Catholics are less risk averse than Protestants, this behavior should be reflected in firms influenced by Catholic culture. This is supported by Shu et al. (2012), who find that funds located in high Catholic – low Protestant areas take more speculative risk (higher fund return volatilities) than those in high Protestant - low

[53] Weber and other authors (Arruñada, 2010; Mayer and Sharp, 1962; Putman, 1993; Stulz and Williamson, 2003 among others) suggest that such differences are: ways to salvation (divine grace or salvation by works), the sacrament of penance for Catholics, the vertical bond between Catholics and the Church versus the horizontal bond that Protestants have with other people, and the view of wealth as a hint of salvation in the Protestant view (and most specifically in the Calvinist view).

Catholic counties. Also, Hilary and Hui (2009) document how firms in Protestant areas are associated with corporate risk aversion.

#### 3.2.2.2.Catholics are more risk averse than Protestants.

On the other hand, some authors suggest the contrary: Catholics are more risk averse than Protestants: Weber (1930), and later Stulz and Williamson (2003), argue that Protestants have more risk tolerance. Renneboog and Spaenjers (2012), using Dutch survey data, show that Catholics are more risk averse than Protestants and give more importance to thrift.[54] Halek and Eisenhauer (2011) suggest that Catholics are more averse to pure risk than Protestants.[55] In line with these views there are studies that suggest that firms influenced by Catholic culture take less risk. This is the case of Gao et al. (2017) who find a negative relationship between the Catholic to Protestant ratio and hedge fund risk. Also, Adhikari and Agrawal (2016b) find that Catholic ratios predict lower levels of bank risk taking more consistently. Baxamusa and Jalal (2015) suggests that Catholic CEOs are more conservative than Protestant CEOs in their financial decisions.[56] Baxamusa and Jalal offer an interesting hypothesis for their results: they argue that more entrepreneurial behavior is related to less risk aversion; therefore, as Protestants, compared with Catholics, encourage more entrepreneurship, Protestants are less risk averse than Catholics.

#### 3.2.2.3.Solving the puzzle.

Whether Catholics are more (or less) risk averse than Protestants, and how this risk aversion affects a firm's decisions, is still an open question and CUs because of their characteristics offer a unique setting to solve this puzzle. First their cooperative nature, where members are at the same time depositors and owners. This implies that if religious differences affect risk attitudes then, apart from the direct effect on managers' and employees' behavior, more risk averse members should put pressure on the credit union to avoid risk taking behaviors. Second, CUs have a restricted field of membership, which includes: community, occupational and associational. Associational CUs are also classified between faith-based and non-faith based. The existence of an associational faith-based common bond implies that there is a group of credit unions where members, managers and employees share the same religion and therefore the same values, traditions and culture. Using this

[54] Also, Guiso et al.,2003 find that Catholics value thrift more than Protestants, a result that in their words contradicts Weber's (1930) arguments.

[55] In fact, Halek and Eisenhauer (2011) try to reconcile the views on risk taking by Catholics and Protestants, arguing that while Catholics are more tolerant than Protestants of speculative risk, they are more averse to pure risk.

[56] Baxamusa and Jalal (2015) observe that firms with Catholic CEOs have higher diversification and lower leverage, issue debt with less frequency but issue equity with higher frequency.

subsample of credit unions and identifying manually which CUs are Catholic and which Protestant, it is possible to test clearly the effect of differences in religious beliefs on credit union risk taking.

### 3.3. Data

Data on US CUs is collected from the call reports available from the National Credit Union Administration (NCUA). Although the NCUA provides quarterly data, semiannually data is used given that quarterly data for all CUs regarding their size is only available since 2002S1.[57] These call reports contain detailed financial information as well as headquarters location and field of membership for each CU that operates in the United States. This study is restricted to federal CUs, to avoid any issue related to the influence of religion on the state supervisor. The sample period covers 1994S1 – 2016S2 yielding a maximum of 408,526 semiannual observations which correspond to 12,162 CUs. The list of variables collected is shown in Appendix A. Continuous CU variables were winsorized at the 0.5% level in each tail.

The data on religious affiliations, at the county level, for the first stage of the analysis comes from the American Religion Data Archive (ARDA), which provides information about the total number of people belonging to any religion, as well as number of adherents by specific religious affiliations. These data come from surveys conducted every 10 years by the Glenmary Research Center. Given that data is available only every 10 years, this study uses data for: 1990, 2000 and 2010. The variables of interest are: religiosity, calculated as number of adherents over total population (See Hilary and Hui, 2009), and the Catholic to Protestant ratio (See Adhikari and Agrawal, 2016b; Kumar, 2009; Kumar et al.,2011; Schneider and Spalt, 2017), which is build using the data on total Catholic adherents and total Protestant adherents.[58]

To control for demographic variables that may affect risk taking, county level data on demographics from the US Census Bureau was collected. Data on census as well as data on religion is decennial, so to obtain semiannual data it was necessary to linearly interpolated the data for 1994 to 2010 (Data between 1994 and 1999, was obtained by linearly interpolating data for 1990 and 2000, then for 2001 to 2009 was linearly interpolated data for 2000 and 2010, while for the data between 2011 and 2016 the 2010 data was set (See: Adhikari and Agrawal, 2016b; Gao et al., 2017; Hilary and Hui, 2009; Shu et al.,2012). To control for macroeconomic conditions, county-

[57] Before 2002Q2 only CUs with assets higher than 50 million report quarterly data, smaller CUs reported data semiannually until that date. Given the purposes of this study and the reduced number of faith-based credit unions it was more convenient to use all the sample of CUs regarding their size with semiannual data than to use quarterly data for a subsample of CUs.

[58] Data on Catholic and Protestant adherents also come from ARDA.

level data on the unemployment rate and personal income per capita was obtained from the Bureau of Labor Statistics and the Bureau of Economic Analysis respectively.

For sections 5 and 6 of this study, associational faith-based credit unions were used. Information about field of membership is available from the call reports of the NCUA. Nevertheless, the NCUA call reports do not provide information about the specific religious affiliation of the credit unions with faith-based membership. Therefore, religious affiliations were collected manually, using internet searches.[59] Given the small number of Jewish or Muslim CUs this study only uses Catholic or Protestant CUs. Then, a dummy for Catholic CUs was built, it takes value 1 when the credit union is Catholic and 0 when the credit union is Protestant.[60]

Table 1, panels A and B show descriptive statistics and correlations of the main variables used in this analysis. These statistics are mostly self-explanatory.

### 3.4. The effect of religiosity on risk taking

#### 3.4.1. Does religiosity affect Credit Unions' risk taking?

The relation between religiosity and the degree to which firms are willing to take risks has been widely analyzed in the literature (See: Adhikari and Agrawal, 2016b; Gao et al., 2017 or Hilary and Hui, 2009). Nevertheless, only Adhikari and Agrawal (2016b) have studied the effect of religiosity at the county level and bank risk taking in the US. Despite its increased importance in the US, to my knowledge, there is no study addressing the effect of religiosity or cultural values on credit union risk taking.

Given their cooperative nature and closeness among members because of their field of membership, it is expected that social norms and values of members, employees and managers should affect risk taking. Therefore, high religiosity ratios at the county level should be related with low credit union risk taking. To test that hypothesis, the following regression is estimated:

$$\mathrm{RISK}_{it} = \beta_0 + \beta_1 \mathrm{REL}_{j,t} + \mathrm{CUControls}_{i,t-1} + \mathrm{FOM}_{i,t} + \mathrm{CtControls}_{j,t} + \mu_j + d_t + \epsilon_{i,i,t} \qquad (1)$$

Given that CUs do not have shares in the stock markets it is not possible to use risk-market indicators. Therefore, it is necessary to use risk indicators from the banking literature, that do not rely on stock market valuations, as well as commonly used CUs risk taking indicators. In regression

[59] The religious affiliation of a maximum of 313 credit unions for the period 1994S1 to 2016S2 were obtained, yielding 9,312 observations.

[60] Being Catholic or Protestant means that the members of the credit union are Catholics or Protestants and therefore it is reasonable to expect that the employees and managers belong to this specific religion.

(1) RISK is a vector of risk indicators that includes: ZSCORE[61] a log of the z-score measure of solvency (High values of z-score implies higher solvency and lower probability of bankruptcy), calculated in a similar way to Adhikari and Agrawal (2016b) and Hesse and Cihák (2007). It also includes the logarithm of REGZ, which is the probability of exhausting regulatory capital (See Ely, 2014; Esho et al.,2005)[62] where $\text{REGZ} = \frac{\text{ROA} + \text{NWTA} - 0.06}{\sigma\text{ROA}}$. The use of 0.06 is justified because according to the NCUA, CUs with net worth ratio below 6% are considered undercapitalized. Then, high values of REGZ suggest that the credit union's probability of exhausting regulatory capital is low. Following Hilary and Hui (2009) the volatility of ROA (The standard deviation of ROA) is used (VOL3Y). [63] Finally, the vector of risk indicators also include: NPL (Non-performing loans) defined as delinquent loans with more than 60 days over total loans and leases, as a measure of credit risk; net worth deflated by total assets as a measure of capital adequacy (NWTA); and short investments[64] over assets as a measure of liquidity of the credit union (SHTINV).

