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BASEL III CAPITAL BUFFER REQUIREMENTS AND CREDIT UNION PRUDENTIAL REGULATION: A CANADIAN EVIDENCE

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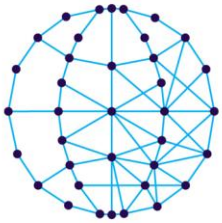

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Abstract

Some Canadian provinces have already adopted Basel III rulesfor the oversight of their administrated credit unions. This paper analyzes the importance of the Basel III additional capital buffer requirements for credit union prudential regulation. Based on a sample of the 100 largest credit unions in Canada from 1996 to 2014, we find that Canadian credit union capital buffers average 5.8% of RWA and behave countercyclically over the business cycle.This result suggests that,unlike commercial banks worldwide, there is no need to require credit unions to hold the countercyclical bufferadvocated by Basel III. However, there is evidence that low-capitalized credit unions capital buffers are procyclical. These credit unions increased their Risk Weighted Assets (RWA) during booms but failed to build up additional capital. Hence, low-capitalized credit unions may be required to hold the Basel III additional conservation capital buffer.

Keywords : Capital regulation, Credit union capital, Business cycle fluctuations, Countercyclical capital buffer, Basel III

Résumé

Certaines provinces canadiennes ont déjà adopté les règles de Basel III pour la surveillance de leurs coopératives de crédit administrées. Cet article étudie l'importance des exigences de tenir une réserve de fonds en vertu de la règlementation prudentielle sous Basel III régissant les coopératives de crédit. Un échantillon constitué des 100 premières coopératives de crédit en importance au Canada de 1996 à 2004 nous révèle que les réserves de fonds des coopératives de crédit du Canada affichent des actifs pondérés en fonction des risques (APR) de 5,8 % et se comportent de façon anticyclique sur le cours d'un cycle commercial. Les résultats semblent indiquer que, contrairement aux banques commerciales partout dans le monde, il n'est pas requis pour les coopératives de crédit de tenir une réserve de fonds anticylcique comme le soutient Basel III. Cependant, il ressort que les réserves de fonds des coopératives de crédit faiblement capitalisées sont procycliques. Ces coopératives de crédit ont accru leurs APR durant leurs cycles d'expansion, sans toutefois parvenir à se bâtir un capital excédentaire. Par conséquent, les coopératives de crédit faiblement capitalisées devraient être tenues de maintenir une réserve de fonds plus importante.

Resumen

Algunas provincias canadienses ya adoptaron las normas de Basilea III para el control de sus cooperativas de crédito administradas. Este documento analiza la importancia de los requisitos adicionales de Basilea III respecto de las reservas de capital para la regulación prudencial de las cooperativas de crédito. Sobre la base de una muestra de las 100 cooperativas de crédito más grandes de Canadá entre 1996 y 2014, encontramos que las reservas de capital de las cooperativas de crédito canadienses, en promedio, son de 5,8 % de los activos ponderados en función del riesgo y se comportan de manera contracíclica respecto del ciclo económico. Este resultado sugiere que, a diferencia de los bancos de todo el mundo, no existe la necesidad de exigir a las cooperativas de crédito que mantengan la reserva contracíclica recomendada por Basilea III. Sin embargo, hay pruebas de que las reservas de capital de las cooperativas de crédito con un bajo nivel de capitalización son procíclicas. Estas cooperativas de crédito aumentaron sus activos ponderados en función del riesgo

durante los periodos de auge pero fracasaron a la hora de acumular capital adicional. Por lo tanto, es probable que se requiera que las cooperativas de crédito con un bajo nivel de capitalización mantengan la reserva de capital de conservación adicional de Basilea III.

Introduction

Canada has the highest proportion of members of credit unions—currently some 10 million, about one third of the Canadian total population. Credit unions are non-profit institutions, operated on the principle of one-member-one-vote and motivated by self-help and solidarity ideals (e.g., Brizland and Pigeon, 2013;Goddard, McKillop & Wilson, 2015).

Out of the 696 credit unions that operated in Canada, 352 operate out of the province of Quebec (September 2014). The five (5) largest credit unions in Canada are Desjardins Group (Quebec), Vancity (British Columbia), Coast Capital Savings (British Columbia), Servus Credit Union (Alberta), Meridian Credit Union (Ontario), and First West Credit Union (British Columbia). Desjardins Group is by far the largest credit union federation in North America. Founded in 1900 by Alphonse Desjardins, it federates nearly half (344 local credit unions, or Caisses Populaires Desjardins) of credit unions in Canada. This federation has over 6 million members and manages over 210 billion Canadian dollars. In terms of assets, Desjardins Group achievesnearly the size of all credit unions outside of Quebec combined (Moore, 2014).

