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Drivers of Depositor Discipline in Credit Unions

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Drivers of Depositor Discipline in Credit Unions.

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ABSTRACT

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Keywords: credit unions, depositor discipline, financial literacy.
JEL Classification: M41, G12.

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1. Introduction

Market discipline of financial institutions is one of the pillars of the Basel Committee on Banking Supervision and it has been considered a key factor in reinforcing and supporting the effects of explicit regulation and supervision:[1] 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, carried through reduced access to financing, gives banks incentives to reduce risk or to take corrective actions which, in turn, should lead to increased stability of the financial system (Nier and Baumann, 2006). Research has shown that this market-based discipline is exercised for public banks not only by equity markets but also by deposit markets. Indeed, depositors have been shown to be a major source of discipline for both public and private banks: see Berger and Turk-Ariss (2015), Calomiris and Powell (2001), Macey and Garret (1988), Martinez Peria and Schmukler (2001) and Park and Peristiani (1998), among others. However, there is still little evidence on whether or not market discipline plays a role in monitoring credit unions (CUs) or cooperative banks and the few studies available tend to be limited in scope and focused on the existence or not of negative depositor reaction to specific types of credit union assets. To our knowledge, there is still no analysis of the broad mechanisms through which depositor discipline works for CUs.

The analysis of the existence of depositor discipline in CUs is of special relevance for three different reasons. First, the owner/depositor dual role of credit union (CU) members suggests that there might be significant differences in how discipline works in CUs as opposed to other financial or depository institutions. Since owners of the CU are also its depositors, there might be lower asymmetry of information between CU management and the members of the CU. These lower informational asymmetries might lead to a stronger disciplining effect. On the other hand, owner-depositors may be less willing to exercise strong discipline on the CU and might be more reluctant to withdraw their deposits even in the presence of significant risk-taking or worsening of CU fundamentals. Second, CUs have a defined field of membership (common bond) which limits the potential customers the CU can serve. This limited potential market implies that the relationship of a CU with its members is, in general, closer than that of other financial institutions with their depositors. This may reinforce the two opposing effects of low informational asymmetries: while we would expect that the still lower levels of informational asymmetries created by field of membership would generate stronger discipline effects, the enhanced sense of ownership/belonging could increase the reluctance to discipline. Third, it may be argued that CU members may have lower average levels of financial

[1] Bank for International Settlements, 2001. Pillar 3 – Market discipline. http://www.bis.org/publ/bcbs_wp7.htm.

literacy: around 47% of CUs had a low income designation in 2018, which meant that these CUs served predominantly low income areas where financial sophistication may arguably be lower.[2] Thus, the ability to process financial information by CU depositors may mediate the intensity of potential disciplining effects.

In this paper we use these three arguments as a framework for our analysis of depositor discipline in the US credit union sector. We attempt to understand whether there is indeed significant discipline exercised by CU members, how this discipline works and what the effect is of financial sophistication on the discipline exercised by members. Specifically, we are interested in answering the following questions:

- Do CU members exercise discipline on credit unions with bad fundamentals or which have riskier balance-sheets?
- When exercising discipline, do CU members act as owners or as creditors (depositors)?
- What factors (such as the existence of a deposit guarantee scheme or differences between fields of membership) affect the intensity of discipline exercised by CU members?
- How important is the role of member financial literacy in the disciplining of CUs?

The answers to these questions have important policy implications. First, understanding the way members react to CU strategies should help design policies aimed at controlling CU risk taking. Second, given the special features of CUs, which differentiate them from other financial institutions, the disciplining mechanisms may work differently and, therefore, regulation of credit unions and banks might need to diverge further. Finally, knowledge of the effect of financial literacy on depositor discipline should help design institutional efforts to enhance financial literacy among the population while understanding their impact on the overall financial system.

We use a large panel of quarterly data on CUs which covers the period 1994-2018. Our analysis is divided in several parts. First, we test for the existence of depositor discipline using methodologies common to the market discipline literature (see Barajas and Steiner, 2000; Calomiris and Powell, 2001; Maechler and McDill 2006; Martinez Peria and Schmukler, 2001; Gómez-Biscarri et al, 2019). In particular, we relate deposit and member growth to a set of CU fundamentals and risk indicators while controlling for idiosyncratic and macroeconomic factors: we expect that CU members withdraw or diversify their shares and deposits or abandon the CU when fundamentals deteriorate or the CU increases its risk-taking.[3] We also look at the reaction of saving rates (interest on deposits

[2] Source: call reports NCUA.
[3] We believe that a difference in the behavior of deposit amounts and number of members of the CU may shed some light on whether the behavior of CU members resembles that of depositors (creditors) or of shareholders (owners).

and dividends on shares), where we expect to see an increase in saving rates when fundamentals deteriorate or the CU increases its risk taking. We then document how persistent (long-lasting) the discipline effect is and how it is mediated by the existence of a deposit insurance scheme and by differences in CU field of membership. In the final part of our analysis we examine how financial literacy affects the strength of depositor discipline.

Our results show strong evidence of depositor discipline related to CU fundamentals (earnings, net worth and net interest margin) and risk-taking indicators (earnings volatility and risk of the loan portfolio): deposits and shares in CUs strongly react to deterioration in fundamentals or increases in measures of asset risk. Our results also show that the number of members reacts significantly to those variables, thus suggesting, with some qualifications, that CU members act more as depositors than as shareholders. The analysis of saving rates shows that these rates increase when credit risk indicators deteriorate. Regarding the speed of depositor discipline, we show that depositor discipline persists in time until two years after financial information is made available. We next examine how discipline is mediated by the existence of a deposit insurance scheme: insured deposits react much less than uninsured depositors, though we still find evidence of a significant reaction of insured deposits (probably from diversification of further deposits). Regarding field of membership, our results suggest that while members of CUs with community or multiple fields of membership react strongly to good and bad fundamentals in ways consistent with depositor discipline, members of community and associational CUs do not react as markedly, especially with respect to credit risk indicators. Also, we uncover differences between associational and community CUs in the reaction of their members to return on assets, bad volatility, and net interest margin. We argue that these differences may be caused by differences in asymmetry of information and loyalty to the CU, although we leave those results as deserving further analysis. Finally, we provide evidence suggestive that more financially sophisticated members exercise stronger discipline on deposits.

The remainder of the paper is organized as follows. In Section 2 we review the literature on market discipline and credit unions, which we use to design our analyses. In Section 3 we describe our data. In Section 4 we show the main descriptive results on the mechanisms of depositor discipline, including persistence and the impact of deposit insurance schemes and field of membership. In Section 5 we look at the impact of financial literacy. In Section 6 we review some robustness tests and in Section 7 we conclude by suggesting the main big picture implications of our results.

2. A look at the related literature

2.1. Market Discipline

Market discipline is a way of "self-regulation" exercised by bank stakeholders which contributes to reducing systemic risk in the banking system by decreasing the risk exposure of banks (Arnold et al., 2016): if market participants react to poor bank performance or bad bank fundamentals, banks have strong incentives to reduce excessive risk-taking. In depository institutions, this discipline may be exercised by the institution's owners, through equity markets, or by depositors. In fact, depositors may be especially effective in exercising discipline on institutions where deposits are the main source of financing, as is the case of banks –public and, especially, private- or credit unions. This is why most studies of market discipline on banks have focused on whether depositors –and other debt holders- effectively discipline banks and the channels through which this discipline is exercised: Ellis and Flannery (1992) and Flannery and Sorescu (1996) show how debt holders obtain premium yields on debt instruments from the riskier banks. Maechler and McDill (2006) and Park and Peristiani (1998) focus on depositors and show that there is evidence of depositor discipline (via both increases in interest rates and decreases of deposit growth). Evidence of this disciplining effect has also been found in international contexts and, especially, during times of high financial instability. Several studies find evidence of market discipline in Latin America via deposit withdrawals or increases on interest rates (Barajas and Steiner, 2000, for Colombia; Calomiris and Powell, 2001, for Argentina; Martinez Peria and Schmukler, 2001, for Argentina, Chile and Mexico). Other studies have found market discipline in Japan (Murata and Hori, 2006), China (Hou et al., 2016), Turkey (Aysan et al., 2017), Europe (Sironi, 2003; Hasan el al., 2013), Germany (Arnold et al., 2016) and Switzerland (Birchler and Maechler, 2002).

The existence of depositor discipline rests on:

a) the prompt access of depositors to financial information about the bank, that is, on the extent of informational asymmetries between bank managers and depositors (Miles, 1995; Flannery, 1998; Hasan et al., 2013);

b) the ability of depositors to process this financial information, since depositor discipline is a monitoring activity whereby depositors react to signals of poor bank performance: Davenport and McDill (2006) analyzed the failure of Hamilton Bank in 2002 and showed that the most sophisticated depositors, such as business accounts, were significantly more sensitive to bank performance; De Ceuster and Masschelein (2003) also showed that small and uninformed depositors play a weaker role on market discipline.

