CANADIAN CENTRE FOR THE STUDY OF CO-OPERATIVES (CCSC)

Understanding Growth and its Policy Implications for Canadian Credit Unions

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ABSTRACT

In this paper, we investigate the sources of growth for the 100 largest Canadian credit unions (CUs) over the past decade. We find the existence of diseconomies of scale in growth for these credit unions. Our result suggests that these credit unions may have fully exploited gains to scale in their provincial markets. Exploring the economics of scope, we find that there are potentials for non-interest income to generate growth. Cost efficiency enhances growth while a higher capital-asset ratio hinders growth. Interestingly, mergers do not impact one-year growth, one, two, or three years after the merger. We also find that the acquiring CU does not out-perform peer CUs (matched on size and growth) one year after the merger. However, when growth is calculated over two years the acquiring CU out-performs the same peers. Multivariate analysis reveals that mergers affect growth through the quadratic term of the size variable. Our result helps to explain the recent trend in the federalization of large CUs and has implications for smaller CUs that cannot justify federalization.

[1] The author has benefited from discussion with Marc-Andre Pigeon (Johnson Shoyama Graduate School of Public Policy, University of Saskatchewan), Jordan van Rijn (CUAN), Luis G Dopico (Filene), Min Muang (Edwards School of Business) and 2021 Seminar participants at Canadian Centre for the Study of Co-operatives.

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1.0 INTRODUCTION

What are the determinants of growth for Credit Unions (CU)? We examine this question using data from a sample of the 100 largest Canadian CUs. CUs in our sample have grown an average of 6.9% over the last decade. We focus on two important questions; first, following the existing literature, we examine whether there are economies of scale and scope in growth. During our sample period the Canadian CU industry has experienced massive consolidation, so the second focus of this paper is to investigate how mergers (acquisitions, amalgamations, etc.) effects growth. Additionally, we examine the affects of efficiency, capitalization, and risk on growth. Saunders and Walter (1994) argue that the question of growth for depository institutions lies at the heart of strategic and regulatory discussions (page 69), so this paper contributes to important policy discussion. In addition, identification and understanding the source of growth could also help us understand recent trends (massive consolidation in the industry and the reason behind why large CUs are seeking federal charter[23]) in Canadian CU industry.

Most recent studies examining the growth of CUs are based on U.S. (Goddard, McKillop, and Wilson, 2002, Goddard, Molyneux and Wilson, 2004, Goddard and Wilson, 2005) or international CU data (Goddard et al. 2004, Ward and McKillop, 2005); however, there are substantial differences in the regulatory environments. For example, most U.S. CUs are federally regulated, while in Canada, almost all of them are provincially regulated. There is also a difference in deposit insurance schemes as a deposit in a Canadian CU is guaranteed by the province but, the total deposit that is guaranteed varies significantly across the provinces[4]; for U.S. CUs deposit insurance is provided by NCUA and the limit is set at $250,000. The competition CUs face from Commercial banks is also different in different countries. In the US, CUs face competition from Multinational Banks, Large National banks, and small community banks, but in Canada, the banking industry is oligopolistic[5] as six very large banks control 95% of all banking assets. Additionally, concentration and competition within the CU industry is very different. At the end of 2019, there were over 5000 CUs in the US while, outside the province of Quebec, there were only 251 CUs in Canada and the largest 100 controlled almost all the assets. Given these differences in the regulatory and competitive environments, the challenges faced by CUs in Canada differ from those in the US or elsewhere. So, the empirical findings based on U.S. or international data most likely will not apply to Canadian CUs.