Compared to banks, credit unions hold less assets: For example,Royal Bank of Canada (RBC), the largest Canadian bank, accounted for 940,550 billion in assets in 2014, almost 4.5 times the size of the entireDesjardins Group, the largest federation of unions in Canada, and roughly 25 times the Caisse Centrale Desjardins. However, credit unions have specific characteristics that make them highly complementary to banking services. For example, they are more efficient than banks in the assessment of the borrowers'creditworthiness, because the members know each other fairly well (due to common bond)and can impose sanctions on delinquent payers (seeBanerjee et al. 1994). Furthermore, unlike banks they fund a large share of their lending activities, mostly with stable "guaranteed" deposits. Vital to the national economy, they provide alternative financing to small and medium enterprises (SMEs), households and other economic agents that otherwise would have difficulty accessing traditional bank financing (CIBP, 2014). Given this importance and the fact that members' deposits are guaranteed by the regulatory bodies in Canada, credit unions are subject toprovincial surveillance.

In Quebec, for example, the Autorité des Marchés Financiers (AMF) ensures micro and macro prudential regulation of the credit union system.In a recentfinal document (issued in 2014 and revised in January 2016), it releasednew guidelines on regulatory standards (AMF, 2016) based on the recommendations of Basel III (BCBS, 2011). New requirements for credit unions are: (a) a leverage ratio (including off-balance sheet activities) as a supplementary measure to risk-based capital requirement of Basel II;(b) a countercyclical capital buffer, to promote the build-up of capital buffers in periods of expansion, that can be used during periods of stress; and(c) short-term and long term liquidity standards (Liquidity Coverage Ratio (LCR), Net Stable Funding Ratio (NSFR)).

Unlike banks, credit unions faceparticular challenges to comply with these regulations (Moore (2014)) due to their non-profit and cooperative status. Above all,compared to banks, they are limited in their ability to raise capital.In addition to the existing Basel II rules, new rules on conservation and countercyclical capital buffers are introduced by regulators in response to the 2007-2008 banking crisis in which credit unionsare not responsible and have shown to perform better than banks through the business cycle (Smith and Woodbury, 2010).This raises doubt on the necessity to adopt all corrective action of Basel III to credit unions despite their solid and stable business structure andtheir difficulty to raise capital.

Meanwhile, most papers on credit unions focus on the credit union efficiency or the modelling of their objective function. Very little has been done to analyze how their special business fits with various regulations they are subject to. This paper aims to build upon the capital structure adjustment theory in order to analyze the importance of Basel III countercyclical and conservationcapital buffer for credit union prudential regulation.

We investigate the desirability of the countercyclical capital buffer by studying the cyclical behavior of Canadian credit unions' capital buffer. We study the importance of the conservation capital buffer based on the adjustment behavior of the capital-constrained credit unions.

Our paper is close to the one of Goddard, McKillop &Wilson (2015),which addresses the issue of capital adjustment for US credit unions. Existing literature highlights the importance to study capital adjustment behavior jointly with risk posture, because credit unions are subject to capital regulation based on their level of risk (asset risk). UnlikeGoddard, McKillop &Wilson (2015), we account for the endogenous risk adjustment behavior in our capital adjustment framework. To fit the study for credit unions, we simultaneously account for their non-for profit nature in investigating jointly capital and risk posture with decisions about benefits or profits to members (we call it Benefit to members).

We are not aware that otherstudieslike ours clearly address the merit of applyingthe conservation and countercyclical capital buffer requirements to credit unions. The remaining sections are organized as follows: Section 1 presents the credit union regulation followed by a brief literature in section 2. Section 3 discusses the empirical model. After the data description in section 4, we discuss the results in section 5. We provide robustness check in session 6 and section 7 concludes.

Credit unions regulation in Canada

The deposit insurance provided by the government is one of the main motives for credit union regulation. The incentive of moral hazard from managersis weaker in credit unions due to the shareholders status of the credit union members (depositors or borrowers). As owners of the credit union,they contribute to its management through their voting rights. That said, it is not necessary to protect depositors from excessive risk taking behavior as it is the case with banks. Unfortunately, evidence shows that members' (depositors and borrowers) capacity to control and discipline credit unions is limited. In fact, due to the status of a one member-one vote, the incentive and ability of members to generate a concentration of voting power is limited and attendance of members at votes are low (Hiller et al. 2008). This reduction of the member supervisory power increases the information asymmetry that can easily lead to credit union runs in the event of doubt about its financial condition.

The regulation of credit unions is set up to protect depositors and deposit insurers against excessive risk taking from executives and ensure the solvency of credit unions in difficult timesi(e.g., Goddard, McKillop & Wilson , 2015). So, capital requirement is desirable for the stability of credit unions, mainly during bad economic times. However, the exact capital ratio to apply to credit unions is to date an unsettled question. We believe that the credit union common bond considerably limits default as members know each other and can impose social sanctions on delinquent payers (Banerjee et al., 1994).