The two factors mentioned above interact with a final dimension of depositor discipline, namely the distinction between uninsured and insured deposits. At the basic level of analysis, the existence of an insurance scheme would seem to reduce or eliminate the extent of market discipline by making

insured deposits unresponsive to bad fundamentals (see, e.g., Birchler and Maechler, 2002; Hannan and Hanweck, 1988; Goldberg and Hudgins, 1996, 2002; Maechler and McDill, 2006; Ioannidou and De Dreu, 2019). Furthermore, uninsured depositors tend to be investors/savers with large amounts invested so the strength of discipline exercised by such depositors may be enhanced by higher sophistication and lower levels of asymmetry of information (De Ceuster and Masschelein, 2003). Along these lines, Goldberg and Hudgins (1996, 2002) show evidence that uninsured deposits react more to signals of institutional failure and that there is a reduction in the ratio of uninsured deposits to total deposits in failing thrift institutions. However, evidence of market discipline exercised by insured depositors has also been found (Cook and Spellman, 1994; Davenport and McDill, 2006; Lamers, 2015; Park and Peristiani, 1998; Martinez Peria and Schmukler, 2001). This would be justified if the cost of the guarantee were high or there were concerns about the possibility that the insurance scheme would be fully recognized or about the credibility of its implementation.[4] In any case, the distinction between insured and uninsured deposits appears to be a relevant aspect when examining how deposit behavior can discipline bank risk-taking.

2.2. Credit Unions

Credit unions are financial cooperative associations which serve a limited group of members according to a defined "field of membership," which effectively restricts the customers to which the credit union can cater. The National Credit Union Administration (NCUA) defines three forms of membership: employment, association, or residence. 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. CUs have a unique structure compared with banks, in that CU members play a dual role as both owners and depositors, given that their shares are treated as deposits for which they receive an interest 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: some states allow CUs to be insured by private insurers instead of the NCUSIF. The limit of the deposit insurance was $100,000 per share owner but this limit

[4] Note, specifically, that a deposit insurance scheme could fail in a systemic crisis. For example, the assets held by the National Credit Union Share Insurance Fund (NCUSIF) are 16.7 billion dollars: total insured deposits are 1.22 trillion dollars and the ratio of total assets managed by NCUSIF to insured deposits is 1.37%. Thus, in bad economic times or in systemic crises the insurance fund is likely to be insufficient to cover all insured deposits. See: https://www.ncua.gov/Legal/Documents/Reports/annual-report-2019.pdf

increased to $250,000 in 2008.[5] By December 2018, there were 5,492 credit unions in the US, 3,376 of which were federally chartered and federally insured, 1,999 were state chartered and federally insured, and 117 were state chartered not federally insured.

The literature on credit unions has grown to be quite substantial, and it has focused on the specific areas in which CUs differ from other depository institutions: the credit union maximization problem (Leggett and Stewart, 1999; McKillop et al., 2020; Smith et al., 1981; Smith, 1984), interest rates and competition with the banking industry (Feinberg, 2001; Hannan, 2003; Tokle and Tokle, 2000), performance measures of CUs (Bauer, 2008; Bauer et al., 2009; Desrochers and Fischer, 2005; Fried et al., 1993, 1999; Goddard et al., 2008; Wilcox, 2005, 2006), growth (Goddard et al., 2002; Goddard and Wilson, 2005; Leggett and Strand, 2002), mergers and acquisitions (Bauer et al., 2009; Goddard et al., 2014; McAlevey et al., 2010), issues related to the field of membership (Black and Dugger, 1981; Ely, 2014; Frame et al., 2003; Goddard et al., 2002) and risk-taking (Bauer et al., 2009; Emmons and Schmid, 1999; Ely, 2014; Fiordelisi and Mare, 2014; Frame et al., 2003; Van Rijn et al., 2019). The behavior of deposits in CUs, however, has received scarce attention. Some authors have looked at market discipline in international settings: Arnold et al. (2016) found mixed evidence of market discipline in commercial, savings banks and cooperative banks in Germany;[6] Murata and Hori (2006) found evidence of depositor discipline at Shinkin banks and credit cooperatives in Japan. For the US, Kane and Hendershott (1996) argued that managerial incentives to benefit from risk-taking are limited by the intensity of monitoring by other CUs and private co-insurers. Karels and McClatchey (1999) evaluated whether the adoption of the deposit insurance scheme in Iowa increased risk-taking by CUs but found no significant evidence. Finally, Gomez-Biscarri et al. (2019) analyzed the effects of business lending on credit union risk and found that members are aware of the riskiness of business loans and exercise discipline on such loans via withdrawal of deposits.

In the rest of the paper, we attempt to contribute to the credit union literature by offering the first comprehensive set of results on the existence of depositor discipline in CUs and describing the mechanisms and mediating factors of such discipline.

3. Data

We collected quarterly data from the CU call reports available from the NCUA, which contain financial information for every CU that operates in the United States. Given that before 2003Q3 only

[5] "Congressional Law – H.R. 1424 (Section 136) increases the federal insurance on all eligible accounts temporarily through December 31, 2009. H.R. 1424 was signed into law October 3, 2008." (NCUA, 2008); The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 made the new limit of $250,000 permanent. (NCUA, 2010).

[6] Arnold et al. (2016) found evidence of market discipline in cooperative banks prior to the crisis, but this discipline disappeared during the crisis. The opposite behavior was found for commercial banks.

CUs with assets higher than 50 million dollars (peer groups 4, 5 and 6) reported quarterly call reports we restrict our sample to CUs in those peer groups as in Gomez-Biscarri et al. (2019). Our sample period covers 1994Q1-2018Q4, yielding an initial sample of 189,832 quarterly observations which correspond to a maximum of 2,353 CUs. The list of variables we collect and generate is shown in Appendix A. Our main dependent variable of interest is the growth rate of total shares and deposits. As explanatory variables and controls we use CU balance-sheet and income statement characteristics which describe the performance and risk taking of the CU. We review these variables as they appear in our analyses. All continuous CU variables were winsorized at the 0.5% level in each tail to avoid issues with outliers. We excluded the CU-quarter observations which correspond to the quarter in which a merger or acquisition took place. Overall, this reduced our sample to 167,859 CU-quarter observations. In addition, we collected information on macroeconomic variables at the state level (personal income per capita and unemployment rates) from the Federal Reserve of Saint Louis (FRED).[7] For inflation, we collected inflation rates at the regional level extracted from the Bureau of Labor Statistics.

Additional information that we collected for specific analyses is:

- The credit union's field of membership and whether the CU has the low-income designation.
- The breakdown between uninsured and insured shares and deposits of the CU, to be used in the analysis of the effects of a deposit insurance scheme.
- Information on (state-level) financial literacy of the population. This variable, available from the state-level surveys of the National Financial Capability Studies conducted by FINRA Investor Education Formation (Lusardi and Mitchell, 2011) is used in the analyses of financial literacy.

Tables 1 and 2 show some descriptive statistics and correlations of the main variables used in our analyses. We do not comment on these statistics, which are mostly self-explanatory.

4. A descriptive look at discipline in credit unions

In this section we start our analysis of depositor (member) discipline in credit unions. We proceed in five steps: first, we look for general evidence of depositor discipline by looking at the reaction of CU shares and deposits to CU fundamentals and risk-taking indicators. Second, we analyze the effect of the same explanatory variables on the growth of CU members, which we use to offer some comments on whether members behave as "depositors" or as "shareholders," and on saving rates. Third, we

[7] Most CUs concentrate their operations in one state, so state-level macroeconomic conditions are likely to be a relevant factor to control for in our analyses of CU behavior.

examine the effect of the deposit insurance scheme by distinguishing the behavior of insured and uninsured deposits. Fourth, we look at different horizons of depositor response, in order to examine the speed (or persistence) of discipline. Finally, we examine the effect of field of membership on depositor discipline, in an analysis suggestive of informational asymmetries based on member characteristics.

4.1 The relationship between CU deposits and fundamentals: initial evidence of discipline

Evidence of market discipline in the US banking system suggests that depositors react to bad bank fundamentals and to the bank's risk-taking strategies. The evidence for CUs is much more limited: a study by Gomez-Biscarri et al. (2019) has shown some evidence focused on the reaction of members to business lending. It is reasonable to expect, however, that CU members exercise general discipline on the credit union given that CU financial statements are easily available. In addition, two factors reduce significantly the potential asymmetry of information between members and the CU, namely the closeness of members to their CU (stemming from field of membership restrictions) and the dual character of CU members, who are both depositors and shareholders.

In order to give an initial description of CU depositor discipline, we use methodologies similar to those that have been applied to banks and test whether CU fundamentals and risk-taking strategies are related to changes in deposits (see, e.g., Maechler and McDill, 2006; Martinez Peria and Schmukler, 2001). We first regress our main dependent variable of interest, growth in total shares and deposits, on a set of risk indicators and CU fundamentals, some of which have been previously used in the literature of market discipline of banks (Barajas and Steiner, 2000; Berger and Turk-Ariss, 2015; Calomiris and Powell, 2001; Martinez Peria and Schmukler, 2001) and some which are specific to credit unions (Bauer et al., 2009; Gomez-Biscarri et al., 2019; Frame et al., 2003). In particular, we use the following regressors: net worth over assets of the CU (*NWTA*), 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*), the (log)number of past quarters with losses (*PL*) and the interaction of past losses with *sdROA* (See Gomez-Biscarri et al. , 2019). We also include a measure of size (*size*, natural log of assets) and we control for the saving rate on shares and deposits (*Sav_rate*), computed as the (lagged) average interest rate paid by the CU on shares and deposits (Maechler and McDill, 2006). In order to ameliorate problems of endogeneity, in our regressions we use one-quarter lagged values of all CU risk indicators. Appendix A describes all our variables in more detail. Our baseline regression is as follows:

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

where $\Delta S\&D$ is the quarter-on-quarter growth in total shares and deposits (in some specifications, only total shares or the subset of uninsured / insured deposits), *RISK* is the vector of fundamentals and risk indicators and *Controls* is the vector which contains *size* and *Sav_rate*. ST_{it} is a vector which contains macroeconomic 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 this baseline model are reported in Table 3, columns 1 and 2, along with our predicted signs for the response coefficients. As expected, growth in shares and in total shares and deposits react positively to indicators of financial health: note the positive and significant coefficients of *ROA* (0.529 and 0.545; t-stats of 6.80 and 6.76), *NWTA* (0.134 and 0.141; t-stats of 10.99 and 11.42), *NIM* (0.677 and 0.683; t-stats of 4.30 and 4.20). Results on the credit risk indicators are also consistent with depositor discipline: the estimated coefficients on both non-performing loans and charge-offs are negative and significant (*NPL*: -0.189 and -0.198, t-stats of -10.76 and -11.29; *ch-offs*: -0.988 and -1.047, t-stats of -9.35 and -9.99), which suggests that when CU members observe signs of increases in credit risk, they tend to withdraw their shares and deposits. For the standard deviation of ROA (*sdROA*) we obtain a significant positive coefficient (0.001, t-stats of 2.05 and 2.14). However, the coefficient on the interaction of *sdROA* with past losses (*PL*) is negative and significant (-0.001, t-stats of -4.43 and -4.57): we interpret this result as suggesting that depositors penalize (discipline) the volatility which comes from bad performance, a result which makes intuitive sense.[8] Regarding the *control* variables, higher saving rates lead to higher deposit growth (coefficients of 3.229 and 3.104, t-stats of 10.11 and 9.79) whereas *size* is negatively related to growth in shares and deposits (coefficients of -0.010, t.stats of -9.13 and -8.90). This latter result might suggest that it may be difficult for large CUs to grow because of field of membership restrictions.

The baseline results in columns 1-2 are in line with findings, for a shorter sample period, in Gomez-Biscarri et al. (2019). Though descriptive, we believe these results to be suggestive that members of CUs react positively to signs of financial health and negatively to risk and increase or decrease their shares and deposits in consequence.[9] To gain further insights, we analyze membership turnover by estimating again the baseline equation (1) using membership growth (*membersgrowth*) as dependent variable. The results of this regression are reported in Table 3, column 3. Interestingly, membership does not react to variables such as *ROA* but it reacts positively to *NWTA* (and *NIM*) and negatively

[8] Past losses is the log of one plus the number of quarters in which the CU had negative ROA during the previous three years.

[9] Note that in all our analysis of deposit growth, a decrease in growth rates may be interpreted as a withdrawal of deposits or as a reduction of further increases in deposits (i.e. a diversification of a member's deposits across depository institutions). Similarly, in the analysis of member growth, a decrease in member growth rates may be interpreted as members leaving the CU or, probably more likely, as a reduction in the inflow of new members.

to *NPL* and *ch-offs* as well as to the interaction between past losses and the standard deviation of ROA. It appears, therefore, that CU membership reacts more significantly to the more explicit signs of bad performance (*NPL*, *ch-offs* and losses). We comment on these results in further detail in Section 4.3.

4.2 The relationship between CU saving rates and fundamentals

We now look at the relationship of fundamentals with saving rates. This relationship can be interpreted from a disciplining perspective as suggesting that when a CU increases its risk taking, additionally to withdrawing their savings (Table 3) members may ask for higher interest rates (Arnold et al., 2016; Barajas and Steiner, 2000; Calomiris and Powell, 2001; Martinez Peria and Schmukler, 2001).[10] This question is particularly intriguing in the context of CUs: on the one hand, our previous results suggest that CUs with bad fundamentals may need to pay higher interest on deposits and dividends on shares to keep a certain level of deposits and shares in the CU.[11] On the other hand, given the dual role of depositors as shareholders and the fact that saving rates on shares are indeed dividends, which tend to be linked to the good performance of the CU, it is difficult to know a priori in what direction CUs fundamentals will affect saving rates. We test the effect of fundamentals on CU saving rates using the following baseline regression:

$$Saving\ rate_{it} = \beta_1' RISK_{it-1} + \beta_2' Controls_{it-1} + \beta_3' ST_{it} + u_i + d_t + \varepsilon_{it,} \qquad (2)$$

We measure saving rates in three different ways. First, we use the average rate that the CU pays on shares and deposits (Dividends on shares + Interest on deposits) / Total shares and deposits (Bauer, 2008). We call this variable *Sav_rate*. Alternatively, we use the average dividend rate on regular shares (*divregsh*) which is reported in the call reports. This is a pure dividend paid to the most common type of shares (which represent 35% of total shares as of December 2018).[12] Finally, we consider the non-member deposit rate (*intnonmembers*), also from the call reports. This rate can be understood as a traditional interest rate on non-owner deposits. Regarding risk variables, we use the same fundamentals as in equation (1), a control for size and an additional control for each saving rate measure: we include the lagged value of total shares and deposits for *Sav_rate*, the lagged value of regular shares for *divregsh* and the lagged value of nonmember deposits for *intnonmembers*. As in equation (1), we control for state-level personal income per capita and unemployment and for

[10] To our knowledge, this is the first paper to test the effect of fundamentals and risk taking on saving rates from a disciplining perspective in credit unions or cooperative b.

[11] This alternative interpretation is not fundamentally different to viewing increased saving rates as reflective of depositor discipline: in order to prevent or reduce depositor flight the CU may have to pay higher interest rates to compensate depositors for the increased risk.

[12] The other components of shares are: share certificates (22%), money market shares (20%), share drafts (16%), Ira/Keogh accounts (6%) and miscellaneous other shares (1%).

regional-level inflation.

Results are reported in Table 4 columns 1-3. As expected, the main credit risk indicators (*NPL* and *charge-offs*) are positively related to rates paid on deposits. The coefficient on *NPL* is always significant (0.003, 0.009 and 0.020; t-stats of 2.85, 2.02 and 1.91 for columns 1, 2 and 3, respectively) whereas the coefficient on *charge-offs* is only significant for column (1) (*Sav_rate*) (0.031, 0.031 and 0.027; t-stats of 5.58, 1.62 and 0.68 for columns 1, 2 and 3, respectively). Regarding loans, we also obtain positive and significant coefficients of 0.002, 0.005 and 0.006 (t-stats 21.56, 9.04 and 4.87 for columns 1, 2 and 3, respectively). All in all, our results suggest that CUs with higher credit risk need to offer higher saving rates on shares and deposits, a result consistent with member-based discipline. Regarding the other fundamentals, we find a negative and significant coefficient for *NIM* (net interest margin) in all three columns (-0.305, -0.629 and -0.232 with t-stats: -23.11, -12.40 and -2.97) a result also suggestive of discipline. For *NWTA* our results are only suggestive of discipline for the interest on nonmember deposits (column 3) were we obtain a negative and significant coefficient for *NWTA* (-0.031 with t-stat -4.50).[13] In the case of *ROA*, we obtain a positive coefficient for columns 1 and 2 (0.041 and 0.171 with t-stats: 7.58 and 7.38) suggesting that CUs with higher ROA pay higher average saving rates and dividend rates. A similar interpretation may be given to the results for *NWTA* in column 2 (*divregsh*), were we obtain a positive and significant coefficient of 0.016 (t-stat: 5.00), suggesting that higher net worth in the CU translates into a higher dividend on regular shares. These last results, although in contrast with previous findings in the depositor discipline literature for banks, may be rationalized for CUs on the basis of the dual role of members as owners and depositors: the positive coefficients in column 2 of *ROA* and *NWTA* suggest that CUs with better performance and net worth may be able to pay higher dividends. This may not be a signal of lack of depositor discipline but of the capability of high-performing CUs to reward their owners.

4.3 Do CU members behave as owners or as creditors?

CU members play a dual role as both cooperative owners and depositors so they may have a conflict of interest in disciplining the credit union, even when fundamentals deteriorate. Interestingly, we find a result in columns 1 and 2 of Table 3 which differs from those traditionally found for banks and which offers a first hint about possible implications of this duality: the loan activity of the CU (proxied by loans over total assets, *loansta*) is positively related (coefficients of 0.029 and 0.032, t-stats of 13.25 and 14.14) to shares growth. 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 on CUs: since CU members benefit directly

[13] We do not obtain a significant result for ROA in column 3.

from loans granted by the CU, it is expected that they do not punish the CU for the amount of loans granted. On the contrary, members expect an active behavior in terms of granting loans while keeping the risk of the loan portfolio low (thus the penalization of bad loan indicators). The positive estimated coefficient of *loansta* might, therefore, be a sign of borrower orientation preference by CU members.[14] 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. Additionally, the results in Table 4 (columns 1 and 2: average saving rates and dividend on regular shares, respectively) for *ROA* and *NWTA* may suggest a saver orientation in that better performing CUs indeed pay higher interest and dividends to their owners.

Even though the results just described are consistent with CU members behaving as owners, the other coefficients were consistent with CU members disciplining the CU by withdrawing their shares (or refraining from making additional deposits), a result aligned with a traditional depositor view. The results in column 3 of Table 3, as mentioned above, also suggested that membership was less reactive than deposits and shares, a result consistent with owner-type behavior.

All in all, CU members seem to behave differently from bank depositors in several respects. First and most importantly, the response of deposit growth to loans is positive, contrary to previous findings for banks. We interpret this as a consequence of the recognition of the maximization problem expressed by Smith et al. (1981) and Smith (1984). Second, average saving rates and dividends on shares react positively to ROA a result not suggestive of discipline but consistent with their nature as dividends. Finally, membership in the CU is less reactive than shares and deposits.