Following the previous literature (Adhikari and Agrawal, 2016b; Hilary and Hue, 2009), the main explicatory variable is REL (religiosity), which is a measure of the religiosity in the county where the headquarters of the credit union is located. REL is calculated as the total number of adherents, of any religion, divided by the total population of the county. The vector CU Controls has different lagged idiosyncratic variables that may affect risk taking: credit union age, size, NPL (not included when NPL is the dependent variable), ROA (not included when ZSCORE or REGZ is the dependent variables), net worth ratio NWTA (not included when ZSCORE or REGZ is the dependent variable), shares and deposits deflated by total assets and non-interest income over total assets. Following Ely (2014), controls include the mix of loans: business loans, unsecured loans (credit card and other unsecured loans), real estate loans and auto loans (vehicle loans).[65] Following the literature (Adhikari and Agrawal, 2016b; Hilary and Hue, 2009; Gao et al.,2017) the vector

[61] Zscore measures the bank probability of insolvency (Lepetit and Strobel, 2013). It is calculated with the formula $\text{zscore} = \frac{\text{ROA} + \text{NWTA}}{\sigma\text{ROA}}$. where NWTA is the capital ratio of the credit union defined by net worth over total assets. There are some differences in the literature regarding whether to use average ROA and capital ratio or current ratios, as well as over what period to calculate the σROA (See Lepetit and Strobel, 2013 for a discussion). In this study two approaches were used: first the same used by Adhikari and Agrawal (2016b) and Hesse and Cihák (2007) that uses current values of ROA, capital ratios and for the denominator the standard deviation of ROA over the full sample. A second approach is the one suggested by Lepetit and Strobel (2013) where ROA is the mean ROA over the full sample, NWTA is current capital ratio and σROA is the standard deviation of ROA over the full sample. Alternative measures of zscore, particularly future zscore 3 years and 5 years forward were calculated and used for robustness purposes and provide similar results (These later results are not tabulated but are available upon request).

[62] With REGZ it was also calculated, for robustness, an alternative measure of forward looking REGZ 3 years forward (6 semesters), and the results are similar (These results are not tabulated but available upon request).

[63] Hilary and Hui (2009) use the standard deviation of ROA from year t-5 to t+5. This study uses the standard deviation of ROA from year t-3 to t+3.

[64] This measure considers short investments = cash+cash on deposits+ cash equivalents+total investments with maturity lower than 1 year. This measure is the same as suggested by the NCUA in their Financial performance ratios.

[65] All loans types are deflated by total loans and leases.

CtControls include some demographic controls and economic conditions, at the county level, such as: population, average age, percentage of minority population, proportion of married population, education, female ratio, county unemployment rate and personal income per capita. FOM refers to field of membership, it includes: multiple field of membership, community, occupational and associational. Finally, all regressions include county fixed effects, time effects and standard errors are clustered at the CU and county level.

Table 2 panels A and B show results for regression (1). Results in Table 2 panel A are in line with what is expected, that is, religiosity has a positive and significant effect in reducing insolvency risk as measured by ZSCORE and ZSCORE2[66] (0.232 and 0.217 with t-stats 3.03 and 3.14). For the measure of REGZ is observed a positive and significant coefficient of 0.284 with t-statistics 3.28. These results suggest that CUs that have their headquarters in counties with high religiosity have lower probabilities of insolvency and exhausting regulatory capital. Finally, in column 4 (VOL3Y) the coefficient is -0.104, and although it is only significant at 10% with a t-stat of -1.73, this result suggests an impact of religiosity in reducing return on asset volatility. Apart from the main explanatory variable there are other interesting results. All in all, it appears that some characteristics of the credit union such as credit union age and size reduce insolvency risk and volatility. Also, non-performing loans increase insolvency risk and volatility. The results on shares and deposits in increasing solvency risk but reducing volatility risk are surprising.[67] Finally, non-interest income appears to increase solvency risk and volatility, a result in line with previous findings in the literature (Fiordelisi and Mare, 2014; Goddard et al.,2008). Regarding the results on the mix of loans, it seems that unsecured loans and business loans increase solvency and volatility risk[68] while auto loans (vehicle loans) and real estate loans reduce risk, a result that might be explained given that these two types of loans are covered by collateral; these results would be useful for the second stage of the analysis. Finally, demographic variables suggest that the average age of the population, educational attainment and, to a lower extent, the female ratio all have a positive effect on reducing risk. While total population, minority ratio and unemployment increase risk, surprisingly personal income and married people also appear to increase risk.

Table 2 panel B shows the results for the second set of risk indicators. These results are quite surprising for NPL: while the expected coefficient was negative, results show a positive coefficient

[66] Given the way ZSCORE is constructed a positive value of zscore implies a lower probability of insolvency.

[67] Perhaps this result might be evidence of depositor discipline (chapter 1) since a negative correlation between volatility and shares and deposits might be a sign that members reduce their savings in the CU when volatility increases.

[68] In the first chapter it was found that member business loans granted by CUs have a positive and significant relationship to credit risk.

of 0.008 with a t-stat of 3.46. Then, for each percentage point of religiosity adherence, NPL increases 0.8%.[69] These results might be explained by differences in faith affiliations. It should be noted that that REL takes into account any person who adheres to a religion without taking into consideration the religious belief of that person. It is possible that the intensity of the scrutiny of loan applications or the mix of loans changes when the composition of religiosity among the population changes or when the credit union is either Catholic or Protestant (this analysis will be shown in section 6). On the other hand, the effect of religiosity on net worth ratio is positive although significant only at the 10% level (0.003 with t-stat 1.72), and the effect of the measure of liquidity risk is also positive, although again significant only at the 10% level, one-point increases in religiosity leading to a 1.8% increase in short term investments (t-stat 1.69).

All in all, the results in Table 2 panels A and B suggest that religiosity has a positive effect in reducing credit union risk taking: it reduces solvency risk, volatility risk and liquidity risk but increases credit risk.[70]

### 3.4.2. Do differences in religious affiliations affect risk taking?

While there is consensus that religion has a positive effect on reducing risk taking by non-financial and financial firms, there are opposite views on for the effect of the specific religious affiliation, particularly as far as differences between Catholics and Protestants are concerned. Thus, while Gao et al. (2017), Kumar (2009), Kumar et al. (2011), and to a lesser extent Hilary and Hui (2009) suggest that Catholics are less averse to risk, some authors like Adhikari and Agrawal (2016b), Baxamusa and Jalal (2015) or Renneboog and Spaenjers (2012) find the contrary: Catholics are more risk adverse. It is possible that the particularities of CUs might help to solve this puzzle.

Credit unions tend to be smaller than banks and closer to their members and communities, so they offer an interesting setting to test whether differences in religious affiliations affect risk taking. In the first stage the analysis is conducted in a similar way to Adhikari and Agrawal (2016b) and Gao et al (2017) using the Catholic to Protestant ratio. In the second stage (section 5), the field of associational-faith-based membership is used, that allows to test (for credit unions which define themselves according to a religious faith) whether difference in religious affiliations matters for risk taking.

[69] Previous religion-risk literature did not commonly use NPL as a risk indicator, except for Adhikari and Agrawal (2016b) who found no significant result. However, they found that during a crisis,banks in more religious areas have lower NPL ratios.

[70] The results with respect to solvency, volatility and liquidity risk are consistent with previous findings in the literature (See Adhikari and Agrawal, 2016b; Gao et al.,2017; Hilary and Hui, 2009).

For the first-stage analysis equation (1) is used replacing the main explicative variable REL for CPratio (Catholic to Protestant ratio) which is built with the information available at ARDA. As with REL, it was necessary to linearly interpolate data between 1994 and 1999 as well as data between 2001 and 2009, while setting values of 2010 for 2011 to 2016.

$$\mathrm{RISK}_{it} = \beta_0 + \beta_1 \mathrm{CPratio}_{j,t} + \mathrm{CUControls}_{i,t-1} + \mathrm{FOM}_{i,t} + \mathrm{CtControls}_{j,t} + \mu_j + d_t + \epsilon_{i,i,t} \quad (2)$$

Results are reported in Table 3 panels A and B. Although as mentioned before, the previous literature has found a differential effect for Catholics and Protestants, most of the regressions in panels A and B do not show conclusive evidence. Regressions in columns 1, 2 and 3 of panel A for ZSCORE and REGZ do not report evidence that the Catholic to Protestant ratio affects insolvency risk or probability of exhausting capital ratio. Nevertheless, results in column 4 Table 3 (panel A) report evidence that Credit Unions with headquarters in counties with a higher proportion of Catholic to Protestant population have lower volatility (-0.013 with t-stats -2.63). One percentage increase in the Catholic to Protestant (CP) ratio decreases volatility by 1.3%. With respect to panel B there is no evidence that the CP ratio affects NPL or NWTA in any direction, while the results suggest that the CP ratio has a small positive effect on liquidity risk reduction (coefficient 0.004 with t-stat 3.30). All in all, the results in Table 4 suggest that the influence of Catholic religion in the county-headquarters has a limited effect in reducing volatility and liquidity risk and no effect on solvency or credit risk. Nevertheless, these results need to be taken with caution. Both the REL ratio and the CP ratio are built upon the results of surveys taken every 10 years, where the ratios from intermediate years need to be linearly interpolated. Although the use of these surveys is common in the religion–risk taking literature, as is the linear interpolation of these results, this methodology involves some risks regarding the accuracy of the religious proxy but also the implicit assumption that the religiosity of the county headquarters is the same as the religiosity of the CEO and employees. It is true that some studies have proxies for the CEO's religion by looking at the religiosity in the state where the CEO grew up (Adhikari and Agrawal, 2016b) or the religiosity of the county where the CEO attended college (Gao et al., 2017), but the assumption here is that the religiosity of the college or place of birth affects CEO religiosity (or at least his/her social values or norms). The analysis of Baxamusa and Jalal (2015) is particularly interesting in this context, since it considers CEOs that identify themselves as Catholics.[71] In short, credit unions offer an interesting

[71] Baxamusa and Jalal (2015) only consider the religious affiliation of the CEO, they do not consider the affiliation of other employees, shareholders and other stakeholders of the firm.

opportunity to look more deeply and identify more clearly the effect of religious differences (and in that sense, cultural differences) into credit union behavior using the field of membership.