Empirical literature (e.g., Alhadeff and Alhadeff, 1964, Yeates, Irons and Rhoades, 1975, Tschoegl, 1983, Saunders and Walter,1994, Goddard, McKillop and Wilson, 2002, Goddard, Molyneux and Wilson, 2004, Goddard and Wilson, 2005) that examines the growth of deposit-taking institutions develops its empirical models based on the Law of Proportionate Effect (LPE) hypothesis first introduced by Gibrat (1931). Tschoegl (1983) proposes three testable propositions for the LPE, two of which can be tested given the short sample period and our data frequency (annual). These two propositions are related to the impact of size on growth and the persistence of growth. Previous literature (Goddard and Wilson, 2005) has explored the non-linearity of the size-growth relationship. We find evidence of diseconomies of scale in growth. There is robust evidence of non-linearity in this relationship; we find larger CUs grew slower than smaller CUs over the past decade. We also find that growth is persistent, but elasticity is less than one.

Our primary focus in testing economies of scope is non-interest income. We find that diversification to non-interest income positively affects growth. Following Saunders and Walter (1994), we also test for two additional ratios: ratio of total deposit to total loans and ratio of total loan to total asset. Our results show that these two ratios do not affect growth. Organic growth in CUs can also arise from efficiency or from taking additional risk. We find that efficiency (measured using cost to income ratio) enhances growth while holding higher capital has an adverse effect on growth. Credit risk proxies such as loan loss provision, allowance for loan loss, or nonperforming assets have no impact on growth.

In 2008 there were 516 CUs (Credit Unions and Caisses Populaires) outside of Quebec, by 2019, that number decreased to 251 CUs. In 2008 the largest 100 CUs in Canada controlled 81.4% of total CU assets and by the end of 2019 they had control over 93% of CU assets[4]. Thus, mergers are a significant force in reshaping the Canadian CU industry. Some argue regulators encourage smaller, inefficient CUs with limited growth potentials, to merge with larger CUs. It is a way for smaller CUs to exit the industry when their existence becomes challenging[5]. We examine whether mergers are it also a part of the growth strategy of larger CUs? During our study period, we found 75 merger events[6] involving CUs in our dataset. We find that past mergers (within the past three years) do not impact asset growth in the subsequent year. We create a peer group of CUs which do not take part in merger using Propensity Score Matching (PSM) to match acquiring CUs. Based on this matched sample we find acquiring CUs out-perform non-acquiring peers when growth is calculated over two calendar years. However, an acquirer's growth is not statistically any different from its non-acquiring peers when growth is calculated over one calendar year after the merger.

The rest of the paper is organized in the following sections. In the next section, we review the literature and propose testable hypotheses, section three describes data, variable construction, and introduces the empirical method. The fourth section discusses empirical results. The last section concludes by discussing the policy implication of our results.

2.0 LITERATURE/HYPOTHESIS

In this literature review, we concentrate on past research on the role of economies of scale, economies of scope, and mergers on growth.

2.1 Economies of Scale

Size is essential for CUs to realize increasing returns to scale and scope, in addition to improve performance. Tschoegl (1983) proposes three testable propositions based on Gibrat's Law (LPE): " (P1) that the growth rate of each bank over some period is independent of its size; (P2) that the variability of growth rates is independent of the banks' size; and (P3) that the banks' growth rates in two consecutive periods are independent of each other"(p. 187). With annual data and short sample period we only test first and third proposition of Tschoegl(1983). Therefore, we propose that:

H1: The growth rate of each CU is independent of its size.

H2: Growth rates of CUs in two consecutive periods are independent of each other.

Two studies have investigated scale efficiency based on Canadian CU (CUs from British Columbia) data between 1976-77. First, Murray and White (1983) find evidence of overall economies of scale. Following, Kim (1986) distinguishes between overall and product-specific economies of scale. He reports CUs exhibit mild overall economies of scale and mild product-specific economies of scale in mortgage and investment, but diseconomies of scale in non-mortgage loans.