4.4 The impact of a deposit insurance scheme on discipline

We go deeper in the analysis of depositor discipline by distinguishing the behavior of insured versus uninsured deposits. The presence of deposit insurance schemes should mitigate the effect of discipline for deposits that are covered by the insurance system (Calomiris and Jaremski, 2019; Dam et al., 2015; Demirgüç-Kunt and Detragiache, 2002; Ioannidou and Penas, 2010; Keeley, 1990). However, the possibility of a systemic financial crisis, where the nationwide depositor insurance fund could be insufficient (see footnote 6) could generate some reaction even in insured deposits. Indeed, evidence of market discipline in insured deposits has been found in banks (Cook and Spellman, 1994; Davenport and McDill, 2006; Karels and McClatchey, 1999; Park and Peristiani, 1998). Additionally, depositors may decide to diversify their savings across institutions –despite being below the

[14] This terminology comes from Smith (1984) and Smith et al. (1981), who showed that CUs might have a depositor orientation, offering higher deposit rates, a borrower orientation, giving loans at lower rates or a neutral orientation. Also, McKillop et al. (2020) point it out that cooperative financial institutions maximize welfare of members via their loan granting activity.

maximum amount insured- when their "traditional" depository institution shows signs of worsening fundamentals. Uninsured depositors, on the other hand, are unconditionally expected to be much more reactive, given their higher exposure to bankruptcy of a specific institution and, as mentioned above, the fact that they tend to be more sophisticated or, at least, have higher incentives to be informed about CU fundamentals.

We run our baseline regression (1) using as dependent variables the growth in insured (*Δinsd*) and uninsured (*Δunind*) deposits as dependent variables. We report the results in Table 5. For insured deposits (column 1), the results are parallel, in signs and significance, to those of total shares and deposits (Table 3), although the reaction coefficients are of slightly smaller magnitude, suggesting that insured deposits are less reactive overall: note that insured deposits react positively to *ROA*, *NWTA* and *NIM* and negatively to bad ROA volatility (*PL*× *sdROA*), to *NPL* and *ch-offs*.[15] For uninsured deposits (column 2), the results are more noteworthy. Note that we find less variables which are significant, a consequence of the lower amounts of uninsured deposits (we lose 14% of the observations). However, note that the magnitudes of the reaction coefficients are always noticeably larger than those of insured deposits (and of total shares and deposits), especially those that are statistically significant. We find evidence that uninsured deposits react significantly to the variables which measure bad fundamentals (*NPL* and *ch-offs*) with reaction coefficients four and six times larger than those of insured deposits (-0.707 vs. -0.172 for *NPL*; -5.201 vs -0.921 for *ch*-offs). Also, uninsured deposits and shares react positively to *NWTA*, *NIM*, the loan activity and to interest rates and negatively to *size*, again with larger coefficients than those of insured deposits and shares. All in all, our results strongly suggest that: a) there is (weak) depositor discipline on insured deposits/shares of CUs; b) depositor discipline is considerably higher for uninsured deposits, especially when indicators of credit risk deteriorate.

4.5 Is discipline persistent over time?

Our previous analyses used quarter-on-quarter growth of deposits regressed on one-quarter lagged indicators of CU risk-taking. If depositors take time to learn and process the information about CU risk-taking or to react to that information the disciplining effect may be relatively slow (and, therefore, long-lasting). In order to test whether the effects of changes in fundamentals take place over long periods of time we repeat our baseline regressions using as dependent variable the growth accumulated over several quarters (1 to 8).[16]

[15] The differences in the estimated coefficients of column 1 in Tables 4 and 3 are not large, though, a result which would be expected given that a large fraction of the shares and deposits are insured.

[16] Regressions for quarter t+1 are done using CU fixed-effects, time effects and standard errors clustered by CU and quarter. For quarters t+2 to t+8, given the problem of overlapping errors which this definition generates, we use Driscoll

The results of these regressions are reported graphically in Figure 1.[17] The graphs plot the estimated response coefficients of shares and deposits growth to six of our regressors (*NPL*, *ch-offs*, *NWTA*, *ROA*, *PL* × *sdROA and NIM*) for the eight different horizons. The graphs show strong evidence that depositor discipline takes several quarters to fully realize. For total shares and deposits the reaction coefficients associated to the risk variables always keep the expected signs (and are in all cases statistically significant). Also, the absolute value of the estimated coefficients increases monotonically from the first quarter until 3 quarters ahead. After quarter four the reaction of shares and deposits diverges, although it still increases (in absolute values) for all six regressors: for *NPL* and *ROA* the trend continues over the full eight quarters whereas the slope is reduced slightly for *charge-offs* and *NIM* around quarters 3 and 4. Finally, the coefficient for "bad volatility" (*PL*×*sdROA*) levels off in quarter 4 and remains constant around 0.04 between quarters 5 to 8, suggesting that the reaction to losses and volatility is the fastest and takes approximately one year to reach its full extent.

In sum, the persistence results suggest that the reaction of CU shares and deposits is relatively slow. The reasons for this may be threefold: first, the slow reaction may be suggestive of a more patient attitude of CU members, rooted in the relatively high commitment to the CU; second, it may be the case that CU members do not discipline the CU by aggressively withdrawing deposits but, rather, by diversifying their subsequent deposits; third, given that the slow reaction is also observable for positive signals, it could be a consequence of different levels of asymmetry of information by CU members: some members may observe and process the information on CU fundamentals faster than others or the more sophisticated members may react faster (Davenport and McDill, 2006).

4.6 Does field of membership affect the level of discipline exercised by CU members?

Given the importance of potential informational asymmetries, we now examine a key CU characteristic that may be related to such asymmetries and, therefore, may affect the intensity of depositor discipline: the field of membership. The field of membership definition of a CU effectively restricts the potential members who can profit from the services of the CU and it generates potential differences in informational asymmetries across CU types. In order to test the effect of field of membership on discipline we use the classification of common bonds recognized by the Federal credit union Act (NCUA, 2020):

and Kraay (1998) standard errors, which correct for correlation across banks and serial autocorrelation, using lags equal to the number of periods of overlap.

[17] Tables with regression estimates are available from the authors upon request.

- Community field of membership: according to NCUA, a community CU operates in a "geographically well-defined local community or neighborhood" or in a rural district.[18] Community CUs are geographically less dispersed. This physical proximity leads to potential informal links between community residents and managers (who are probably also residents) which may reduce the asymmetry of information. Thus, we expect that community CUs may be subject to high depositor discipline.
- Single common bond associational: these are CUs whose members "participate in activities developing common loyalties, mutual benefits, and mutual interests."(NCUA, 2003) This includes, for example, members of a specific church or of a trade union. For these CUs we expect that although the asymmetry of information might be low, which may intensify member discipline, the higher loyalty of members (of a religious congregation or a union) towards the CU may act as a counterforce and reduce the extent of discipline.
- Single common bond occupational: these are defined as "credit unions that serve a single occupational sponsor" such as a corporation, trade industry or profession.[19] Similarly to associational common bond CUs, we expect that the closer relationship of members with colleagues or with the sponsor (when the CU is sponsored by a common employer) may reduce the extent of discipline.
- Multiple field of membership: credit unions may apply for a multiple field of membership (MFOM). For this type of CUs we do not expect that loyalty to the sponsor or association will play a significant role. On the other hand, however, we expect the asymmetry of information, particularly when compared with a community or associational CU, to be higher. Note that the literature has pointed out that single field of membership reduces the asymmetry of information between the CU and its members (see McKillop et al., 2020). Thus, we have no strong priors regarding the relative strength of discipline in MFOM CUs.

We test the effect of field of membership by re-estimating equation (1) for subsamples determined by field of membership: community CUs (Table 6, column 1), CUs with multiple fields of membership (column 2), CUs with association common bond (column 3) and CUs with occupational field of membership (column 4). The results suggest that the reaction of shares and deposits to fundamentals differs across different fields of membership. First, regarding "bad volatility" (*PL*× *sdROA*) associational CUs show a stronger reaction (-0.004 with t-stat -2.48) than community and multiple field of membership CUs (both with coefficient -0.001 and t-stats -3.16 and -3.11) while occupational CUs do not show a significant result. For the indicators of good performance (*ROA* and

[18] 12 CFR Part 701 - NCUA.
[19] https://www.law.cornell.edu/cfr/text/12/appendix-B_to_part_701

NWTA) we find the strongest reaction for occupational CUs (1.168 for *ROA* with t-stat 3.31 and 0.222 for *NWTA* with t-stat 3.75) followed by multiple field of membership (0.647 for *ROA* with t-stat 5.17 and 0.186 for *NWTA* with t-stat 8.65) and community CUs (0.322 for *ROA* with t-stat 2.53 and 0.170 for *NWTA* with t-stat 7.25). Associational CUs show the lower response to indicators of good performance (not significant result for *ROA* while for *NWTA* the coefficient is 0.115 with a t-stat of 2.21). Results regarding *NIM* are not consistent, in that for occupational CUs we do not find a significant result (although the estimated coefficient is positive) while for multiple field of membership and community CUs we obtain positive and significant coefficients (0.752 for multiple field of membership with a t-stat of 3.02 and 0.582 for community with a t-stat of 1.98). Interestingly we find a negative coefficient for associational CUs -1.856 with a t-stat of -1.73). Finally, for indicators related with credit risk (*NPL* and *ch-offs*), we do not observe a significant reaction in occupational and associational CUs while for both community and MFOM CUs we observe a strong reaction to credit risk indicators (-0.205 for *NPL* with a t-stat of -6.42 and -1.037 for *ch-offs* with a t-stat of -6.70 for community CUs; -0.221 for *NPL* with a t-stat of -7.45 and -0.755 for *ch-offs* with a t-stat of -4.58 for MFOM CUs).