### 3.5. Do differences in religious affiliations affect risk taking? – Evidence from the faith-based credit unions

As already mentioned, CUs are financial cooperative associations with a restricted field of membership. Their field of membership could be community-based, occupational or associational (Federal CUs have also the possibility to add several fields of memberships, i.e. they may apply for a multiple field of membership). The associational CUs may also be differentiated between faith based, and non-faith based. According to the NCUA: "A single associational common bond consists of individuals (natural persons) and/or groups (non-natural persons) whose members participate in activities developing common loyalties, mutual benefits, and mutual interests." (NCUA, 2003).[72] Associational credit unions are classified into faith-based and non-faith-based, the first of which are credit unions whose associational common bond is defined by membership of a group with a common religious faith.[73] For example, "Members of St. John's Methodist Church and St. Luke's Methodist Church, located in Toledo, Ohio." (NCUA, 2003). This particular field of membership offers a unique setting of firms (credit unions) for which the specific religious affiliation can be unequivocally identified. Thus, their members, employees and managers clearly share the values and social norms of a specific faith. However, the NCUA does not record the faith denomination of the credit union, and the highest degree of detail in this matter is the "associational faith based" field of membership. In order to identify the religious affiliation of the credit union, it was necessary to manually collect, using web searches, the data on the specific religious affiliation of the credit unions and classified it into Catholic or Protestant.[74] Then, for those associational faith-based credit unions, a dummy named CATH identify the Catholic CUs with 1 and the Protestant CUs with 0.

#### 3.5.1. An initial look at the data

Table 4 shows some statistics that allow to make initial comparisons between the two groups. In the sample there are 6,096 CUs-observations of Protestant credit unions and 3,216 CUs-observations of Catholic credit unions. (The maximum number of Protestant CUs in the sample is

[72] National Credit Union Adminstration, 2003 Chartering And Field of Membership Manual, https://www.ncua.gov/Resources/Documents/CUDev/Chartering%20And%20Field%20of%20Membership%20Manual.pdf

[73] However, the NCUA clarifies that a faith-based association cannot be defined as Catholics in the US, or members of the Methodist church, given that is a very large group. The associational membership needs to be narrower, for instance, members of the Catholic parishes St. James and St. John in Boston.

[74] Initially, data was collected also on other non-Christian religions such as Buddhists, Hindus, Muslims and Jews. However, it was possible to identify only a small number of faith-based credit unions from non-Christian faiths.

197, and there were 116 catholic CUs).[75] In general terms Catholic CUs are considerably larger, hold higher proportions of shares and deposits, similar profitability as measured by ROA, and are older. In terms of risk indicators, a first look shows higher ZSCORE and REGZ measures for Catholics but no differences in capital adequacy. NPL is considerably higher for Protestant CUs but the proportion of loans over assets is lower for Protestant than for Catholic CUs. Regarding the mix of loans, Catholic CUs hold lower proportions of business loans and unsecured loans than Protestant CUs, while their holdings of real estate and automobile loans are higher. The results in Tables 2 and 3, which suggest that unsecured loans and business loans are riskier[76] may help to explain higher ZSCORES and lower NPL ratio for Catholic CUs. Finally, non-interest income is higher for Protestant CUs suggesting more diversification into non-interest activities. Taken together, these results give a taste of potential higher risk taking by Protestant CUs. Nevertheless, these preliminary results need to be taken with caution and only a more detailed analysis could confirm this hypothesis.

### 3.5.2. Regression analyses

To confirm whether Catholic and Protestant CUs take significantly different levels of risk the next regression is used:

$$\mathrm{RISK}_{it} = \beta_0 + \beta_1 \mathrm{CATH}_{j,t} + \mathrm{CUControls}_{i,t-1} + \mathrm{CtControls}_{j,t} + \mu_j + d_t + \epsilon_{i,i,t} \quad (3)$$

Equation (3) is similar to (1) and (2) but the main explanatory variable is the dummy CATH, that takes value 1 when the CU is Catholic and 0 when it is Protestant. Also, given that all the CUs in the subsample are associational faith based CUs, then it is not necessary to control for field of membership. Results are reported in Tables 5 and 6.

Table 5 shows clear evidence of higher risk taking for Protestant CUs. In columns 1 and 2 Catholic CUs have higher ZSCORE ratios (0.478 and 0.419 with t-stats 3.80 and 3.90). Also, for REGZ the coefficient is positive and significant (0.473 with t-stats 3.64). Regarding volatility, the coefficient is negative and significant (-0.176 with t-stats -2.53). These results suggest that Catholic CUs have a lower probability of insolvency, and of exhausting regulatory capital, as well as lower volatility on returns. Then, in panel B, column 1 shows a negative and significant coefficient (-0.019 with t-stat -2.04) suggesting that Catholic CUs have on average 1.9% less NPL than Protestants; in column 2 (NWTA) the coefficient is positive and significant although relatively low (0.005) (t-stat 2.15) indicating that Catholic CUs have 0.5% higher NWTA. The result for short investment assets

[75] This study only includes those associational faith-based CUs that were identified without any doubt as Catholic or Protestants.
[76] Also, the first chapter show that business loans increase credit risk of CUs.

suggests that Catholic CUs have lower liquidity risk, since Catholic CUs have on average 5.8% higher short-term investments than Protestant CUs. Finally, column 4, shows the results for a probit regression using as a dependent variable a dummy that takes the value of 1 when NWTA is lower than 0.06 (CUs with NWTA ratios below 0.06 are considered low capitalized by the NCUA); this regression gives an idea of the probability of being low capitalized. For this regression, the Catholic dummy has a negative significant coefficient of -0.229 with t-stat -2.48. Taken together, the results in Table 5 (panels A and B) suggest that Catholic CUs have lower risk taking: higher solvency ratios, lower ROA volatility, lower NPL, lower probability of being low capitalized, with higher capital ratios and liquidity.

### 3.5.3. Additional tests (matching estimators)

In order to confirm the results in Table 5, an additional test for robustness was used using the subsample of Catholic and Protestant CUs. To that end a series of matching estimator were designed to tests for the risk variables and some variables of interest. The treatment group are the Catholic CUs and the control group the Protestant CUs. The matching variables are: CUAGE, BUSLOANS, RESTATE, AUTOLOANS, UNSECLOANS, SIZE, S&D, NONINTINC, NPL (Except when NPL is the risk indicator), NWTA and ROA (Except when ZSCORE, ZSCORE2 or REGZ are the risk indicators), POP, AGE, MIN, MARR, EDU, FEM, UNEMP, PINCOME. The exact matches are county and time (semester-year). In all cases we use the Average Treatment Effect on the Treated of Abadie and Imbens (2011). The number of matches are: 1, 2 and 3. Results are shown in Table 6 panels A, B and C.

Results for ZSCOREs measures and REGZ are again positive and significant (the maximum p-value is 0.004). ZSCORES are between 0.125 and 0.219, for REGZ values are between 0.102 and 0.139. These results confirm that Catholic CUs have a lower solvency risk than Protestant CUs. Regarding volatility, Catholic CUs have volatilities between 13.2% and 14.2% lower than Protestant CUs (in all cases with p-values of 0.000), which again confirms that Catholic CUs have lower volatility than Protestant CUs. Then for short investment assets, the results also confirm lower liquidity risk with coefficients between 0.071 and 0.073 (in all cases p-values of 0.000). Nevertheless, the results for NWTA, although statistically significant, are again relatively low with coefficients of 0.001 in all cases suggesting that Catholic CUs have around 0.1% higher capital ratios than Protestants. Finally, the results for NPL are not statistically significant.

Panels B and C, as well as Tables 7 and 8, were built to explain why Catholic CUs have lower risk taking indicators.

### 3.6. Why do Catholic credit unions take less risk?

As mentioned before, there were mixed results in the literature about whether Catholics take less or more risk than Protestants. The results of this study, although not conclusive when using the ARDA surveys, show pretty clear evidence, for the manually collected subsample, that Catholic CUs take less risk than Protestant CUs. The objective of this section is to go one step further in understanding the causes of these results.

The overall results in Tables 4, 5 and 6 indeed suggest that Catholic credit unions have lower volatility returns, higher solvency, higher liquidity and lower credit risk, results that are in line with findings by Adhikari and Agrawal (2016b) and Gao et al.,2017.[77] It is possible that differences in risk taking come from differences in business models, arising from cultural and sociological differences between Catholics and Protestants. First, there is a wide body of literature which argues that Catholics trust people less than Protestants, a behavior that is explained by the vertical bond of the Catholic church which differs from the horizontal bond in the Protestant denominations (See Guiso et al., 2003; Inglehart, 1999; Laporta et al.,1997 and Putman, 1993). That difference in trust may have a positive consequence in reduced risk taking for credit unions. If Catholic CUs are more distrustful, they would have higher controls when evaluating loan applications[78] and would prefer to grant loans with collateral such as vehicles and real estate. Second, according to Weber (1930) and Stulz and Williamson (2003) Protestants encourage more entrepreneurship than Catholics, Nunziata and Rocco (2016) and later Nunziata and Rocco (2018) find empirical evidence for these claims for Switzerland and later for other European areas (that used to be part of the Holy Roman Empire). According to this view, Protestants CUs should grant higher amounts of business loans to their members, which would have a direct effect on increasing credit risk[79] and total risk[80]. Third, Guiso et al. (2003) and later Renneboog and Spaenjers (2012) suggest that Catholics give more importance to thrift. This, on the one hand, would imply that Catholic CUs should be more careful with members savings, which should translate into more careful considerations of loan applications (then lower NPL) but also higher solvency, capital and liquidity ratios (which is consistent with the results in Tables 4, 5 and 6). On the other hand, if Catholics give more importance to savings, it is likely that they would prefer real estate loans.