Several test the LPE for CUs using U.S. CU data. Using a sample of state-chartered CU in New York between 1914-1990, Barron et al. (1994) find that old and small CUs are likely to fail while young and small CUs have the highest growth. More recent studies find mixed results for the size growth relationship. Goddard et al. (2002), using data from U.S. CUs between 1990-1999, test the three LPE hypotheses and reject all of them. They find that larger CUs grew faster than smaller CUs, there was negative persistence of growth, and the growth of larger CUs was more stable than smaller CUs. In multivariate analysis, they report that larger CUs grew faster because of efficiency, lower capital, or a lower bad debt ratio. Additionally, this study finds that federally chartered CUs exhibited an inverse relationship between size and growth. They argue the difference in size and growth relationship between state and federally chartered CUs comes from how restrictive regulators are. State regulators allow CUs to explore growth opportunities that federally regulated CUs cannot explore. Goddard and Wilson (2005) have examined the relationship between size, age, and growth of U.S. CUs between 1992-2001. They report that larger CUs grew faster than smaller ones, growth was persistent, and younger CUs outgrew older ones.

Studies using international CU data have also reported mixed results. Using annual data between 1992 and 1998 for European banks and CUs, Goddard et al. (2004) examine the interaction between profit and growth. They report a positive relationship between growth and relative size. For a sub-sample of cooperative banks, they do not find any relationship between relative size and subsequent growth. They find that growth is persistent, and profit is a significant determinant of subsequent growth. In addition, they report that expansion in off-balance-sheet activity and share of total banking sector assets are significant determinants of growth. Meanwhile, Ward and McKillop (2005), based on a sample of UK CUs between 1994-2000, find that smaller CUs grow faster than larger CUs up to a certain size, but then the pattern reverses. Also, they report that the growth of smaller CUs is more volatile than that of larger CUs and the growth is persistent. Finally, Moore (2005), based on a sample of Barbados CUs, finds that size is not a significant factor in growth, age is inversely related to growth, and efficiency positively impacts growth.

There are many studies which test the LPE using banking data. Earlier studies such as Alhadeff and Alhadeff (1964), Yeates and Rhoades (1974), and Saunders and Walter (1994) reject the LPE using bank data. Alhadeff and Alhadeff (1964) test the hypothesis based on the 200 largest banks between 1930-1960 and find that the groups of leading banks (top decile) grew less than the banking system. They also find that the growth of the smaller banks is higher than that of the larger bank group. They argue that this growth may be due to mergers and acquisitions. Yeats and Rhoades (1974) test the relationship between size and growth on a random sample of 600 U.S. commercial banks between 1960-1971. They also find that larger banks grew slower than smaller banks. Tschoegl (1983) tests three hypotheses based on the LPE using data of the largest 100 banks with at least one office outside their home country between 1969-1977. Tschoegl finds support for the first hypothesis as his parameter estimate on size is close to one. However, he could not find any evidence of persistent growth. Saunders and Walter (1994) argue whether the economies of scale and scope that exist for the banking sector are central to the regulatory and strategic discussion about optimal firm size in the banking industry. They test the size growth relationship on the largest 143 banks (these are banks that are among the top 200 banks by size worldwide) between 1981-1986. They find that the elasticity of growth with respect to size is less than one. They argue that diseconomies of scale are a plausible cause behind their findings. Wilson and Williams (2000) find no relationship between size and growth using a sample of European banks between 1990-1996. However, in their sample of Italian banks, they find that smaller banks grew faster. For larger banks, they find that the variability of growth is smaller.

2.2 Economies of Scope

CU management solves the optimization problem when choosing a new service for its members. The likelihood of a CU introducing a new service increases when the marginal revenue generated from a fee-based service exceeds the marginal cost of introducing such a service. There is not much work in CU literature on the effect of economies of scope on growth. In the banking literature, the major discussion surrounding economies of scope is related to non-interest income activity (such as fee-based income etc.). Theoretical literature predicts that the information produced from intermediation activity is a valuable input for non-interest income with little additional cost, which suggests that synergies related to economies of scope can arise from banks engaging in non-interest activities (Diamond, 1984; Diamond, 1991; Petersen and Rajan, 1994; Saunders and Walter, 1994; Puri, 1999; Stein, 2002). A lack of specialization or focus can hinder innovation and the effectiveness of executive incentives (Damanpour, 1991; Holmstrom and Milgrom, 1991; Bárcena-Ruiz, Espinosa, 1999; MacDonald and Marx, 2001). Thus, we hypothesize:

H3: Non-interest income unrelated to growth of CUs.