These results, though tentative and deserving further future research, suggest that the field of membership is a mediating factor in the reaction of CU members to CU fundamentals. Members of occupational and associational CUs do not show any reaction to indicators of credit risk, a behavior that might stem from a stronger commitment to their sponsor or association. Note, however, that members of associational CUs react to bad volatility and to capital ratios (*NWTA*) and punish CUs with high net interest margin. This may imply that members of associational CUs are loyal to the association but give more importance to the interest they receive than to the returns and risk of the CU.[20] Members of occupational CUs seem to tolerate bad volatility, which implies confidence in the capability of the sponsor to keep the CU safe, but they do react positively to indicators of good performance such as *ROA* and *NWTA*. Thus, members of occupational CUs are willing to increase their savings if the CU is profitable and is paying high dividends (note the positive coefficient of saving rates) and granting loans (positive coefficient of loans). On the other hand, community and MFOM CUs show coefficients consistent with discipline in all cases. In both cases members react positively to indicators of good performance (*ROA*, *NWTA* and *NIM*) and negatively to risk indicators (bad volatility, *NPL* and *ch-offs*). Members of MFOM CUs exhibit a stronger reaction to good performance indicators, whereas members of community CUs exhibit a stronger reaction to

[20] High NIM would imply a high interest on loans and a lower interest on deposits. Note also that the coefficient for loans is the largest one (0.058 with t-stat 4.71), suggesting that members of associational CUs exhibit the strongest borrower orientation.

deterioration in credit risk. These differences might be explained by the lower asymmetry of information of community CU members while members of MFOM CUs may put more attention to returns and, therefore, to the immediate capacity of the credit union to pay a higher dividend.

5. The capacity of CU members to process financial information – The effect of financial literacy

In this section we evaluate whether the capacity of CU members to understand and process financial information may influence the extent of depositor discipline. The literature has shown that financial literacy affects the ability of people to make financial decisions (Campbell, 2006; Dhar and Zhu, 2006; Lusardi and Mitchell, 2011; Klapper et al., 2013; Van Rooij et al., 2011). Also, Davenport and McDill (2006) find that the more sophisticated depositors (those with uninsured deposits) react more intensely and faster to signals of bank failure. We expect, therefore, that more sophisticated or financially literate investors will exercise higher levels of discipline. Indeed, the results from Table 5 were already in line with this argument: uninsured depositors react much more intensely to bad CU fundamentals. In order to show further evidence, we estimate regressions similar to those of Section 4.1 using two proxies of depositor sophistication:

1) Financial literacy: Widdowson and Hailwood (2007) suggest that financial literacy reduces risk-taking in the financial system since people with higher financial knowledge may exercise higher depositor discipline. We use the state-level surveys of the National Financial Capability Studies of 2009, 2012, 2015 and 2018 to construct the proxy *finlit*, which is the average number of correct answers to the standardized finance quiz in the state where the CU has its headquarters. Given the lack of yearly updates of the survey, we assume that financial literacy changes slowly over time. Consequently, for the years 1994 to 2009 we assign the results of the survey conducted in 2009. For the survey years we use the results of the survey conducted in each year and for years in-between surveys we linearly interpolate the data. As robustness tests we performed two additional sets of regressions: first, we conducted regressions restricted to CUs that have branches in only one state; second, we calculated *finlitw*, which is *finlit* weighted by the number of branches that the CU has in each state (if the CU operates only in one state, *finlitw* and *finlit* are equivalent).

2) Low-Income designation of the CU: NCUA regulation states that "a credit union serving predominantly low-income members may be designated as a low-income credit union."[21] Given that members of low-income CUs have lower wages or income, it is presumable that they will have lower levels of financial awareness and sophistication. Indeed, Dhar and Zhu (2006) find a relation between

[21] Section 701.34 of NCUA's Rules and Regulations.

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. Therefore, we expect that CUs which have the low-income designation will receive less discipline when compared to CUs without that definition. We define a variable *lowinc* as a dummy which takes value 1 when the CU is under the low-income designation.

We use equation (1) with a modification: in the vector of risk indicators we replace *NPL* and *ch-offs* with the variable *CRISK* (credit risk). This variable was used by Gomez-Biscarri et al. (2019) to describe the quality of the loan portfolio and is the sum of quarterly *NPL* plus quarterly *ch-offs*.[22] We then interact this variable with our proxies of financial literacy *finlit, finlitw* and *lowinc.* The results of these analyses are shown in Table 7 panels A, B and C. Panel A shows the results for the inclusion of *finlit* (column 1) and its interaction with *CRISK* (column 2) and of *lowinc* (column 3) and its interaction with *CRISK* (column 4). We use the complete sample and assume that most of the CUs operate in the same state where their headquarters are based (indeed, in 2018 85% of the CUs in our sample operated only in one state). The baseline coefficient for *finlit* in column 1 is -0.002 but it is not significant (t-stat of -1.06). The results for the interactions in column 2 are more noteworthy: the estimated coefficient on the interactions with *CRISK* is negative and significant (-0.403; t-stats of -3.50) suggesting that financial literacy intensifies the discipline of risk measures. For the *lowinc* proxy, the baseline coefficient in column 3 is positive (0.001 with t-stat: 2.76), suggesting higher deposit growth of CUs with the low-income designation. In the interacted model, the interaction *lowinc* × *CRISK* is positive and significant at the 10% confidence level (0.063; t-stat: 1.66) suggesting that CUs with the low income designation are subject to lower discipline.

Panels B and C of Table 7 show the results of the two robustness analyses. As mentioned before, around 85% of CUs operated in only one state in 2018 (this percentage is quite stable: it was 87.6% in 2010).[23] In panel B we restrict the sample to those CUs that only operate in one state. Columns 1 and 2 show the results for the inclusion of *finlit* and its interaction with *CRISK* assuming that before 2010 CUs operated in the same state as in 2010Q3; columns 3 to 4 restrict the sample to the period 2010Q3 to 2018Q4, for which we have detailed information of location of CUs operations. The results in column 2 show a negative and significant coefficient of the interaction between *finlit* and *CRISK* (-0.375, t-stat of -2.93). In column 4 the coefficient is also negative but only marginally

[22] Gomez-Biscarri et al (2019) suggest that the use of NPL + Charge offs is justified because in June 2000 the FFIEC compelled financial institutions to charge-off loans with 180 days delinquency. (https://www.occ.treas.gov/news-issuances/federal-register/2000/65fr36903.pdf)

[23] Branch information was first collected in the call reports in 2010Q3.

significant (-0.224, t-stat of -1.67)[24]. In panel C we consider again all CUs, but we use the variable *finlitw* (weighted average of financial literacy using information on branch location). Again, in columns 1 and 2 we assume that the financial branch information is stable before 2010 while in columns 3 and 4 we only consider the information after 2010Q3. The results in panel C are, again, in line with our expectations: we obtain negative and significant coefficients for the interactions of the proxy of financial literacy with the main measure of credit risk (-0.409 with a t-stat of -3.44 in column 2; -0.248 with a t-stat of -1.97 in column 4).

All in all, we believe the results shown in Table 7 are in line with the hypothesis that financial literacy (or financial sophistication) plays an important role in depositor discipline. When members have a better understanding of financial issues, they are more able to understand whether a financial institution might have problems and react in consequence by withdrawing their shares and deposits or (more likely in the case of CUs) by diversifying their subsequent deposits across depository institutions.

6. Robustness tests

We performed a series of additional tests in order to gauge the robustness of our results. To save space we outline these tests but do not report the results, which are available upon request.

1) Measure of risk: we ran our baseline model (Tables 3-7), using a set of risk variables which included an alternative measure of risk, coverage (*COVGE*, see Barajas and Steiner, 2000).[25] Results from using this alternative risk indicator were consistent with our previous findings.

2) We ran our baseline analyses (Tables 3-4) excluding the quarters corresponding to the financial crisis (as defined by the NBER recession indicator). The results did not change significantly.

3) Use of *CRISK*: Instead of using *CRISK* for our analyses in Table 7, we used separately *NPL* and *charge-offs* and interacted it with our proxies for financial literacy. Results and conclusions remained the same.

7. Concluding remarks

We have analyzed whether and how CU depositors exercise discipline on the CU by reacting to increases in risk-taking or deterioration of CU fundamentals. We first explored whether members of credit unions react to CU fundamentals and the mechanisms which are behind this reaction: in

[24] Note that in columns 3 and 4 the number of observations is significantly reduced to 64,364.
[25] COVGE = (Net worth + loan loss provisions + Delinquent Loans) / Total assets.

particular, we looked at the persistence of discipline over time and at the effects of the deposit guarantee scheme and field of membership. We finally analyzed the role of financial literacy by looking at how the ability of members to understand financial information might affect the strength of the disciplining behavior.

Our results show strong evidence of depositor discipline exercised by CU members. Specifically, we find that delinquent loans and charge-offs are negatively related to growth in total shares and deposits. Additionally, depositors also penalize volatility induced by bad performance, while they favor CUs with high net worth ratios, accounting performance and net interest margin. Interestingly, when problems arise, in addition to the reduction in shares and deposits there is a decrease in the number of members, which might imply that CU members behave more as depositors than as owners. On the other hand, depositors seems to ask for higher returns on their savings for CUs with high credit risk (non-performing loans and charge-offs). Also, our evidence suggests that the field of membership plays a role in the way discipline is exercised by CU members. There is a strong divergence in the reaction of members from different fields of membership to CU fundamentals. While members of MFOM and community CUs react to bad and good fundamentals in ways consistent with depositor discipline, members of associational and occupational CUs do not react to indicators of credit risk. Also, there are differences between associational and occupational CUs, especially in that members of associational CUs show a strong negative reaction to bad volatility while members of occupational CUs react positively to ROA. We posit that some of these differences in disciplining mechanisms across field of membership may be explained by different levels of asymmetry of information and loyalty to the credit union. Finally, we presented evidence that the financial sophistication of members plays an important role on depositor discipline. Our results, using different proxies for financial literacy, suggest that the more capable members are of processing financial information, the higher the intensity of the depositor discipline.