Finally, Baxamusa and Jalal (2015) argue that Catholic CEOs are more averse to leverage, issue less debt and diversify more. However, regarding diversification, previous results in the credit

[77] However, they do not go further in the reasons for these results.
[78] This would explain the reduction in NPL for Catholic credit unions founded in table 5 panel B.
[79] See first chapter and results for Tables 2 and 3 panels B.
[80] See the negative relationship between business loans and zscore in Tables 2 and 3 panel A.

union literature show that diversification into non-interest income sources may increase risk taking (Fiordelisi and Mare, 2014; Goddard et al.,2008) and so it is not clear a priori if the risk aversion documented by Baxamusa and Jalal (2015), and suggested by the results in Table 5, may arise from differences in diversification, and what the direction of this difference would be. Finally, differences in business models may also be reflected in ROA, saver or borrower orientation.

Results in Table 6 (panels B and C) are useful for a first test of these hypotheses. Panel B of Table 6 shows the results of matching estimators of loans and mix of loan differences for the treatment and control group. Panel C shows the results of matching estimators for differences in other CU characteristics such as: ROA, interest on loans, deposits and non-interest income. The results in panel B show that Catholic CUs give fewer loans than Protestant CUs, between 2.9% and 3.5% fewer (this is statistically significant with a p-value of 0.000) a result that is consistent with the findings of Baxamusa and Jalal (2015). Then, regarding the mix of loans, it appears that Catholic CUs grant fewer unsecured loans (between 1.8 and 2.7% less), slightly fewer business loans (between 0.6 and 0.7% less) and more real estate loans (between 4.5 and 5.4% more). On the other hand, the results in Panel C are less conclusive: Catholic CUs have slightly lower non-interest diversification (but the coefficient is very low -0.001) and pay 0.1% less in shares and deposits.

In addition, Tables 7 and 8, show results of equation (3) but instead of risk the dependent variables are: loans, mix of loans (Table 7) and CU characteristics (Table 8). Regarding Table 7, the result for the effect of Catholic CUs on loan levels is negative but not statistically significant. However, for the mix of loans, the results are significant for business loans where the coefficient is -0.011 with t-stat -3.24, for unsecured -0.08 with t-stat -2.50 and for automobile loans 0.08 with t-stat 2.54. For real estate the results show a positive, but not statistically significant, coefficient of 0.015 (t-stat 1.02). All in all, the results in Tables 6 and 7 suggest that Catholic and Protestant CUs differ significantly in the type of loans they grant and therefore in their business model. Protestant CUs tend to give more unsecured and business loans, giving support for the view that Protestants are more entrepreneurial. On the other hand, Catholic CUs appears to grant more automobile and real estate loans, supporting the view of Catholics being less trustful (preferring loans with collateral). Finally, the view of the Catholic preference for thrift receives support from previous results regarding higher liquidity and solvency as well as results regarding preference for real estate lending. [81] Regarding other CU characteristics, it was only obtained a significant coefficient for non-interest income. Although relatively lower, it appears that Catholic CUs obtain less non-

[81] Preference for real estate may also been explained by higher birth rates (Leher, 1996; Salamon, 1992).

interest income (-0.001 with t-stat -2.44), a result that contradicts Baxamusa and Jalal (2015). There are no significant results for: ROA, interest on deposits and interest on loans.

Summarizing, differences in risk taking between Catholic and Protestant CUs might be explained by differences in their business models, which arise from their cultural and sociological differences. Differences in trust, entrepreneurship and attitudes to thrift explain why both groups differ in their lending practices: these differences in types of loans would be one of the reasons explaining why Catholic CUs have lower risk levels.[82] Also, differences in attitudes to thrift might explain why Catholic CUs appear to be more conservative in terms of short investment holdings and capital ratios.

## 3.7. Robustness tests

### 3.7.1. Community credit unions

In section 4 regressions (1) and (2) were ran using federal credit unions and controlling for field of membership. However, it may be argued that a credit union may have different branches in different locations and given that is only being considered the religion of the county where the headquarter is located, the results obtained might also being influenced by the religiosity of other counties where the CU have branches. Another possibility, for occupational Credit Unions[83], is that the culture of the firm where the members of the credit union work influences the risk taking of the credit union. To isolate these potential effects, equations (1) and (2) were regressed for community CUs, where the community field of membership is restricted to people who live in a specific and delimited geographic area. The results are similar to those obtained previously and do not change the conclusions of section 4.1 and 4.2. These Tables are not tabulated to save space, but are available upon request.

### 3.7.2. Alternative measures of ZSCORE

Some alternative measures of ZSCORE, REGZ and volatility were used. Basically, a forward-looking measure for these 3 indicators. Then for ZSCORE was calculated the average ROA and average NWTA for the following 3 years, andthe standard deviation of the following 3 years, σROA. The new measure is FZSCORE3Y. A 5 years horizon was also applied: FZSCORE5Y. Then, for REGZ: average ROA, average NWTA and σROA was calculated for the following 3 years. For volatility, the standardized σROA was calculated also for the next 3 years. Then

[82] See the relationship between types of loans and NPL in tables 2 and 3 panel B and between types of loans and other risk indicators in tables 2 and 3 panel A.
[83] Occupational CUs are those CUs whose field of membership is an "occupational common bond", which implies that their members are employees of a specific firm.

regressions: (1), (2) and (3) were ran using Driscoll-Kraay (1998) standard errors with lag length equal to the horizon of the risk measure. Results were very similar; coefficient signs and significance did not change in any case. Again, these tables have not been included to save space, but are available upon request.

### 3.7.3. Robustness test excluding the 2008 financial crisis.

The 2008 financial crisis may cause some distortion in the results given the differences in assets holdings between Catholic and Protestant CUs. Although the time fixed effects might control for this, a robustness test excluding the crisis was done. Equation (1) was ran, using the dummy CATH and excluding the years 2008 and 2009. The results, for risk indicators, were very similar in magnitude, sign and significance that the results reported in tables 5 (Panels A and B), 6 and 7. These results are also not tabulated but are available upon request.

### 3.7.4. Catholic and Protestant CUs versus non-faith-based CUs.

To test for the differences between Catholic and Protestant CUs with respect to other non-faith-based CUs, equation (1) was run using a modified version of the dummy CATH or alternatively the dummy PROT. The modified version of CATH takes values of 1 when the CU is Catholic and 0 when is non-faith-based. PROT takes values of 1 when the CU is Protestant and 0 when is non-faith-based. The results for ZSCORE and REGZ show a positive and significant (at the 1% level) coefficient for CATH and negative and significant for volatility. While for PROT it was only obtained a positive coefficient (but with a lower magnitude and significant at the 10%) for one of the measures of ZSCORE and a negative coefficient (significant at the 1%) for volatility. All in all, the results suggest that Catholic CUs have lower solvency risk and volatility than the rest of CUs, while Protestant CUs have lower volatility than the rest of CUs. These results in a way offer robustness for findings in section 4. [84]

## 3.8. Concluding remarks

The previous literature has found that religion does have an influence on firms' behavior, specifically on risk taking. Although there is a consensus about the effect of religious adherence as a factor that reduces firms' risk taking, the effect of different religious beliefs is not completely clear. While some studies argue that Catholics are more risk tolerant than Protestants and this is reflected in firms that operate in high-Catholic, low-Protestant areas, other analyses show different evidence and suggest a greater inclination to take risks in Protestant locations. The credit union

[84] These tables are also not tabulated but are available upon request.

industry, given its particularities regarding field of membership and cooperative nature, offers a perfect setting to solve this puzzle.

Using the decennial ARDA surveys of religiosity as a starting point, and linearly interpolating the missing data, this study finds clear evidence that religiosity in the county where the CU headquarters are located had a positive effect in reducing volatility risk, increasing solvency, reducing the probability of exhausting regulatory capital and reducing liquidity risk. Surprisingly, religiosity appears to increase credit risk, a result that may be explained because of differences in lending practices between Catholics and Protestants.

The analysis performed using the ARDA surveys about differences in risk taking for Catholics and Protestants only show evidence of Catholic CUs having lower volatility and liquidity risk. Then this study takes advantage of the particularities of CUs' field of membership and uses a specific sample of association faith-based CUs, with manually collected information about the faith of CU members. The results show evidence that Catholic CUs take less risk than Protestant CUs. Particularly, Catholic CUs are more solvent, less volatile, have lower probability of exhausting regulatory capital, lower probability of being poorly capitalized, have lower liquidity and lower credit risk. These results might be explained by sociological differences between Catholics and Protestants that are reflected in their business models. The previous literature and the results of this paper suggest that differences in attitudes with respect to trust, entrepreneurship and thrift, influence the lending practices of CUs and their safeguarding of members' savings.

These results contribute to the general literature on the influence of culture, social norms and religion on firm's risk taking. Particularly, this paper helps to address the puzzle of the effect of differences in religious beliefs (between Catholics and Protestants) on risk taking, as well as their underlying reasons. The findings in this paper also contribute to the literature on CUs, showing how culture, and particularly religious beliefs, affect credit union managers' decisions on lending and risk taking, and therefore have policy implications for CUs supervisors.