Unlike banks, which are federally regulated, provincial jurisdiction are responsible for the prudential regulation of Canadian credit unions. In each province, there are organizationswhose purpose is to regulate credit unions and provide deposits insurance. These organizations, which are subject to provincial authorities, ensure that Canadian credit unions maintain adequate capital to support their business.The capital regulations take the form of minimum capital ratios requirements. Historically, credit unionsmust maintain adequate amounts of capital to support their risk and growth. Two capital requirements are implemented prior to the Basel III adoption. The risk-based capital ratio (Total capital/ Total assets weighted for risk) is internationally monitored, and the non-risk-based capital ratio or leverage (Total capital / Total assets) newly introduced under Basel III but in effect in Canada for quite a while. Different limits have been applied by provinces. The 8% limits on the risk-based capital ratio is adopted by all provinces except British Columbia (10%) and Alberta (10.5%). Concerning leverage limits, all provinces have adopted 5% of leverage except Ontario (4%).

Recently, the Basel Committee has released its latest international regulatory standards called Basel III following the 2007-2008 financial crisisin order to adjust the existing standards (Basel II). The new regulation adds to capital regulation, bothnew capital buffer requirements and new liquidity standards. Most of Basel III standards are primarily designed for banks and should be reviewed by provincial authorities when applied to credit unions. Consequently, these standards sometimes fail to account for credit unions' specificities. We focus in this paper on newly introduced countercyclical and conservation Tier 1 capital.Credit union actual capital ratios (risk-based capital ratio and leverage ratio) are higher than the minimum required. This means that they already hold a sufficient buffer. However, this buffer is not regulated prior to the new Basel III. The regulated buffer will impose new constraints on credit unions. Firstly, they were allowed to lower their buffer to expand activities (assets or risky assets) without provisioning for capital. Such behavior is still possible under the conservation capital buffer but the capital buffer must quickly be rebuilt to meet the minimum capital buffer requirement. Secondly, the countercyclical capital buffer will impose another burden on credit unions during credit expansion. They will be required to rapidlyhold additional core or Tier1 capital buffer. Despite the desirability of such Tier 1 capital buffer, a sudden increase inits requirement could challenge credit unions due to their not-for-profit and private business status. For example, Hiller et al. (2008) show that under the pressure to satisfy the newly introduced risk-based capital ratio minimum of 8% in 1992 in Australia, credit unions have used regulatory arbitrage. Instead of raising new capital or reducing risk, credit unions reallocated the components of their assets to make them seem artificially less risky. This behavior is a clear evidence of the difficulties credit unions face to rapidly raise their capital level. To meet Tier 1 capital, financial institutions mostly rely oncommon equity or retained earnings (disclosed reserves). Unfortunately,credit unions are limited in raising both. Firstly, credit unions are private entities and cannot issue common equity on financial market (Andrews, 2014; Hoel, 2007). They instead issue membership capital shares, which are not eligible as capital instruments (under IFRS standards)

because they lack permanency.Members can withdraw their share in the event of resignation. Some credit unions issued investment shares, but this is limited by the one-member-one-voteprinciple (Goddard, McKillop &Wilson, 2015). That said, the only and costless alternative for credit unions to adjust for the Tier 1 under Basel III Tier 1 conservation capital is earning retention (Andrews, 2014).

However, retention of earnings conflicts with the non-profit status of credit unions. It limits their ability to charge higher spreads to their customers-members-owners and so to generate enough profit to be retained for capital purpose. In addition, members have a preference for distributed profit (as dividend) over retention for capital purpose. Another point worth making is that credit unions have lost thetax advantage that allowed them to retain more profit as capital (Moore, 2014) and are currently undergoing a competition with banks even in rural areas where they were major players.Due to this reliance on profit, sudden capital requirement may not be desirable for credit unions. This is in line with the findings of Brown and Davis (2009). According to them, Australian credit unions set performance levels on short-term assets in order to progressively bridge the capital gap (the difference between the target capital ratio and thereached one). In addition,Goddard, McKillop &Wilson (2015) find evidence of gradual capital adjustment by credit unions in anticipation of the United StatesPrompt Corrective Action (PCA) in 2000.

Like US credit unions, Canadian credit unions establish their desired level of capital ratio well above the regulatory target and publishes it in their annual reports. They adopt a conservation capital building behavior essentially based on their disclosed reserves. For example, credit unions of Manitoba and Newfoundland & Labrador maintain a minimum of 3% of their assets in the form of retained earnings to meet their capital requirements. In British Columbia, credit unions are required to hold at least 35% of retained earnings as capital. In Quebec the Desjardins Group, to strengthen its capital position, regularly retains one third (1/3) of its revenues for capital accumulation.