Several studies use CU data to examine economies of scope. Using British Columbia CU data, Murray and White (1983) and Kim (1986) report overall economies of scope. Goddard et al. (2008), using a sample of U.S. CUs, find the performance of larger CUs benefited from diversification into non-interest income on both a risk-adjusted and unadjusted basis. Empirical banking studies use large bank data to test the impact of non-interest income. In a sample of U.S. and international banks, Laeven and Levine (2007) find evidence that diversification into non-interest activities leads to a share price discount. Schmid and Walter (2009) see a similar result. However, Lelyveld and Knot (2009) find evidence of a diversification premium for bank-insurance financial conglomerates.

DeYoung (1994) reports that banks that produces relatively larger amount of fee-based services (e.g. fiduciary and trust services, consulting services, data processing services, cash management services, fee from sale of insurance policies and mutual funds, the provision of letters of credit and mortgage services) have been more cost efficient than their peers. Rogers and Sinkey (1999) on the other hand report that non-traditional[7] non-interest income is associated with larger size, smaller core deposits, smaller net interest margins, and a reduction in various accounting risk measures. Past literature has found that a larger proportion of fee income is associated with an increase in revenue volatility (DeYoung and Roland, 2001; DeYoung and Rice, 2004a, b; Stiroh, 2004a, b). While these authors find a worsening of the risk-return trade-off, bank franchise value tends to increase with an increase in non-interest income (Baele, De Jonghe, and Vennet, 2007). Past literature also predict that trading income or combining insurance income with traditional banking will decrease risk and increase risk-return trade-off and Bank Holding Company value (Boyd and Graham, 1988; Allen and Jagtiani, 2000; Lown, Osler, Strahan, and Sufi, 2000; Estrella, 2001)[8]. Fields, Fraser, and Kolari (2007) find that bidders' gained wealth in a bank-insurance merger. They find evidence of economies of scale and potential of economies of scope. Apergis (2014), using a sample of U.S. financial institutions, finds that non-traditional bank activities result in a positive effect on both profitability and insolvency risk.

Recent non-U.S. studies seem to have a different results from studies based on U.S. data. Kohler (2015) uses a large sample of European banks and finds that "banks will be significantly more stable and profitable if they increase their share of non-interest income, indicating that substantial benefits are to be gained from income diversification." (p. 195) Kohler argues that these benefits are large for savings and cooperative banks. Similarly, using a sample of banks in emerging economies, Meslier, Tacneng, and Tarazi (2014) find a shift towards non-interest activities increases profits and risk-adjusted profits. However, using Chinese banking data between 1986 and 2008, Li and Zhang (2013) find that non-interest income has higher volatility and cyclicality compared to net interest income, and there is diminishing marginal benefit for non-interest income. Lastly, De Jonghe et al. (2015) examine the effect of non-interest income on systematic risk exposure and find that non-interest income reduces large banks' exposure, although it increases systematic risk exposure for smaller banks. The benefit of diversification disappears in countries with higher asymmetric information, corruption, and concentration of banking markets.

2.3 Merger and growth

To examine the effect of mergers on the growth of CUs, Goddard et al. (2009) examine the acquisitions of U.S. CUs between 2001 to 2006. They report that the probability of disappearance decreases in size and profitability but increases in liquidity. Growth constrained CUs are less attractive targets while CUs with low capitalization and smaller loan portfolios are attractive targets. They also report that the absence of internet banking makes CUs more vulnerable to acquisition. Dopico and Wilcox (2010, 2011) argue reducing non-interest expenses is the primary aim of mergers. In their sample, they detect the largest improvement in cost efficiency amongst mergers of equals; when the CUs are different sizes, the effects were much more significant for the targets.