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## Appendices, figures and tables chapter 3

### Appendix A: Variable Definitions

| | Variable | Definition |
|---|---|---|
| *Main dependent variables* | *ZSCORE* | Natural logarithm of $\text{z} - \text{score} = \frac{ROA_{it} + NWTA_{it}}{\sigma ROA_i}$ Where ROA and NWTA are current values and $\sigma ROA_i$ is the standard deviation of ROA for the full sample.[85] |
| | *ZSCORE2* | Natural logarithm of $\text{z} - \text{score} = \frac{avROA_{it} + NWTA_{it}}{\sigma ROA_i}$ Where avROA is the average ROA for the full sample, NWTA is the current values and $\sigma ROA_i$ is the standard deviation of ROA for the full sample.[86] |
| | *REGZ* | Natural logarithm of regz $= \frac{ROA_{it} + NWTA_{it} - 0.06}{\sigma ROA_i}$ Where ROA and NWTA are current values and $\sigma ROA_i$ is the standard deviation of ROA for the full sample. |
| | *VOL3Y* | Standard deviation of *ROA* (calculated over 12 semesters, from t-3 to t+3).[87] |
| | *NPL* | Delinquent loans with more than 60 days over total loans and leases |
| | *NWTA* | Net worth over total assets of the CU |
| | *SHTINV* | Short term investments over total assets. Where short investments = cash+cash on deposits+ cash equivalents+total investments with maturity lower than 1 year. |
| *Main explicative variables* | *REL* | Number of adherents to any religion divided by the total population of the county where the headquarter of the CU is located. |
| | *CPRATIO* | Number of Catholic adherents divided by the number of Protestant adherents in the county where the headquarter of the CU is located. |
| | *CATH* | Dummy that takes values of 1 when the associational faith-based CU is Catholic, 0 when it is Protestant. |
| *Credit Union variables* | *ROA* | Return on assets of the CU. |
| | *NONINTI* | Non-interest income deflated by total assets of the CU. |
| | *BUSLOAN* | Business loans over total loans of the CU. |
| | *RESTATE* | Real estate loans over total loans of the CU. |
| | *AUTOL* | Automobile loans over total loans of the CU. |
| | *UNSECL* | Unsecured loans (credit cards + other unsecured) over total loans of the CU. |
| | *SIZE* | Natural logarithm of total assets of the CU. |
| | *S&D* | Shares and deposits deflated by total assets of the CU. |
| | *MFOM* | Dummy that takes value 1 when the CU has a multiple field of membership, 0 if community or single field of membership, 0 otherwise. |
| | *OCCUP* | Dummy that takes value 1 when the CU is single field occupational, 0 otherwise |

[85] See Adhikari and Agrawal (2016) and Hesse and Cihák (2007).
[86] See Lepetit and Strobel (2013).
[87] Similar to Hilary and Hui (2009).

| | | |
|---|---|---|
| | *COMM* | Dummy that takes value 1 when the CU is community-based, 0 otherwise. |
| | *ASSOC* | Dummy that takes value 1 when the CU is single field associational, 0 otherwise |
| | *LOANSTA* | Total loans and leases over total assets of the CU. |
| | *CUAGE* | Natural logarithm of the CU age (In years) |
| *Demographic and macro controls* | *POP* | Natural logarithm of the population of the county where the headquarters of the CU is located. |
| | *AGE* | Natural logarithm of the average age of the population in the county where the headquarters of the CU is located. |
| | *MIN* | Fraction of the minority population (Others than white) in the county where the headquarters of the CU is located. |
| | *MARR* | Ratio of married households in the county where the headquarters of the CU is located. |
| | *EDU* | Fraction of the population with advanced education in the county where the headquarters of the CU is located. Advanced education is defined by the ratio of people 25 years and above with a bachelor, postgraduate or professional degree. |
| | *FEM* | Ratio of male to female population in the county where the headquarters of the CU is located. |
| | *UNEMP* | Unemployment rate in the county where the headquarters of the CU is located. |
| | *PINCOME* | Personal income per capita in the county where the headquarters of the CU is located. |

**Table 1: Descriptive statistics**

| *Panel A: basic descriptive statistics of the main variables* | | | | |
|---|---|---|---|---|
| **Variables** | | **Mean** | **Median** | **StdDev** |
| *Main dependent variables* | *ZSCORE* | 3.300 | 3.454 | 0.890 |
| | *ZSCORE2* | 3.316 | 3.454 | 0.789 |
| | *REGZ* | 2.572 | 2.745 | 1.062 |
| | *VOL3Y* | 0.998 | 0.638 | 1.000 |
| | *NPL* | 0.022 | 0.011 | 0.039 |
| | *NWTA* | 0.134 | 0.119 | 0.060 |
| | *SHTINV* | 0.284 | 0.247 | 0.171 |
| *Main explicative variables* | *REL* | 0.533 | 0.534 | 0.124 |
| | *CPRATIO* | 1.454 | 0.863 | 0.124 |
| *CU Controls* | *ROA* | 0.003 | 0.003 | 0.007 |
| | *NONINTI* | 0.004 | 0.003 | 0.004 |
| | *BUSLOAN* | 0.013 | 0.000 | 0.047 |
| | *RESTATE* | 0.145 | 0.065 | 0.176 |
| | *AUTOL* | 0.486 | 0.501 | 0.231 |
| | *UNSECL* | 0.205 | 0.148 | 0.203 |
| | *SIZE* | 1.614 | 1.612 | 2.002 |
| | *S&D* | 0.856 | 0.871 | 0.062 |
| | *MFOM* | 0.361 | 0.000 | 0.480 |
| | *OCCUP* | 0.137 | 0.000 | 0.344 |
| | *COMM* | 0.256 | 0.000 | 0.436 |
| | *ASSOC* | 0.783 | 0.000 | 0.269 |
| *Demographic and macro controls* | *POP* | 1.259 | 1.267 | 1.530 |
| | *AGE* | 3.627 | 3.627 | 0.065 |
| | *MIN* | 0.245 | 0.207 | 0.176 |
| | *MARR* | 0.505 | 0.514 | 0.070 |
| | *EDU* | 0.258 | 0.253 | 0.091 |
| | *FEM* | 0.511 | 0.512 | 0.013 |
| | *UNEMP* | 0.058 | 0.054 | 0.023 |
| | $PINCOME_t$ | 1.037 | 1.036 | 0.334 |

**Table 1: Correlation matrix**

| *Panel B: correlation matrix* | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| *ZSCORE* | 1.00 | 0.91 | -0.52 | -0.25 | 0.26 | -0.10 | 0.01 | -0.08 | 0.11 | -0.01 | 0.12 | 0.24 | 0.01 | -0.19 | 0.34 | -0.25 |
| *REGZ* | 0.89 | 1.00 | -0.34 | -0.18 | 0.60 | 0.01 | 0.04 | -0.08 | 0.15 | -0.12 | 0.01 | 0.09 | 0.06 | -0.12 | 0.15 | -0.56 |
| *VOL3Y* | -0.51 | -0.38 | 1.00 | 0.34 | 0.20 | 0.20 | 0.04 | 0.03 | -0.08 | -0.10 | -0.18 | -0.34 | 0.04 | 0.21 | -0.47 | -0.19 |
| *NPL* | -0.28 | -0.19 | 0.43 | 1.00 | 0.08 | 0.13 | 0.06 | 0.04 | -0.10 | -0.09 | -0.09 | -0.21 | 0.00 | 0.18 | -0.28 | -0.07 |
| *NWTA* | 0.12 | 0.41 | 0.24 | 0.19 | 1.00 | 0.27 | 0.10 | -0.02 | 0.05 | -0.32 | -0.21 | -0.25 | 0.10 | 0.09 | -0.34 | -0.92 |
| *SHTINV* | -0.18 | -0.07 | 0.25 | 0.30 | 0.29 | 1.00 | 0.08 | 0.09 | -0.11 | -0.33 | -0.31 | -0.35 | 0.08 | 0.24 | -0.46 | -0.18 |
| *REL* | -0.01 | 0.03 | 0.05 | 0.07 | 0.09 | 0.08 | 1.00 | 0.19 | 0.05 | -0.17 | -0.09 | -0.10 | -0.01 | 0.06 | -0.17 | -0.09 |
| *CPRATIO* | -0.07 | -0.05 | 0.05 | 0.09 | 0.04 | 0.13 | 0.29 | 1.00 | -0.05 | -0.17 | -0.01 | 0.07 | -0.26 | 0.11 | -0.03 | 0.02 |
| *ROA* | 0.11 | 0.16 | -0.15 | -0.13 | 0.00 | -0.11 | 0.04 | -0.02 | 1.00 | 0.04 | 0.01 | -0.03 | 0.01 | 0.01 | 0.03 | -0.06 |
| *NONINTI* | -0.04 | -0.11 | 0.00 | -0.09 | -0.23 | -0.23 | -0.13 | -0.15 | 0.08 | 1.00 | 0.29 | 0.35 | -0.11 | -0.08 | 0.51 | 0.25 |
| *BUSLOAN* | 0.04 | 0.00 | -0.06 | -0.04 | -0.08 | -0.16 | -0.03 | 0.02 | 0.01 | 0.11 | 1.00 | 0.40 | -0.29 | -0.30 | 0.48 | 0.12 |
| *RESTATE* | 0.19 | 0.10 | -0.24 | -0.18 | -0.20 | -0.29 | -0.09 | 0.10 | -0.02 | 0.16 | 0.21 | 1.00 | -0.48 | -0.34 | 0.68 | 0.19 |
| *AUTOL* | 0.05 | 0.07 | -0.09 | -0.11 | 0.03 | -0.04 | -0.01 | -0.27 | 0.00 | -0.05 | -0.25 | -0.48 | 1.00 | -0.11 | -0.29 | -0.06 |
| *UNSECL* | -0.24 | -0.15 | 0.33 | 0.29 | 0.21 | 0.37 | 0.09 | 0.19 | -0.01 | -0.10 | -0.16 | -0.33 | -0.35 | 1.00 | -0.27 | -0.05 |
| *SIZE* | 0.35 | 0.18 | -0.45 | -0.39 | -0.37 | -0.49 | -0.16 | -0.04 | 0.04 | 0.36 | 0.27 | 0.56 | -0.19 | -0.40 | 1.00 | 0.26 |
| *S&D* | -0.11 | -0.38 | -0.24 | -0.18 | -0.94 | -0.23 | -0.08 | -0.04 | 0.00 | 0.17 | 0.02 | 0.15 | 0.01 | -0.18 | 0.29 | 1.00 |