In view of all these efforts accomplished by credit unions to build buffers despite their limited capital source alternatives, it appears important then to challenge the usefulness of the newly introducedadditional bufferrequirements for credit unions.We investigate the desirability of the countercyclical capital buffer by studying the cyclical behavior of Canadian credit unions capital buffer. A positive co-movement with the cycle means that the capital buffer is high during hard times and low during upturns. This is undesirable because during recessions, revenues are low and it is difficult for credit unions to adjust for capital without cutting new loans or liquidating existing assets. This makes the countercyclical capital buffer desirable. The importance ofa conservation capital buffer is investigated based on the adjustment behavior of the capital-constrained credit unions. Specifically, we study the adjustment behavior of credit unions when they are very close to the regulatory limit. If adjustment is faster compared with well-capitalized credit unions, it becomes desirable to implement a conservation capital buffer in order to avoid sudden adjustment, which can be socially costly for the credit union stability.

In this paper, we consider two capital buffers, the risk-based capital buffer and the exposure-based capital ratio. The buffer on the risk-based capital (leverage ratio) is the additional capital that credit unions hold above the minimum of 8% of Risk Weighted Assets (respectively 5% of total assets)required. To adjust for the risk-based capital ratio or leverage ratio, credit unions can increase their Tier 1 capital position (the numerator of the ratio) or decrease their risky asset holding or their total

assets. This substitution effect between the numerator and the denominator of the ratio makes the adjustments in capital and risk interrelated. Further, credit unions are highly dependent on their profit to build capital, which contrasts with their non-profit nature. Therefore,we complement the joint capital and risk adjustment by adjustment in profits for members.

The brief literature below describes papers investigating the capital adjustment with credit unions. We also provide an overviewof studiesthat investigate risk taking and profits for members,although these address research questions different than ours.

Brief literature review

According to Goddard, McKillop &Wilson (2015), US credit union capital buffers are positively related to the business cycle (countercyclical). This means that credit unions manage to build their buffers during booms in order to avoid undesirable and socially costly adjustment during busts (by reducing assets or loans), and there is no need to require them to hold countercyclical capital buffers. In contrast, the study of Stolz & Wedow (2011) contradicts the non-desirability of countercyclical capital buffer documented in Goddard, McKillop & Wilson (2015). They found that Germany's local banks' capital buffersare instead procyclical during the 1993-2004period.The main difference between the two studies is that they are conducted in two different countries using different ratios.There is also a difference in the capital ratio used in both studies. Stolz & Wedow (2011) use the risk-based capital buffer whereas Goddard, McKillop & Wilson (2015) use the capital to assets ratio. Interestingly, the fact thatboth ratios are regulated by Canadian credit union regulators gives a better view of the desirability of the additional buffer for credit unions.It is however worthwhile noting that there is evidence in the literature (See, Ayuso et al., 2004 and Guidara; Lai and Soumaré, 2013, among others) that banks' capital buffers are procyclical, which makes the countercyclical capital buffer requirementvery desirable for banks.

The desirability of theconservation capital buffer requirements is also an unsettled issue. Our hypothesis is that the conservation capital buffer holding is only desirable if less capitalized credit unions adjust faster than well capitalizedcredit unionsin reducing assets or cutting loans. As stated earlier, it is hard forcredit unions to rapidly raise their capital ratio without cutting in loans or reducing assets. Some studies (Goddard, McKillop & Wilson, 2015; Heid, Porath et Stolz, 2003) confirm the asymmetry in adjustment based on the bufferlevel held by credit unions. According to Goddard, McKillop & Wilson (2015), credit unions with low buffers adjust faster compared to well-capitalized credit unions. Heid, Porath & Stolz (2003) studiedthe behavior of capital-constrained credit unions prior to the crisis.They alsoinvestigated the impact of regulations on the adjustment of capital and risk for financial institutions in Germany during the period from 1994 to 2002. They find that adjustment to capital and risk depends on the amount of capital buffers. Banks and credit unions with lower capital buffers try to rebuild their buffers by increasing capital and reducing risk. However, banks and credit unions with high buffers try to maintain their buffers by increasing the risk when the capital stock increases. This result shows the importance to impose conservation capital buffers on credit unions to avoid costly capital raising during hard times and risk reduction through asset liquidation or credit crunch. Contrary to those studies, Stolz & Wedow (2011) results support that low-capitalized banks do not catch up with their well-capitalized peers over the observation period and they do not decrease risk-weighted assets during a recession. This finding suggests that their low capitalization does not force

them to retreat from lending, which supports the desirability of conservation capital buffers for credit unions under Basel III.

Note that none ofthese studies internalize the specific not-for-profit and cooperative features of credit unions in their analysis. We complement their approach by estimating how the credit union adjustment process affectsthe benefitsto members. In the next section, we present our study data and methodology.

The empirical model

The aim of this paper is threefold. Firstly, we estimate the effect of business cycle fluctuations on Canadian credit unioncapital buffers (risk-based and leverage capital buffers). Secondly, we decompose the adjustment process by studying adjustment in the numerator of the ratio and its denominator. Thirdly, we investigate how adjustment affectsthe credit union portfolio main objectives, which is to offer benefit to members. This section describes our empirical model estimation strategy. It is organized as follows.We first present the partial adjustment model, state the hypotheses to be tested, and describe the estimation methodology. Wethen define the measures of the variables of interest,the credit union capital buffers and the business cycle. Finally, we define the measures and the potential impact of the credit union-specific control variables.