We believe our paper significantly contributes to the literature on depositor discipline by giving a broad description of the mechanisms through which this discipline works in CUs. Also, the results of our paper have important policy implications in that they should allow supervisors to understand the peculiarities of the discipline effect in CUs. First, we show that indeed CUs are subject to depositor discipline (both via deposits and saving rates). Second, we find that although deposit insurance reduces discipline it does not eliminate it and insured deposits are still subject to discipline. Third, we show that field of membership affects the way depositor discipline works in CUs. Finally, we find that financial literacy has an important effect on the level of market discipline. Thus, our results reinforce previous calls for improving financial literacy as a way of increasing the monitoring

exercised on financial institutions and, therefore, on increasing the stability of the overall financial system.

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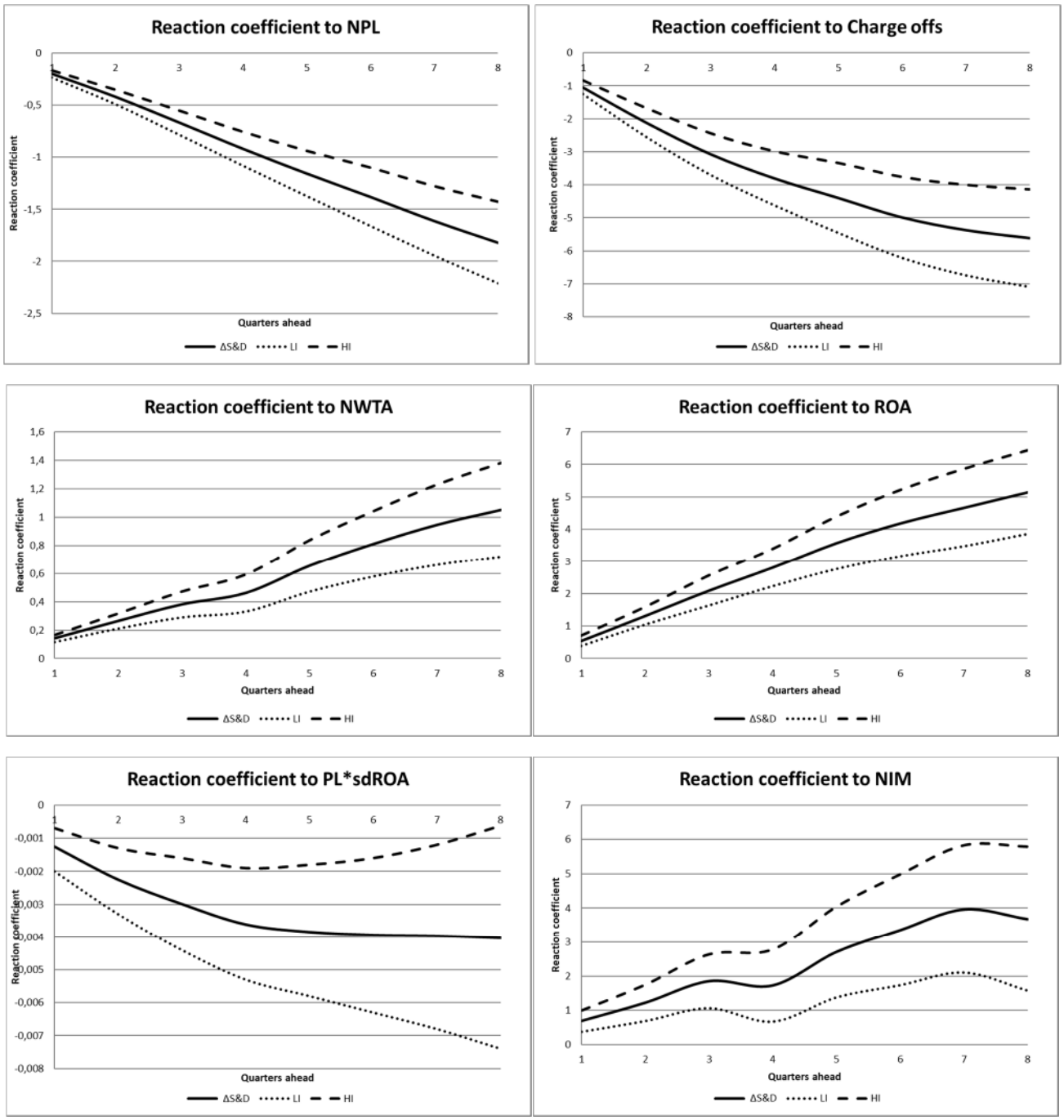
Appendix A: Variable Definitions

Variable		Definition
Dependent variables	*S&D*	Total shares and deposits of the CU deflated by total assets.
	Δshares	Quarter-on-quarter growth of shares of the CU.
	ΔS&D	Quarter-on-quarter growth of shares and deposits of the CU.
	Δunind	Quarter-on-quarter growth of uninsured shares and deposits of the CU.
	Δinsd	Quarter-on-quarter growth of insured shares and deposits of the CU.
	membersgrowth	Quarter-on-quarter growth in the number of members of the CU.
Explanatory variables	*ROA*	Return on assets of the CU.
	sdROA	Standard deviation of *ROA* (calculated over the previous 12 quarters).
	PL	Past losses the CU computed as natural logarithm of 1 plus the number of quarters where the credit union obtained losses during the previous 12 quarters (From t-1 to t-12). This variable takes values between 0 and 2.57.
	NWTA	Net worth over total assets of the CUs.
	NPL	Total amount of delinquent loans over total loans and leases of the CU.
	ch-offs	Quarterly Charge offs over total loans and leases of the CU.
	CRISK	Average value of the quarterly observations of (*NPL* + *ch-offs*).
	NIM	Net interest margin of the CU.
	loansta	Total loans and leases over total assets of the CU.
	size	Natural logarithm of total assets of the CU.
	Sav_rate	Saving rate: Average interest rates on total shares and deposits paid by the CU computed as (Dividends on shares + Interest on deposits)/Total shares and deposits.
	divregsh	Average dividend rate on regular shares.
	intnonmemb	Average interest on non-members deposits.
	Nonmembdep	Total nonmembers deposits of the CU deflated by total assets.
Low income and financial literacy variables	*lowinc*	Dummy which takes value 1 when the CU is under the low-income designation, 0 otherwise.
	finlit	Average of correct answers (out of five) to the financial literacy quiz conducted in 2009, 2012, 2015 and 2018 by FINRA Investor education formation in the state where the headquarters of the CU are located.
	$finlit_W$	Average of *finlit* for credit unions that operate in more than one state. Calculated according to the number of branches the CU i has in each state in quarter t.
Macro-economic variables by state	*pinc_s*	Change in quarterly personal income in the state where the headquarters of the CU are located.
	unemp_s	Unemployment rate in the state where the headquarters of the CU are located.
	inf_s	Quarterly inflation rate in the census region level where the headquarters of the CU are located.

Figure 1. Discipline takes time: reaction coefficients of deposit growth at different horizons



The six panels show the estimated reaction coefficients of regressions of 1 to 8 quarters ahead growth in total shares and deposits (solid thick line) to the variables *NPL*, *ch-offs*, *NWTA*, *ROA*, bad volatility (*PL* × *sdROA*) and *NIM*. The 95% confidence interval is also shown (lower interval with dotted line and upper interval with dashed line). Regressions for quarter t+1 are done using CU fixed-effects, time effects and standard errors clustered by CU and quarter. Regressions for quarterst t+2 to t+8 use also fixed and time effects and Driscoll-Kraay standard errors, correcting for correlation across CUs and serial autocorrelation.

Table 1: Descriptive statistics

Variables	Mean	Median	StdDev
Δshares	0.015	0.011	0.032
ΔS&D	0.015	0.011	0.032
Δunind	0.074	0.033	0.459
Δinsd	0.015	0.010	0.036
membersgrowth	0.005	0.005	0.026
Sav_rate	0.005	0.004	0.003
divregsh	0.011	0.005	0.012
intnonmemb	0.004	0.000	0.012
ROA	0.002	0.002	0.002
sdROA	1.217	0.845	0.999
PL	0.481	0.000	0.665
NWTA	0.109	0.103	0.030
NPL	0.010	0.007	0.009
ch-offs	0.002	0.001	0.002
CRISK	0.011	0.009	0.010
NIM	0.009	0.009	0.002
loansta	0.622	0.639	0.155
size	18.950	18.700	1.004
S&D	0.873	0.882	0.042
Nonmembdep	0.004	0	0.012
finlit	3.018	3.017	0.135
finlitw	3.017	3.016	0.136
lowinc	0.138	0.000	0.345
pinc_s	1.109	1.149	1.209
unemp_s	5.850	5.400	2.020
Inf_s	0.531	0.500	0.922

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 2018. CU-quarter observations in which a CU went through a merger are excluded. Continuous credit union variables were winsorized at the 0,5% level in each tail. Financial literacy variables (*finlit*, *finlitw*) are observed every three years starting in 2009 and vary across state of the CU. Macroeconomic variables (*pinc_s*, *unemp_s*, *Inf_s*) are constant for each quarter but differ across states and regions (so they have cross-sectional variation).