Panel A: See Appendix A for variable definitions. Sample comprises Credit Unions through the period 1994 S1 to 2016 S2. This yields a total of 408,526 Credit Union-quarter observations. CU variables were winsorized at the 0,5% level in each tail. CUs. Panel B: Spearman (Pearson) correlation coefficients of the variables as included in the regression models are shown above (below) the diagonal. Only correlations between CU-level variables are included. All correlations are significant at the 1% level. (1): *ZSCORE*; (2) *REGZY*, (3) *VOL3Y*, (4): *NPL*; (5): *NWTA*; (6): *SHTINV*; (7): *REL*; (8): *CPRATIO*; (9): *ROA*; (10): *NONINTI*; (11): *BUSLOAN*; (12): *RELSTATE*; (13): *AUTOL*; (14): *UNSECL* ; (15): *SIZE*; (16): *S&D*

**Table 2. Does religiosity affect CUs' risk-taking?**

| PANEL A | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Z-SCORE | | Z-SCORE2 | | REGZ | | VOL3Y | |
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $REL_t$ | 0.232*** | (3.03) | 0.217*** | (3.14) | 0.284*** | (3.28) | -0.104* | (-1.73) |
| $CUAGE_{t-1}$ | 0.168*** | (5.74) | 0.148*** | (5.61) | 0.165*** | (4.97) | -0.118*** | (-4.80) |
| $BUSLOANS_{t-1}$ | -0.855*** | (-4.23) | -0.821*** | (-4.54) | -0.840*** | (-3.71) | 0.871*** | (5.68) |
| $RESTATE_{t-1}$ | 0.189*** | (3.34) | 0.190*** | (3.73) | 0.245*** | (3.92) | -0.297*** | (-6.46) |
| $AUTOLOANS_{t-1}$ | 0.312*** | (5.56) | 0.322*** | (7.04) | 0.426*** | (7.10) | -0.524*** | (-10.60) |
| $UNSECLOANS_{t-1}$ | -0.098** | (-2.03) | -0.148*** | (-3.62) | -0.069 | (-1.32) | 0.254*** | (5.84) |
| $SIZE_{t-1}$ | 0.205*** | (29.46) | 0.193*** | (34.13) | 0.202*** | (26.11) | -0.208*** | (-35.01) |
| $NPL_{t-1}$ | -3.111*** | (-13.31) | -2.923*** | (-18.24) | -3.232*** | (-12.63) | 5.282*** | (23.61) |
| $S\&D_{t-1}$ | -3.967*** | (-20.62) | -4.129*** | (-26.22) | -8.273*** | (-30.73) | -3.179*** | (-9.87) |
| $NONINTINC_{t-1}$ | -31.435*** | (-15.50) | -32.652*** | (-17.50) | -38.485*** | (-16.51) | 42.214*** | (21.81) |
| $ROA_{t-1}$ | | | | | | | -22.714*** | (-10.12) |
| $NWTA_{t-1}$ | | | | | | | -2.211*** | (-6.79) |
| $POP_t$ | -0.046*** | (-4.39) | -0.032*** | (-3.67) | -0.054*** | (-4.67) | 0.009 | (0.93) |
| $AGE_t$ | 0.677*** | (2.90) | 0.772*** | (4.04) | 0.802*** | (3.10) | -0.516*** | (-3.03) |
| $MIN_t$ | -0.235*** | (-3.33) | -0.168*** | (-2.72) | -0.140* | (-1.80) | 0.195*** | (3.41) |
| $MARR_t$ | -0.449** | (-2.25) | -0.382** | (-2.18) | -0.420* | (-1.94) | 0.349* | (1.84) |
| $EDU_t$ | 0.410** | (2.30) | 0.343** | (2.10) | 0.419** | (2.11) | -0.203 | (-1.42) |
| $FEM_t$ | 1.459* | (1.78) | 0.776 | (1.05) | 2.307** | (2.53) | -0.692 | (-0.91) |
| $UNEMP_t$ | -0.898** | (-2.00) | -0.808* | (-1.85) | -1.099** | (-2.31) | 0.722* | (1.72) |
| $PINCOME_t$ | -0.229*** | (-3.41) | -0.200*** | (-3.32) | -0.304*** | (-4.03) | 0.017 | (0.28) |
| Observations | 215,965 | | 215,767 | | 210,401 | | 216,311 | |
| County effects | YES | | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | | YES | |
| FOM Controls | YES | | YES | | YES | | YES | |
| R-squared | 0.310 | | 0.390 | | 0.334 | | 0.414 | |

**Table 2 (Continued)**

| PANEL B | | | | | | |
|---|---|---|---|---|---|---|
| Dependent variable | NPL | | NWTA | | SHTINV | |
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $REL_t$ | 0.008*** | (3.46) | 0.003* | (1.72) | 0.018* | (1.69) |
| $CUAGE_{t-1}$ | 0.002* | (1.95) | 0.004*** | (5.05) | -0.023*** | (-5.64) |
| $BUSLOANS_{t-1}$ | 0.039*** | (5.38) | -0.025*** | (-4.30) | -0.161*** | (-5.14) |
| $RESTATE_{t-1}$ | -0.008*** | (-4.09) | 0.004*** | (2.71) | -0.083*** | (-7.27) |
| $AUTOLOANS_{t-1}$ | -0.021*** | (-8.53) | 0.004*** | (3.84) | -0.066*** | (-5.99) |
| $UNSECLOANS_{t-1}$ | 0.014*** | (4.74) | 0.004*** | (3.59) | 0.063*** | (6.48) |
| $SIZE_{t-1}$ | -0.008*** | (-21.03) | -0.002*** | (-7.89) | -0.027*** | (-22.38) |
| $NPL_{t-1}$ | | | -0.024*** | (-5.47) | 0.279*** | (7.67) |
| $S\&D_{t-1}$ | -0.094*** | (-8.26) | -0.887*** | (-95.12) | 0.481*** | (5.79) |
| $NONINTINC_{t-1}$ | 0.515*** | (7.00) | -0.594*** | (-13.67) | 1.818*** | (7.70) |
| $ROA_{t-1}$ | -0.589*** | (-12.51) | 0.273*** | (12.08) | -1.017*** | (-4.12) |
| $NWTA_{t-1}$ | -0.075*** | (-5.65) | | | 0.775*** | (9.10) |
| $POP_t$ | 0.001*** | (4.11) | 0.000 | (0.76) | 0.011*** | (6.59) |
| $AGE_t$ | 0.013** | (2.13) | 0.005 | (1.23) | 0.120*** | (3.84) |
| $MIN_t$ | 0.007*** | (3.12) | 0.003* | (1.87) | 0.036*** | (3.24) |
| $MARR_t$ | -0.003 | (-0.41) | -0.001 | (-0.23) | -0.111*** | (-3.65) |
| $EDU_t$ | 0.000 | (0.03) | -0.014*** | (-3.62) | -0.065** | (-2.27) |
| $FEM_t$ | -0.007 | (-0.26) | -0.001 | (-0.07) | -0.470*** | (-3.64) |
| $UNEMP_t$ | 0.037*** | (2.79) | 0.000 | (0.05) | 0.077 | (1.24) |
| $PINCOME_t$ | -0.003 | (-1.09) | 0.002 | (1.43) | 0.039*** | (3.46) |
| Observations | 216,210 | | 216,307 | | 216,307 | |
| County effects | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | |
| FOM Controls | YES | | YES | | YES | |
| R-squared | 0.278 | | 0.887 | | 0.380 | |