The partial adjustment model and hypotheses

Existing literature shows that credit unions hold large capital buffers. Jackson (2007) describes the evolution of capital ratios for US credit unions over the 1990-2006period and finds that they are over-capitalized (compared to banks). They hold on average 11.6% of capital compared to the minimum requirement of 8%. This result is also confirmed by Goddard, McKillop & Wilson (2015). Most of the credit unions in Canada declare in their annual reports that they target higher risk-based (around 12%, compared to the minimum of 8%). This additional capital buffer held by credit unions allows them to guard against the risk of falling below the regulatory value. Marcus (1984), Milne & Whalley (2001), Milne (2004) and othershave shown that financial institutions have an incentive to hold a capital buffer as insurance against breach of compliance with minimum regulatory capital requirements.We assume that they do so because of the high cost of adjustment. As suggested by Stolz & Wedow (2011),the incentive to hold buffers derives from two assumptions: firstly, credit unions cannot adjust capital and risk instantaneously, otherwise they would not need to hold capital buffers;secondly, a violation of the regulatory minimum capital requirements triggers costly supervisory actions, possibly even leading to credit unionclosure. The theoretical model that supports gradual adjustment to target is the partial adjustment model. It assumes that each year the credit union increasesits capital to reduce the shortfall between the target and realized capital. This is similar to the approach used by Goddard, McKillop &Wilson (2015)for US credit unions and Stolz & Wedow (2011) for German credit unions. In choosing their targeted buffer, credit unions may find a tradeoff between the adjustment costs and the costs of operating with sub-optimal buffers. The proposed model enables partial adjustments of the credit unions' risk-based capital and leverage buffers towards their desirable level.A quick adjustment towards a targeted buffer may have two conflicting explanations.Either the adjustment is less costly or the ratio is the binding one, in which case the credit union may quickly adjust in order to avoid non-compliance costs. The typical partial adjustment model is the following:

$$\Delta BUFF_{it} = \alpha(BUFF^{*}_{it} - BUFF_{it-1}) + \varepsilon_{it}, (1)$$

where$BUFF_{it}$is either the risk-based capital ratio or the leverage isbuffer of credit union i at time t, and ε_{it} is the error term. Equation (1) assumes that every time t, the typical credit union i closes a proportion α of the gap between its actual buffer$BUFF_{it-1}$ (the buffer realized the previous period) and its desired or targetedbuffer$BUFF^{*}_{it}$ in the current period. $\alpha$is also interpreted as the speed of adjustment. The targeted buffer, being unobservable, we assume that it depends on the business cycle owing to its effect on credit risk and credit union-specific variables (e.g., Goddard, McKillop & Wilson, 2015;Stolz & Wedow 2011). Hence, the unobservable target buffer is expressed as follows:

$$BUFF^{*}_{it} = \beta_0 CYCL + \beta_1 CYCL * dyLOW_{i,t} + \delta X_{it-1} + \mu_{it}, (2)$$

Where$X_{it-1}$is a vector of credit unions' predetermined characteristics, $CYCL$ is a proxy for business, $dyLOW_{i,t}$ is a proxy for the credit union capitalization and $\mu_{it}$is the error term. Assuming that X_{it-1} is well chosen, if the tradeoff theory of capital structure choice holds, then we should have $(\beta_0, \beta_1, \delta) \neq 0$. We replace expression (2) in equation (1) and obtain:

$$\Delta BUFF_{it} = \alpha(\beta_0 CYCL + \beta_1 CYCL * REG + \delta X_{it-1} + \mu_{it}, -BUFF_{it-1}) + \varepsilon_{it} \quad (3)$$

$$= -\alpha BUFF_{it-1} + \alpha\beta_0 CYCL + \alpha\beta_1 CYCL * dyLOW_{i,t} + \alpha\delta X_{it-1} + \varepsilon_{it} + \alpha\mu_{it}.$$

In order to obtain the standard form of an endogenous lag model, we add $BUFF_{i-t}$to both sides of Eq. (3) and get the following expression:

$$BUFF_{it} = (1-\alpha)BUFF_{it-1} + \alpha\beta_0 CYCL_{j,t} + \alpha\beta_1 CYCL_{j,t} * dyLOW_{i,t} + \alpha\delta X_{it-1} + \varepsilon_{it} + \alpha\mu_{it} \quad (4)$$

We assume that the error term $\varepsilon_{it} + \alpha\mu_{it}$can be decomposed into two independentcomponents: the credit union specific unobservable variable and the white noise. These are assumed to follow respectively a normal distribution with 0 means and different but constant variance.