Table 2: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
ΔS&D	1.00	0.32	0.90	0.13	0.13	0.04	0.08	-0.04	-0.13	-0.07	-0.09	-0.06	-0.10	-0.02	0.04	0.10	0.05
Δunind	0.16	1.00	0.04	0.06	0.06	0.00	0.05	-0.04	-0.06	-0.02	-0.04	-0.02	-0.04	0.01	0.01	0.02	0.02
Δinsd	0.84	-0.15	1.00	0.11	0.11	0.03	0.05	-0.02	-0.11	-0.07	-0.07	-0.05	-0.08	-0.02	0.04	0.09	0.05
Sav_rate	0.11	0.02	0.08	1.00	0.89	0.01	0.27	-0.11	-0.32	0.04	-0.04	-0.06	-0.05	0.29	0.18	-0.05	-0.04
divregsh	0.10	0.03	0.06	0.88	1.00	-0.07	0.32	-0.17	-0.37	0.10	-0.09	-0.10	-0.10	0.29	0.04	-0.11	-0.03
intnonmemb	0.04	0.00	0.04	0.14	0.05	1.00	0.01	0.05	0.01	-0.08	0.07	0.07	0.08	0.10	0.25	0.07	-0.05
ROA	0.04	0.02	0.00	0.17	0.24	0.00	1.00	-0.15	-0.40	0.17	-0.20	-0.18	-0.21	0.25	0.12	0.12	-0.14
sdROA	-0.05	-0.01	-0.01	-0.15	-0.20	0.03	-0.18	1.00	0.63	-0.09	0.28	0.31	0.32	0.12	0.01	-0.06	0.05
PL	-0.13	-0.01	-0.08	-0.33	-0.34	-0.02	-0.36	0.62	1.00	-0.18	0.28	0.26	0.30	-0.08	-0.11	-0.11	0.16
NWA	-0.07	-0.01	-0.06	0.03	0.05	-0.08	0.17	-0.09	-0.16	1.00	-0.07	-0.13	-0.08	-0.11	-0.25	-0.06	-0.74
NPL	-0.09	-0.02	-0.05	-0.07	-0.10	0.06	-0.24	0.33	0.32	-0.04	1.00	0.42	0.98	0.17	0.02	-0.11	0.05
ch-offs	-0.08	-0.01	-0.04	-0.08	-0.12	0.06	-0.29	0.37	0.32	-0.11	0.43	1.00	0.55	0.30	0.04	0.08	0.09
CRISK	-0.10	-0.02	-0.06	-0.08	-0.12	0.07	-0.27	0.37	0.34	-0.06	0.99	0.56	1.00	0.21	0.01	-0.09	0.06
NIM	-0.02	0.02	-0.02	0.22	0.21	0.12	0.19	0.09	-0.07	-0.10	0.10	0.26	0.13	1.00	0.48	-0.21	0.10
loansta	0.04	-0.01	0.03	0.15	0.00	0.21	0.07	-0.01	-0.12	-0.28	-0.01	0.02	-0.01	0.52	1.00	0.14	0.03
size	0.08	-0.04	0.07	-0.08	-0.12	0.03	0.10	-0.06	-0.13	-0.08	-0.09	0.03	-0.08	-0.24	0.13	1.00	-0.13
S&D	0.04	0.03	0.03	-0.01	0.05	-0.03	-0.10	0.06	0.13	-0.64	0.01	0.07	0.02	0.10	0.02	-0.16	1.00

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): *Δunind*; (3): *Δ*ins*d*; (4) *Sav_rate*; (5) *divregsh;* (6) *intnonmemb*; (7): *ROA*; (8): *sdROA*; (9): *PL*; (10): *NWA*; (11): *NPL*; (12): *ch-offs*; (13) *CRISK;* (14): *NIM*; (15): *loansta* ; (16): *size*; (17) *S&D*.

Table 3: Depositor discipline: the response of shares and deposits and number of members to CU risk indicators

		(1)		(2)		(3)	
Dependent variable		*Δshares*		*ΔS&D*		*membersgrowth*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	+	0.529***	(6.80)	0.545***	(6.76)	-0.009	(-0.18)
$sdROA_{t-1}$	+	0.001**	(2.05)	0.001**	(2.14)	0.000	(1.02)
PL_{t-1}	-	-0.000	(-1.01)	-0.000	(-0.83)	-0.000	(-1.33)
$PL_{t-1} \times sdROA_{t-1}$	-	-0.001***	(-4.43)	-0.001***	(-4.57)	-0.001***	(-7.29)
$NWTA_{t-1}$	+	0.134***	(10.99)	0.141***	(11.42)	0.014**	(1.97)
NPL_{t-1}	-	-0.189***	(-10.76)	-0.198***	(-11.29)	-0.072***	(-6.75)
$ch\text{-}offs_{t-1}$	-	-0.988***	(-9.35)	-1.047***	(-9.99)	-0.835***	(-11.73)
NIM_{t-1}	+	0.677***	(4.30)	0.683***	(4.20)	0.525***	(4.97)
$loansta_{t-1}$	-	0.029***	(13.25)	0.032***	(14.14)	0.013***	(9.79)
$size_{t-1}$		-0.010***	(-9.13)	-0.010***	(-8.90)	0.002***	(4.10)
Sav_rate_{t-1}	+	3.229***	(10.11)	3.104***	(9.79)	0.851***	(5.94)
$pinc\_s_{t-1}$	+	0.001***	(4.20)	0.001***	(4.17)	0.000***	(3.07)
$unemp\_s_{t-1}$	-	-0.001***	(-3.37)	-0.001***	(-3.31)	-0.000	(-1.17)
inf_s_{t-1}	+	-0.002*	(-1.73)	-0.002*	(-1.77)	-0.000	(-0.50)
Observations		167,859		167,859		167,859	
CU and Time FE		YES		YES		YES	
Adj. R-squared		0.375		0.370		0.032	

Fixed-effects panel regressions of shares, shares and deposits and members growth on CU characteristics and macroeconomic controls. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by CU and quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

Table 4: Depositor discipline: the response of interest and dividend rates to CU risk indicators

		(1)		(2)		(3)	
Dependent variable		*Sav_rate*		*divregsh*		*intnonmemb*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	-	0.041***	(7.58)	0.171***	(7.38)	0.005	(0.16)
$sdROA_{t-1}$	+	0.000*	(1.88)	-0.000	(-1.07)	-0.000	(-1.52)
PL_{t-1}	+	0.000	(0.85)	-0.000***	(-2.82)	-0.000	(-0.32)
$PL_{t-1} \times sdROA_{t-1}$	+	-0.000***	(-4.47)	0.000	(1.02)	0.000	(1.32)
$NWTA_{t-1}$	-	0.000	(0.18)	0.016***	(5.00)	-0.031***	(-4.50)
NPL_{t-1}	+	0.003***	(2.85)	0.009**	(2.02)	0.020*	(1.91)
$ch\text{-}offs_{t-1}$	+	0.031***	(5.58)	0.031	(1.62)	0.027	(0.68)
NIM_{t-1}	-	-0.305***	(-23.11)	-0.629***	(-12.40)	-0.232***	(-2.97)
$loansta_{t-1}$	+	0.002***	(21.56)	0.005***	(9.04)	0.006***	(4.87)
$size_{t-1}$	-	0.001***	(10.03)	0.000	(1.13)	0.000	(0.68)
$S\&D_{t-1}$		0.002***	(8.12)				
$Regshares_{t-1}$				0.014***	(8.12)		
$Nonmembdep_{t-1}$						0.306***	(13.07)
$pinc\_s_{t-1}$		-0.000***	(-3.93)	-0.000	(-0.14)	0.000*	(1.73)
$unemp\_s_{t-1}$		0.000	(0.51)	0.000	(0.08)	0.000	(0.88)
inf_s_{t-1}		-0.000	(-0.35)	-0.000	(-1.04)	0.000	(0.96)
Observations		167,859		167,774		167,774	
CU and Time FE		YES		YES		YES	
Adj. R-squared		0.951		0.906		0.160	

Fixed-effects panel regressions of interest and dividend rates on CU characteristics and macroeconomic controls. Column 1: average saving rates, column 2: average dividend on regular shares and column 3: interest on non-member deposits. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by CU and quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

Table 5: The response of insured and uninsured deposits to risk indicators

		(1)		(2)	
Dependent variable		*Δinsd*		*Δunind*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	+	0.526***	(6.85)	-0.410	(-0.47)
$sdROA_{t-1}$	-	0.000	(1.54)	0.006*	(1.84)
PL_{t-1}	-	-0.000	(-0.10)	-0.003	(-0.73)
$PL_{t-1} \times sdROA_{t-1}$	-	-0.001***	(-3.92)	-0.001	(-0.61)
$NWTA_{t-1}$	+	0.128***	(10.04)	0.340***	(3.04)
NPL_{t-1}	-	-0.172***	(-10.78)	-0.707***	(-3.59)
$ch\text{-}offs_{t-1}$	-	-0.921***	(-8.22)	-5.201***	(-5.56)
NIM_{t-1}	+	0.549***	(3.57)	3.364**	(2.14)
$loansta_{t-1}$	-	0.030***	(14.28)	0.107***	(5.84)
$size_{t-1}$		-0.009***	(-8.17)	-0.055***	(-7.05)
Sav_rate_{t-1}	+	2.952***	(8.96)	6.711***	(3.42)
$pinc\_s_{t-1}$	+	0.001***	(4.58)	0.002	(0.83)
$unemp\_s_{t-1}$	-	-0.001***	(-2.71)	-0.001	(-0.74)
inf_s_{t-1}	+	-0.002*	(-1.94)	0.004	(0.85)
Observations		165,015		142,391	
CU and Time FE		YES		YES	
Adj. R-squared		0.349		0.045	