Panels A and B: Panel regressions of risk taking measures on religiosity ratio in the county where the CU Headquarters are located. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 3. Do differences in religious affiliations affect CUs' risk-taking?**

| PANEL A | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Z-SCORE | | Z-SCORE2 | | REGZ | | VOL3Y | |
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| *CPRATIO*$_t$ | 0.003 | (0.55) | -0.001 | (-0.10) | 0.001 | (0.12) | -0.013*** | (-2.63) |
| *CUAGE*$_{t-1}$ | 0.168*** | (5.71) | 0.148*** | (5.57) | 0.165*** | (4.94) | -0.119*** | (-4.80) |
| *BUSLOANS*$_{t-1}$ | -0.840*** | (-4.14) | -0.805*** | (-4.42) | -0.818*** | (-3.60) | 0.873*** | (5.70) |
| *RESTATE*$_{t-1}$ | 0.190*** | (3.35) | 0.192*** | (3.75) | 0.248*** | (3.94) | -0.299*** | (-6.53) |
| *AUTOLOANS*$_{t-1}$ | 0.313*** | (5.54) | 0.319*** | (6.96) | 0.424*** | (7.01) | -0.536*** | (-10.74) |
| *UNSECLOANS*$_{t-1}$ | -0.100** | (-2.06) | -0.148*** | (-3.61) | -0.069 | (-1.32) | 0.260*** | (6.01) |
| *SIZE*$_{t-1}$ | 0.204*** | (29.26) | 0.192*** | (33.96) | 0.200*** | (25.83) | -0.207*** | (-35.17) |
| *NPL*$_{t-1}$ | -3.097*** | (-13.29) | -2.909*** | (-18.21) | -3.214*** | (-12.59) | 5.269*** | (23.59) |
| *S&D*$_{t-1}$ | -3.974*** | (-20.61) | -4.135*** | (-26.21) | -8.284*** | (-30.69) | -3.150*** | (-9.84) |
| *NONINTINC*$_{t-1}$ | -31.471*** | (-15.45) | -32.819*** | (-17.58) | -38.620*** | (-16.50) | 41.901*** | (21.63) |
| *ROA*$_{t-1}$ | | | | | | | -22.743*** | (-10.18) |
| *NWTA*$_{t-1}$ | | | | | | | -2.188*** | (-6.75) |
| Observations | 215,627 | | 215,429 | | 210,067 | | 215,973 | |
| County effects | YES | | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | | YES | |
| FOM Controls | YES | | YES | | YES | | YES | |
| DEMO Controls | YES | | YES | | YES | | YES | |
| R-squared | 0.310 | | 0.389 | | 0.334 | | 0.414 | |

**Table 3 (Continued)**

| PANEL B | | | | | | |
|---|---|---|---|---|---|---|
| Dependent variable | NPL | | NWTA | | SHTINV | |
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $CPRATIO_t$ | 0.000 | (0.46) | 0.000 | (1.14) | 0.004*** | (3.30) |
| $CUAGE_{t-1}$ | 0.002** | (1.99) | 0.004*** | (5.06) | -0.023*** | (-5.65) |
| $BUSLOANS_{t-1}$ | 0.040*** | (5.47) | -0.025*** | (-4.27) | -0.163*** | (-5.16) |
| $RESTATE_{t-1}$ | -0.008*** | (-4.11) | 0.004*** | (2.72) | -0.084*** | (-7.28) |
| $AUTOLOANS_{t-1}$ | -0.021*** | (-8.46) | 0.005*** | (3.97) | -0.064*** | (-5.80) |
| $UNSECLOANS_{t-1}$ | 0.014*** | (4.74) | 0.004*** | (3.50) | 0.061*** | (6.34) |
| $SIZE_{t-1}$ | -0.008*** | (-20.80) | -0.002*** | (-7.89) | -0.027*** | (-22.10) |
| $NPL_{t-1}$ | | | -0.024*** | (-5.49) | 0.281*** | (7.70) |
| $S\&D_{t-1}$ | -0.094*** | (-8.31) | -0.887*** | (-95.31) | 0.478*** | (5.74) |
| $NONINTINC_{t-1}$ | 0.426*** | (6.04) | -0.743*** | (-16.27) | -2.046*** | (-5.80) |
| $ROA_{t-1}$ | -0.589*** | (-12.44) | 0.275*** | (12.10) | -1.019*** | (-4.11) |
| $NWTA_{t-1}$ | -0.075*** | (-5.66) | | | 0.775*** | (9.07) |
| Observations | 215,872 | | 215,969 | | 215,969 | |
| County effects | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | |
| FOM Controls | YES | | YES | | YES | |
| DEMO Controls | YES | | YES | | YES | |
| R-squared | 0.278 | | 0.887 | | 0.381 | |

Panels A and B: Panel regressions of risk taking measures on Catholic to Protestant ratio in the county where the CU Headquarters are located. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 4. Do differences in religious affiliations affect CUs risk-taking? – Additional statistics**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Obs* | *ASSETS* | *Obs* | *S&D* | *Obs* | *ROA* | *Obs* | *CUAGE* |
| *Protestants* | 6,096 | 3,686,100 | 6,095 | 0.833 | 6,036 | 0.002 | 6,096 | 36.664 |
| *Catholics* | 3,216 | 9,243,704 | 3,216 | 0.839 | 3,170 | 0.001 | 3,216 | 53.335 |
| *Difference* | | -5,557,604 | | -0.006 | | 0.000 | | -16.671 |
| *p-value* | | 0.000 | | 0.001 | | 0.175 | | 0.000 |
| | *Obs* | *ZSCORE* | *Obs* | *ZSCORE2* | *Obs* | *REGZ* | *Obs* | *NPL* |
| *Protestants* | 5,994 | 2.239 | 6,045 | 2.317 | 5,688 | 1.614 | 6,022 | 0.118 |
| *Catholics* | 3,164 | 3.203 | 3,188 | 3.241 | 3,111 | 2.541 | 3,210 | 0.061 |
| *Difference* | | -0.964 | | -0.923 | | -0.926 | | 0.057 |
| *p-value* | | 0.000 | | 0.000 | | 0.000 | | 0.000 |
| | *Obs* | *NWTA* | *Obs* | *SHTINV* | *Obs* | *LOANSTA* | *Obs* | *BUSLOANS* |
| *Protestants* | 6,095 | 0.155 | 6,095 | 0.572 | 6,095 | 0.352 | 6,022 | 0.006 |
| *Catholics* | 3,216 | 0.154 | 3,216 | 0.450 | 3,216 | 0.444 | 3,210 | 0.004 |
| *Difference* | | 0.001 | | 0.122 | | -0.092 | | 0.002 |
| *p-value* | | 0.268 | | 0.000 | | 0.000 | | 0.000 |
| | *Obs* | *RESTATE* | *Obs* | *AUTOLOANS* | *Obs* | *UNSECLOANS* | *Obs* | *NONINTINC* |
| *Protestants* | 6,022 | 0.032 | 6,022 | 0.249 | 6,022 | 0.515 | 6,036 | 0.004 |
| *Catholics* | 3,210 | 0.113 | 3,210 | 0.457 | 3,210 | 0.244 | 3,170 | 0.001 |
| *Difference* | | -0.081 | | -0.208 | | 0.271 | | 0.003 |
| *p-value* | | 0.000 | | 0.000 | | 0.000 | | 0.000 |

Comparative statistics on risk indicators, types of loans and variables of interest by Catholic and Protestants. CUAGE and ASSETS in this table are not logged.

**Table 5. Do differences in religious affiliations affect CUs' risk-taking?**

| PANEL A | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Z-SCORE | | Z-SCORE2 | | REGZ | | VOL3Y | |
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $CATH_t$ | 0.474*** | (3.80) | 0.419*** | (3.90) | 0.473*** | (3.64) | -0.176** | (-2.53) |
| $CUAGE_{t-1}$ | 0.338*** | (3.00) | 0.297*** | (3.26) | 0.390*** | (3.00) | -0.101 | (-1.50) |
| $BUSLOANS_{t-1}$ | 0.350 | (0.44) | 0.281 | (0.34) | -0.348 | (-0.49) | -0.817** | (-2.05) |
| $RESTATE_{t-1}$ | 0.002 | (0.44) | 0.001 | (0.32) | -0.000 | (-0.09) | 0.001 | (0.36) |
| $AUTOLOANS_{t-1}$ | -0.132 | (-0.67) | 0.068 | (0.45) | -0.100 | (-0.47) | -0.172 | (-1.52) |
| $UNSECLOANS_{t-1}$ | 0.074 | (0.66) | 0.022 | (0.23) | 0.087 | (0.72) | -0.063 | (-0.84) |
| $SIZE_{t-1}$ | 0.233*** | (5.49) | 0.236*** | (6.58) | 0.211*** | (4.71) | -0.168*** | (-7.48) |
| $NPL_{t-1}$ | -0.809** | (-2.55) | -0.666*** | (-3.70) | -0.812** | (-2.32) | 1.035*** | (5.26) |
| $S\&D_{t-1}$ | -3.339*** | (-3.56) | -3.478*** | (-5.27) | -6.819*** | (-6.76) | -3.231** | (-2.46) |
| $NONINTINC_{t-1}$ | -8.857* | (-1.93) | -9.910*** | (-3.01) | -9.645** | (-1.96) | 21.604*** | (9.32) |
| $ROA_{t-1}$ | | | | | | | -9.965*** | (-7.01) |
| $NWTA_{t-1}$ | | | | | | | -2.397* | (-1.96) |
| Observations | 8,490 | | 8,463 | | 8,170 | | 8,529 | |
| County effects | YES | | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | | YES | |
| DEMO Controls | YES | | YES | | YES | | YES | |
| R-squared | 0.404 | | 0.517 | | 0.410 | | 0.428 | |