Assuming the null hypothesis that business cycle fluctuations do not have an impact on the change in credit unions' capital buffers, we can state our hypotheses in terms of the coefficient$\alpha\beta_0$as follows: H1a: $\alpha\beta_0$= 0.A significant $\alpha\beta_0$is to be interpreted such that the business cycles affect the build-up of Canadian capital buffers. A positive sign of this coefficient means that capital buffer moves countercyclical.

We also test for the effect of capitalization on the cyclical behavior of buffers. Under the null hypothesis that capitalization does not affect cyclical behavior of buffers, we state our hypotheses in terms of the coefficient$\alpha\beta_1$as follows: H2a: $\alpha\beta_1$= 0.

A significant $\alpha\beta_1$means that the impact of the business cycle on the capital buffer adjustment depends on the credit union buffer level.To deepen our knowledge of how credit unions adjust their buffer, we study separately the behavior of the numerator and the denominator of the two capital ratios (risk-based capital ratio and leverage ratio). The two ratios share the same numerator which is the total regulatory capital but have different denominators (Risk Weighted Assets and Total Assets). We also

evaluate how the business cycle and the capitalization affect the total capital (CAP), total risk proxied by RWA and total profit to their members (PROF). We estimate the following equation:

$$Y_{it} = \beta_0 + \beta_1 \Delta CYCL_{it} + \beta_2 CYCL_{j,t} * dyLOW_{i,t} + \beta_3 Y_{it-1} + \gamma_1 X_{i,t-1} + \vartheta_{i,t} \quad (5)$$

where Y_{it} can be replaced by the total capital (CAP), the Risk Weighted Assets (RWA), the total asset (ASSETS) of profit for members (PROF).Hence, the idea behind this specification is that the effect of business cycle fluctuations determines the build-up of capital buffers.

For each value of Y_{it} (CAP, RWA, PROF), we test the cyclical behavior as in (4) based on the coefficientβ_1. We also test for the significance of the coefficientβ_3. The idea behind this test is to quantify how the components of the risk-based and leverage ratio or benefit to members are adjusted to the optimal or targeted buffers.

Estimation methodology

Models in Eqs. (4)– (5) have a dynamic panel structure, so we employ the Blundell and Bond (1998) system generalized method of moments (Syst-GMM) estimator. Its controls for the credit unions specific unobservable component of the error term. At the same time, it also avoids the weak instrument problem that the Arellano and Bond (1991) estimator would face given the near unit root process of our data.As suggested by Stolz and Wedow (2005), in models with endogenous regressors, using too many instruments could result in seriously biased estimates. Hence, we only use a subsample of the whole history of the series as instruments.

Dependent variables

Capital buffers, regulatory capital, risk

Capital buffers (BUFF_R, BUFF_A): A credit union's capital buffer is given by the capital the credit union holds in excess of the regulatory minimum capital requirement. Hence, we define two measures of credit unions' capital buffers (BUFF). The first one, BUFF_R is defined as the risk-based capital ratio (Total capital/ Total Risk Weighted Assets) minus the 8% regulatory minimum. The second BUFF_A is defined as the leverage ratio (Total capital/Total Assets) minus the 5%.

Regulatory capital (CAP)

Total regulatory capital is computed as the sum of Tier1 capital or core capital and Tier2 capital or additional capital instruments. Tier 1 capital major components are the retained earningsand the capital injections by the credit union public owners and members. Tier 2 capital is made of subordinated debt and mostly issued by large credit union to adjust their capital buffer (Stolz and Wedow, 2005).

Risk weighted assets (RISK)

Credit unions take credit and liquidity risk in financing members' long term risky projects (loans) with short term deposit. They also bear market risk through their stock investment portfolio. This risk-taking, although socially beneficial, is also a source of instability for the credit unions in case of systematic default from borrowers. Therefore, regulators require credit unions to hold capital and reserves to buffer unexpected losses. Credit unions should maximize their risk-adjusted profitability when allocating their portfolio. We are unaware of papersthat document credit union risk taking behavior following capital regulation except Hillier et al. (2008), which finds evidence of regulatory arbitrage by credit unions to artificially decrease their risk level. Most existing literature on credit union's risk addresses how credit union revenue volatility is affected by membership or income diversification (see Frame et al. (2002), Esho et al. (2005), Ely (2014), Goddard et al. (2008)). However, we are interested more about portfolio or asset risk than return volatility or return-based risk. Our focus is on how credit unions adjust their risk-taking behavior to meet regulatory requirements. As mentioned earlier, regulators measure banks risk-taking by their total assets weighted by risk (RWA). Jacques and Nigro (1997) argue that the RWA capture both the allocation of risks and the quality of the portfolio risk. This risk measure incorporates credit risk, operational risk and market risks1.