Fixed-effects panel regressions of insured shares and uninsured shares growth on CU characteristics and macroeconomic controls. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by CU and quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

Table 6. The impact of field of membership on the disciplining effect

		Community		Multiple field of membership		Associational		Occupational.	
Dependent variable		*ΔS&D*		*ΔS&D*		*ΔS&D*		*ΔS&D*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	+	0.322**	(2.53)	0.647***	(5.17)	-0.109	(-0.18)	1.168***	(3.31)
$sdROA_{t-1}$	-	0.001	(1.23)	0.001	(1.50)	0.007**	(2.22)	0.001	(0.41)
PL_{t-1}	-	-0.001	(-1.09)	-0.001	(-1.05)	0.002	(1.01)	-0.002	(-1.50)
$PL_{t-1} \times sdROA_{t-1}$	-	-0.001***	(-3.16)	-0.001***	(-3.11)	-0.004**	(-2.48)	-0.000	(-0.66)
$NWTA_{t-1}$	+	0.170***	(7.28)	0.186***	(8.65)	0.115**	(2.21)	0.222***	(3.75)
NPL_{t-1}	-	-0.205***	(-6.42)	-0.221***	(-7.45)	0.021	(0.24)	-0.023	(-0.24)
$ch\text{-}offs_{t-1}$		-1.037***	(-6.70)	-0.755***	(-4.58)	0.076	(0.20)	-0.260	(-0.78)
NIM_{t-1}	+	0.582**	(1.98)	0.752***	(3.02)	-1.856*	(-1.73)	1.111	(1.53)
$loansta_{t-1}$	-	0.030***	(7.79)	0.035***	(10.61)	0.058***	(4.71)	0.051***	(4.30)
Sav_rate_{t-1}	+	3.860***	(6.80)	3.975***	(9.33)	3.879***	(2.90)	4.483***	(4.15)
Observations		33,315		48,499		1,317		5,967	
Other CU controls		YES		YES		YES		YES	
Macro controls		YES		YES		YES		YES	
CU and Time FE		YES		YES		YES		YES	
Adj. R-squared		0.389		0.387		0.233		0.336	

Fixed-effects panel regressions of shares and deposits growth on CU characteristics and the effect of field of membership. Column 1: sample is restricted to community CUs; column 2: sample is restricted to multiple field of membership CUs; column 3: sample is restricted to associational CUs; column 4: sample is restricted to occupational CUs. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by CU and quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

Table 7: The effect of measures of capacity to process information – financial literacy and low-income CUs

Panel A: All credit unions									
		(1)		(2)		(3)		(4)	
Dependent variable		*ΔS&D*		*ΔS&D*		*ΔS&D*		*ΔS&D*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	+	0.675***	(8.46)	0.668***	(8.41)	0.677***	(8.48)	0.676***	(8.47)
$sdROA_{t-1}$	-	0.001**	(2.03)	0.001**	(2.16)	0.001**	(2.08)	0.001**	(2.04)
PL_{t-1}	-	-0.000	(-0.61)	-0.000	(-0.46)	-0.000	(-0.59)	-0.000	(-0.63)
$PL_{t-1} \times sdROA_{t-1}$	-	-0.001***	(-4.95)	-0.001***	(-5.13)	-0.001***	(-4.97)	-0.001***	(-4.94)
$NWTA_{t-1}$	+	0.145***	(11.50)	0.145***	(11.53)	0.145***	(11.56)	0.145***	(11.54)
$CRISK_{t-1}$	-	-0.254***	(-13.05)	0.956***	(2.83)	-0.254***	(-13.05)	-0.264***	(-13.34)
NIM_{t-1}	-	0.432***	(2.76)	0.435***	(2.80)	0.419***	(2.69)	0.418***	(2.68)
$loansta_{t-1}$	+	0.034***	(14.87)	0.034***	(14.83)	0.034***	(14.87)	0.034***	(14.89)
$finlit_{t-1}$	-	-0.002	(-1.06)	0.002	(0.84)				
$finlit_{t-1} \times CRISK_{t-1}$	-			-0.403***	(-3.50)				
lowinc	+					0.001***	(2.76)	0.000	(0.79)
lowinc × $CRISK_{t-1}$	+							0.063*	(1.66)
Observations		167,774		167,774		167,774		167,774	
CU and Time FE		YES		YES		YES		YES	
Macro controls		YES		YES		YES		YES	
Adj. R-squared		0.369		0.369		0.369		0.369	

Table 7 (continued):

Panel B: Credit Unions that operate in one state									
		(1)		(2)		(3)		(4)	
Dependent variable		*ΔS&D*		*ΔS&D*		*ΔS&D*		*ΔS&D*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	+	0.001**	(2.05)	0.001**	(2.16)	0.001*	(1.67)	0.001*	(1.75)
$sdROA_{t-1}$	-	0.634***	(8.05)	0.627***	(8.00)	0.447***	(4.57)	0.447***	(4.58)
PL_{t-1}	-	-0.000	(-0.35)	-0.000	(-0.20)	-0.000	(-0.01)	0.000	(0.09)
$PL_{t-1} \times sdROA_{t-1}$	-	-0.002***	(-5.04)	-0.002***	(-5.23)	-0.001***	(-2.63)	-0.001***	(-2.72)
$NWTA_{t-1}$	+	0.153***	(11.64)	0.153***	(11.66)	0.313***	(10.69)	0.312***	(10.71)
$CRISK_{t-1}$	-	-0.246***	(-12.46)	0.881**	(2.34)	-0.136***	(-7.52)	0.534	(1.25)
NIM_{t-1}	-	0.353**	(2.14)	0.354**	(2.15)	0.670***	(2.61)	0.672***	(2.62)
$loansta_{t-1}$	+	0.033***	(14.02)	0.033***	(13.99)	0.043***	(10.46)	0.043***	(10.45)
$finlit_{t-1}$	+	-0.002	(-1.07)	0.001	(0.53)	-0.001	(-0.28)	0.001	(0.38)
$finlit_{t-1} \times CRISK_{t-1}$	+			-0.375***	(-2.93)			-0.224*	(-1.67)
Observations		143,665		143,665		64,364		64,364	
CU and Time FE		YES		YES		YES		YES	
Macro controls		YES		YES		YES		YES	
Adj. R-squared		0.372		0.372		0.406		0.406	

Table 7 (continued):

Panel C: state-weighted average financial literacy									
		(1)		(2)		(3)		(4)	
Dependent variable		*ΔS&D*		*ΔS&D*		*ΔS&D*		*ΔS&D*	
Variables	Prediction	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ROA_{t-1}	+	0.675***	(8.47)	0.668***	(8.41)	0.473***	(4.83)	0.471***	(4.82)
$sdROA_{t-1}$	-	0.001**	(2.04)	0.001**	(2.16)	0.001*	(1.87)	0.001**	(1.97)
PL_{t-1}	-	-0.000	(-0.61)	-0.000	(-0.46)	0.000	(0.10)	0.000	(0.20)
$PL_{t-1} \times sdROA_{t-1}$	-	-0.001***	(-4.95)	-0.001***	(-5.14)	-0.001**	(-2.56)	-0.001***	(-2.65)
$NWTA_{t-1}$	+	0.145***	(11.51)	0.145***	(11.53)	0.320***	(10.70)	0.320***	(10.72)
$CRISK_{t-1}$	-	-0.255***	(-13.06)	0.974***	(2.79)	-0.141***	(-7.26)	0.601	(1.63)
NIM_{t-1}	-	0.432***	(2.76)	0.435***	(2.79)	0.782***	(3.44)	0.789***	(3.46)
$loansta_{t-1}$	+	0.034***	(14.88)	0.034***	(14.85)	0.043***	(10.26)	0.042***	(10.23)
$finlitw_{t-1}$	+	-0.002	(-0.97)	0.002	(0.86)	-0.000	(-0.15)	0.002	(0.61)
$finlitw_{t-1} \times CRISK_{t-1}$	+			-0.409***	(-3.44)			-0.248**	(-1.97)
Observations		167,774		167,774		74,602		74,602	
CU and Time FE		YES		YES		YES		YES	
Macro controls		YES		YES		YES		YES	
Adj. R-squared		0.369		0.369		0.401		0.401	

Fixed-effects panel regressions of shares and deposits growth on CU characteristics and the effect of financial education. *CRISK*: *NPL+charge-offs*, other CU controls: size and interest rates. Macro controls: personal income, unemployment, inflation. Panel A: columns 1 and 2 contain data for all credit unions and use *finlit* as proxy for financial literacy; columns 3 and 4 contain all credit unions and use the low-income designation as proxy for financial literacy . Panel B: columns 1 and 2 contain credit unions that operate only in one state and use *finlit* as proxy for financial literacy; columns 3 and 4 contain credit unions that operate only in one state for the restricted period 2010Q3-2018Q4 and use *finlit* as proxy for financial literacy. Panel C: columns 1 and 2 contain all credit unions and use *finlitw* as proxy for financial literacy; columns 3 and 4 look at the restricted period 2010Q3-2018Q4 and use *finlitw* as proxy for financial literacy on credit unions for the period 2010Q3 – 2018Q4. See Appendix A for variable definitions. *t*-statistics are based on standard errors clustered by CU and quarter. *, **, *** denote significance (based on two-tail tests) at 10%, 5% and 1% level.

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