**Table 5 (Continued)**

| PANEL B | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | NPL | | NWTA | | SHTINV | | NWTA<0.06 | |
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $CATH_t$ | -0.019** | (-2.04) | 0.005** | (2.15) | 0.058*** | (2.87) | -0.229** | (-2.48) |
| $CUAGE_{t-1}$ | 0.012 | (1.53) | 0.003 | (1.57) | -0.032* | (-1.81) | -0.428*** | (-7.58) |
| $BUSLOANS_{t-1}$ | -0.016 | (-0.28) | -0.013 | (-0.82) | -0.169 | (-1.21) | 0.253 | (0.26) |
| $RESTATE_{t-1}$ | 0.000 | (1.44) | -0.000 | (-0.10) | -0.003*** | (-4.71) | 0.007** | (2.09) |
| $AUTOLOANS_{t-1}$ | 0.004 | (0.28) | 0.006 | (1.58) | -0.194*** | (-6.31) | -0.146 | (-0.98) |
| $UNSECLOANS_{t-1}$ | 0.027*** | (2.71) | 0.004* | (1.71) | 0.007 | (0.39) | -0.001 | (-0.01) |
| $SIZE_{t-1}$ | -0.027*** | (-8.18) | -0.002** | (-2.15) | -0.055*** | (-8.28) | -0.062** | (-1.96) |
| $NPL_{t-1}$ | | | -0.009 | (-1.29) | 0.107*** | (3.14) | 0.924*** | (4.05) |
| $S\&D_{t-1}$ | -0.164 | (-0.86) | -0.888*** | (-27.62) | 0.363* | (1.77) | 12.153*** | (18.57) |
| $NONINTINC_{t-1}$ | 0.338 | (1.05) | -0.289*** | (-3.57) | -0.223 | (-0.37) | 4.074 | (1.10) |
| $ROA_{t-1}$ | -0.933*** | (-4.83) | 0.026 | (0.50) | -0.572* | (-1.87) | -6.232*** | (-2.98) |
| $NWTA_{t-1}$ | -0.145 | (-0.73) | | | 0.537** | (2.34) | | |
| Observations | 8,513 | | 8,529 | | 8,529 | | 8,529 | |
| County effects | YES | | YES | | YES | | NO | |
| Time effects | YES | | YES | | YES | | NO | |
| DEMO Controls | YES | | YES | | YES | | NO | |
| R-squared | 0.219 | | 0.874 | | 0.503 | | 0.359 | |

Panels A and B: Panel regressions of risk taking measures on Catholic Credit Unions. Panel B – Column 4 Probit regression of probability of Net worth < 0.06 on Catholic Credit Unions. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 6. Do differences in religious affiliations affect CUs' risk-taking? – Matching estimators**

**Panel A. Risk indicators.**

| | M=1 | | M=2 | | M=3 | |
|---|---|---|---|---|---|---|
| | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** |
| Z-SCORE | 0.125 | 0.000 | 0.159 | 0.000 | 0.156 | 0.000 |
| Z-SCORE2 | 0.186 | 0.000 | 0.219 | 0.000 | 0.218 | 0.000 |
| REGZ | 0.102 | 0.004 | 0.128 | 0.000 | 0. 139 | 0.000 |
| VOL3Y | -0.132 | 0.000 | -0.158 | 0.000 | -0.143 | 0.000 |
| NPL | 0.004 | 0.346 | 0.003 | 0.391 | 0.001 | 0.725 |
| NWTA | 0.001 | 0.008 | 0.001 | 0.002 | 0.001 | 0.004 |
| SHTINV | 0.071 | 0.000 | 0.072 | 0.000 | 0.073 | 0.000 |

**Panel B. Types of loans.**

| | M=1 | | M=2 | | M=3 | |
|---|---|---|---|---|---|---|
| | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** |
| LOANSTA | -0.029 | 0.000 | -0.035 | 0.000 | -0.033 | 0.000 |
| BUSLOANSTA | -0.007 | 0.000 | -0.007 | 0.000 | -0.006 | 0.000 |
| UNSECURED | -0.027 | 0.002 | -0.018 | 0.020 | -0.019 | 0.012 |
| AUTOLOANS | -0.009 | 0.241 | -0.006 | 0.422 | -0.006 | 0.455 |
| RESTATE | 0.054 | 0.000 | 0.046 | 0.000 | 0.045 | 0.000 |

**Panel C. Other indicators**

| | M=1 | | M=2 | | M=3 | |
|---|---|---|---|---|---|---|
| | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** |
| NONINTINC | -0.001 | 0.006 | -0.001 | 0.008 | -0.000 | 0.017 |
| ROA | -0.001 | 0.227 | -0.000 | 0.227 | -0.000 | 0.590 |
| INTSHDEP | -0.001 | 0.002 | -0.001 | 0.000 | -0.001 | 0.002 |
| INTLOANS | -0.000 | 0.301 | -0.000 | 0.975 | -0.000 | 0.948 |

Matching estimators of the differences in risk indicators (Panel A), types of loans (Panel B) and other indicators (panel C) between treatment and control groups; Treatment group: Catholic Credit Unions Control group: Protestant Credit Unions. Number of matches (Column 1: 1, column 2:2, column 3: 3). Matching variables: CUAGE, BUSLOANS, RESTATE, AUTOLOANS, UNSECLOANS, SIZE, S&D, NONINTINC, NPL (Except when NPL is the risk indicator), NWTA and ROA (Except when ZSCORE, ZSCORE2 or REGZ are the risk indicators), POP, AGE, MIN, MARR, EDU, FEM, UNEMP, PINCOME. Exact matching: County, Semester-year. Estimates shown correspond to the bias-adjusted estimator of the Average Treatment Effect on the Treated of Abadie and Imbens (2011).

**Table 7. Effect of Catholic Credit Unions on types of loans.**

| Dependent variable | LOANSTA | | BUSLOANS | | UNSECURED | | AUTOLOANS | | REALSTATE | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $CATH_t$ | -0.008 | (-0.32) | -0.011*** | (-3.24) | -0.080** | (-2.50) | 0.080** | (2.54) | 0.015 | (1.02) |
| $CUAGE_{t-1}$ | 0.026 | (1.29) | -0.002 | (-0.74) | 0.002 | (0.10) | 0.005 | (0.21) | 0.005 | (0.54) |
| $LOANSTA_{t-1}$ | | | 0.010* | (1.84) | -0.200*** | (-4.41) | 0.320*** | (6.21) | 0.077*** | (2.98) |
| $SIZE_{t-1}$ | 0.041*** | (6.41) | 0.006*** | (3.98) | -0.064*** | (-7.15) | 0.005 | (0.56) | 0.051*** | (10.97) |
| $ROA_{t-1}$ | 0.010 | (0.03) | -0.024 | (-1.05) | 0.295 | (1.00) | -0.237 | (-0.96) | -0.022 | (-0.26) |
| $NWTA_{t-1}$ | 0.049 | (0.32) | -0.018 | (-1.21) | 0.074 | (0.45) | 0.322** | (2.47) | -0.059 | (-1.12) |
| $NPL_{t-1}$ | -0.070** | (-2.20) | 0.001 | (0.41) | 0.137*** | (2.84) | -0.035 | (-0.99) | 0.026* | (1.88) |
| $S\&D_{t-1}$ | 0.273* | (1.91) | -0.028 | (-1.45) | -0.121 | (-0.85) | 0.480*** | (3.89) | 0.013 | (0.26) |
| $NONINTINC_{t-1}$ | 2.116*** | (3.10) | 0.079 | (0.91) | -0.018 | (-0.03) | 0.057 | (0.08) | 0.601** | (2.00) |
| Observations | 8,529 | | 8,513 | | 8,513 | | 8,513 | | 8,513 | |
| County effects | YES | | YES | | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | | YES | | YES | |
| DEMO Controls | YES | | YES | | YES | | YES | | YES | |
| R-squared | 0.500 | | 0.212 | | 0.542 | | 0.579 | | 0.545 | |

Panel regressions of types of loans on Catholic Credit Unions. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

**Table 8. Effect of Catholic Credit Unions on other Credit Union characteristics.**

| Dependent variable | NONINTINC | | ROA | | INTSHDEP | | INTLOANS | |
|---|---|---|---|---|---|---|---|---|
| Variables | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| $CATH_t$ | -0.001** | (-2.44) | -0.000 | (-0.03) | 0.001 | (1.62) | -0.000 | (-0.13) |
| $CUAGE_{t-1}$ | -0.004*** | (-6.02) | -0.002** | (-2.45) | 0.001* | (1.92) | 0.003*** | (2.75) |
| $BUSLOANS_{t-1}$ | 0.002 | (0.35) | -0.001 | (-0.34) | -0.000 | (-0.00) | 0.005 | (0.60) |
| $RESTATE_{t-1}$ | 0.000*** | (2.75) | 0.000 | (0.43) | -0.000** | (-2.07) | -0.000 | (-1.51) |
| $AUTOLOANS_{t-1}$ | 0.001 | (0.87) | -0.001 | (-1.25) | 0.001 | (0.86) | -0.008*** | (-4.40) |
| $UNSECLOANS_{t-1}$ | 0.000 | (0.94) | 0.001 | (1.64) | -0.000 | (-1.09) | 0.006*** | (5.15) |
| $SIZE_{t-1}$ | -0.000 | (-0.28) | 0.000 | (0.62) | 0.001*** | (6.92) | -0.002*** | (-4.23) |
| $NWTA_{t-1}$ | -0.022** | (-2.03) | -0.031* | (-1.71) | 0.011 | (1.35) | 0.011 | (0.70) |
| $ROA_{t-1}$ | -0.017 | (-1.40) | | | 0.076*** | (3.71) | -0.005 | (-0.26) |
| $NPL_{t-1}$ | 0.001 | (0.52) | -0.014*** | (-4.77) | -0.002** | (-2.47) | 0.007*** | (3.07) |
| $S\&D_{t-1}$ | -0.014 | (-1.26) | -0.014 | (-0.72) | 0.009 | (1.02) | -0.008 | (-0.56) |
| $NONINTINC_{t-1}$ | | | 0.036 | (0.92) | -0.053*** | (-2.83) | 0.003 | (0.08) |
| Observations | 8,529 | | 8,528 | | 8,523 | | 8,513 | |
| County effects | YES | | YES | | YES | | YES | |
| Time effects | YES | | YES | | YES | | YES | |
| R-squared | 0.210 | | 0.106 | | 0.500 | | 0.308 | |

Panel regressions of Credit Union characteristics on Catholic Credit Unions. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.