Benefitsto members

The performance of credit unions in this study is measured by how much benefit members derived from their credit unions through loans and deposit certificate rates.This measure of benefit to members is drawn fromthe objective function of credit unionstheoreticallymodelled by Taylor (1971, 1977) and Smith (1981,1984). According to them, credit unions maximize benefits to members by setting better rates on loan and deposit compared to the market. Specifically, Smith (1986) performs an empirical test to show that credit unions are neutral between the interests of their borrowing and saving members.Following the formulation of the objective function in these models, we compute the profit to members as follows:

$$\mathrm{PROF} = 0.5 * \left(\mathrm{r_{LM}} - \mathrm{r^{i}_{L,t}}\right) + 0.5 * \left(\mathrm{r^{i}_{St}} - \mathrm{r_{SM}}\right)$$

where,$\mathrm{r^{i}_{L,t}} = \frac{\mathrm{Loaninterestincome}}{\mathrm{Totalloan}}and\mathrm{r^{i}_{S,t}} = \frac{\mathrm{Interestexpenseondeposit}}{\mathrm{Totaldeposit}}$are respectively, the average loan and deposit rates applied by the cooperative i in year t. So, $\mathrm{r_{LM}} - \mathrm{r^{i}_{L,t}}$may be interpreted as the benefit to borrowing member and$\left(\mathrm{r^{i}_{St}} - \mathrm{r_{SM}}\right)$ the benefit to lending member.

There is evidence in the literature that credit unions set their rates competitively with other financial intermediaries. Feinberg (2001)finds that credit unions actively participate in market discipline, forcing banks to provide competitive lending rates to their customers. Tokle and Tokle (2000) show that bank deposit rates are affected by the rates offered by credit unions. There isclear evidence that credit unions seek to maximize profit to members.

Our variable profit (PROF) thus captures the average earnings available to lenders and borrowers, assuming that both categories of members (borrowers and lenders) have equal weight in the credit cooperative.

Credit unions specific control variables

To estimate the effect of business cycle fluctuations on changes in credit unions' capital buffers, we control for the effect that credit union-specific variables have on optimum capital buffers. Control variables and their definitions are provided in the table below:

	Dependent variables
BUFF_R (Risk-based)	Basel capital to risk-weighted assets ratio minus 0.08
BUFF_A (Asset-based)	The leverage ratio minus 5%
CAP	Total regulatory capital scaled by the whole sample average regulatory capital
RWA	Risk-weighted assets scaled by the average whole sample Risk-weighted assets
	Business cycle variables
CYCL(Provincial)	GDP growth by province
CYCL (Canada)	Canada GDP growth
	Credit unions specific (control) variables
LIQUID	Cash over total assets
RISK	Risk-weighted assets scaled by the total assets
SIZE	Natural log of total assets
ROA	Annual net profit before tax over total assets
dyMERGER	One for the acquirer in the year of the merger and zero otherwise
dyLOW	One if the credit union is among the 50% least capitalized for a respective year
LOSS	Charge for impairment over total loans
AGE	Age of the credit union
BENEF	Benefice to members

Data

We collected financial data on the100 major credit unions in Canada based on the list of the 100 largest credit unions published quarterly by Credit Union Central Canada. We specifically collected balance sheet, income statements and capital requirements datafrom annual reports published by credit cooperatives on their websites, with690 annual reports analyzed. This corresponds to an average of 7 yearsof data per credit union. Somecredit unions postfew annual reports on their websites. The data collected was then cleared to detect any inconsistencies that may affect the quality of the analysis. The most represented provinces are: Quebec (with a federation of 344 local credit unions), British Columbia (27 credit unions), Ontario (25credit unions), Manitoba (20 credit unions), and Alberta (11credit unions). Data on macroeconomic variables comes from Statistics Canada and the Quebec Statistics Institute. Our sample consists of an unbalanced panel of 100 major credit unions (by total assets)in Canada from 1996 to 2014.

Regression analysis

In the following subsections, we present the results of estimating Eqs. (4)–(5). We first show the results for Eq. (4) where we account for asymmetries in the behavior of capital buffers (Basel risk-based capital and leverage buffer) with respect to the business cycle and the capitalization of the credit union. We then decompose the two capital buffers and separately study their common numerator (CAP) and their denominators Basel risk measure (RWA) and total assets (ASSETS), corresponding to estimating Eq. (5). Finally, we show how the business cycle and capitalization affect benefits to members (PROF).

With respect to CYCL_P, the provincial GDP growth, we find a positive and significant coefficient. So business cycles do affect the buffers' behavior (H1a: $\alpha\beta_0 \neq 0$). This is consistent with the positive relation found by Goddard, McKillop & Wilson (2015) for US credit unions. This result suggests that there is no need to require credit unions to build their buffers during booms (as suggested by the Basel III countercyclical capital buffer requirement), as they already do so. However, we find an opposite result for low capitalized credit unions (below the median capital), by interacting the dummy variable of low capitalization (dyLOW) and the business cycle variable (CYCL_P). Hence, low capitalized credit unions are thoseupon which theregulators must impose Basel III countercyclical capital buffers. Results also suggest that credit unions with higher buffers also hold more liquid assets. To dig further our knowledge about the cyclical behavior found in Eq. (4),we run regressions Eq. (5)on both components of the Basel risk-based capital buffer, i.e., capital (CAP) and risk weighted assets (RWA). We only focus on the Basel risk-based buffer (BUFF_R) because Basel III new buffer requirements are risk-based.

We find evidence that credit unions increase their capital position during booms. The coefficient of the CYLC_P in the first column is positively significant. This result suggests that credit unions build up their buffers during booms so that they do not need to curtail credit allocation during busts. However, the negative cyclical behavior found for low capitalized credit unions is due to the reduction in their capital position during booms. We get this result by interacting the dummy variable of low capitalization (dyLOW) and the business cycle variable (CYCL_P). We obtain a negative and significant coefficient in column1. In addition to their low capital in booms, low capitalized credit unions increase their risk taking (RWA) during booms. We find a positive and significant relation between credit unions'risk proxied by the RWA and the CYCL_P*dyLOW interaction variable term in column 2. This result is consistent with Stolz & Wedow (2011) for local German banks. While low-capitalized banks indeed increase their exposure to credit risk by increasing risk-weighted assets in a boom, they fail to increase capital correspondingly. This is also consistent with the argument of Ayuso et al. (2004), who point out that banks that do not build up capital sufficiently in booms to provide for the higher exposure to credit risk will be forced to increase buffers during busts. This low capitalized capital behavior may be explained by the hurdle challenge they face to adjust quickly.

We finally address the cyclical behavior of the credit union benefits to members (PROF). Let us recall that the main objective of credit unions is to grant competitive rates on loans and deposits to their members. Our analysis suggests that there is no cyclical behavior in the way credit unions provide benefit to members. However, there is a negative relation between the size (SIZE) and age (AGE) of the credit union. This result may be explained by the fact that large credit unions tend to behave like

banks and as such can diversify the way they benefit their members. This may also be valid for the variable age as major large credit unions in Canada are likely the old ones.

Robustness check

In this robustness check, we implement the previous analysis with the Zscore as a proxy for credit union risk. In the previous analysis, we use the regulatory measure of risk (RISK) (The Risk Weighted Assets per unit of Assets) and the provision per unit of asset (LOSS). Risk weighted assets are criticized to be backward-looking and easy to game (for example, via securitization). In this section, we use two alternative risk measures that are closer to the credit union default risk measure: theZscore measure. According to Esho et al. (2005), the Zscore is an accounting-based measure of the probability of bankruptcy and is defined as the likelihood of incurring a loss greater than the credit union's total capital.Our results suggest that the relation ofthe capital buffer to the GDP growth and the cross variable CYCL*dyLOW remains unchanged.We also verify if results are driven by major credit unions such Desjardins Caisse Centrale and Vancity credit union, or smallest one, by excluding them from the analysis. We mainly compute decile based on credit union size and run our regression on the decile from 2 to 9. This allows us to exclude largest and smallest credit unions from our sample without drasticallyreducing our limited sample. We only perform the OLS and FE due to data limitation. Results are similar to findingsin section 5. This way our results are not driven by observations in the distribution tail.

Conclusion

This paper examines how the capital buffers (Basel risk-based and leverage ratio) of Canadian credit unions fluctuate over the business cycle. We find strong evidence that capital buffers (risk-based and asset-based) behave countercyclically. However, credit unions with low capital buffers react differently to the business cycle than credit unions with relatively higher capital buffers. Low-capitalized credit unions decrease capital buffers during busts. This decrease is jointly driven by capital and risk weighted assets. Low-capitalized banks reduce capital and raise risk-weighted assets over the business cycle. As suggested by Stolz & Wedow (2011), one plausible explanation may be credit unions'differing risk attitudes. A low capital buffer would then simply reflect credit union lower risk aversion. Blum (1999) shows that constrained banks may take higher risk to target higher profitsin order to meet capital requirements. This behavior of low-capitalized credit unions may also reflect their poor risk management. Based on these results, we recommend regulators toimplement the conservation buffer requirement to force low-capitalized credit unions to hold additional buffers. Meanwhile, there is no need to clearly impose countercyclically buffersto well-capitalized credit unions as they already hold sufficient countercyclical capital buffers. It is also worthwhile mentioning that credit unions do not decrease their risk-taking during bad times, a featurethat underscores the importance they give to sustainingvigorous credit allocation during recessions in order to revive the economy. Additional analysis suggest that credit unions with low net worth prudently managed their capital buffer. On the contrary, less profitable credit unions hold lesser buffers compared to more profitable credit unions one and fail to prudently manage their capital buffers through the business cycle. Finally, we find that the credit union benefits to members do not behave cyclically but rather decrease with the credit union's age and size.

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[i] According to AFIC, capital regulation aims to protect the interests of depositors and promote integrity and financial efficiency.

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