A large part of CU merger literature concentrates on the benefit of the merger to membership. Fried et al. (1999) investigate the impact of the merger on the acquiring and target CUs using a sample of U.S. CU mergers between 1988 and 1995. They find that the members of acquiring CUs do not experience deterioration, while the members of target CUs experience improvements in services. They argue that the members of target CUs are likely to benefit if the CU has room to improve in loan portfolios and if they have previous experience with mergers. Bauer et al. (2009) examine the improvement in rates offered to members to examine the potential benefit of a merger to both the target and acquiring CU. They find gains for the members of the target CUs but not for the members of acquiring CUs. However, they report that financial stability of the merged CUs improved (as measured by CAMEL ratio); which they argue is the regulatory motivation behind a merger.

Several studies use the DEA (Data Envelopment Analysis)[9] approach to measure changes in efficiency resulting from mergers. Garden and Ralston (1999) argue that CUs may have attempted to increase efficiency through mergers. They employ the DEA approach to examine Australian CU merger effects on both allocative and x-efficiency. Their research added non-merging CUs as a control group and compared merged CUs' efficiencies with the control group. There were no effects on either type of efficiency relative to non-merging CUs on average. Ralston et al. (2000), using a sample of Australian CU mergers, do not find any superior efficiency gains compared to those generated through internal growth. Worthington (2001) also focuses on efficiency changes following mergers for Australian CUs. He reports that mergers improved efficiency (pure technical efficiency and scale efficiency) for the CU industry. Based on New Zealand CU merger data, Mcalevey et al. (2010) find that CUs have become efficient over time, particularly ones involved in a merger.

Yeats and Rhoades (1974) found large banks make the majority of bank acquisitions. Using a size-based quintile, they found that banks in the two largest groups accounted for all the merges and the largest size group accounted for 85% of the merges. They argue mergers are more important for larger banks than smaller banks. They find that the gross growth rate of the largest banks is larger than for smaller banks, but once they calculate net growth (net of merger-related growth), the smaller banks out-grew larger banks. McKillop and Wilson (2011) summarize the impact of bank mergers as "Overall, the empirical evidence on bank mergers suggests there is often little improvement in the efficiency or performance of the merged entity. This suggests that the hubris and agency motives for merger may be relevant; or that synergy derives more from enhanced market power than from cost savings". (page 98)

3.0 DATA, VARIABLES, AND METHODOLOGY

3.1 Data & Variables

Our data set includes the largest 100 CUs in Canada, which held for 93% of CU assets outside Quebec in 2019[10]. The history of CUs in Canada goes back to the turn of the last century. The vast majority of Canadian CUs started their operation during the 1930s. Modern-day Canadian CUs have 5.8 million members (CCUA) in addition to the 4.7 million members served by the Desjardins Group, which operates in Quebec and Ontario. Given this combined membership, Canadian CUs serve about a third of the Canadian population's banking needs, which is the highest per capita basis in the world. Since there is no established database for Canadian CUs, we collected data from a private source (https://canadiancreditunion.ca/) and from regulators' websites.

Table 1 presents all the variables used in this study and how we create them. SIZE is log of total asset. Asset Growth is the difference in nominal asset value year over year, normalized by the asset value of the past year. In constructing $SIZE^2$, we first deduct the mean total asset from a CU asset, then take a square of the demeaned term. The reason for constructing $SIZE^2$ was to avoid a very high correlation between SIZE and $SIZE^2$. NTR, LA, and DPL are three proxies that measures economies of scope. A traditional CU would have lower non-interest income (NTR), a larger proportion of its assets in loans (LA), and will fund a higher portion of its loans with the deposit (DPL). CIR (cost to income ratio) captures cost efficiency, where more efficient operation would mean a lower CIR. ALL (allowance for loan losses), PLL (provision for loan losses), and NPL (non-performing loans) are three proxies of credit risk. Canadian CUs report five categories of loans: business loan, consumer loan, agricultural loan, commercial loan, and consumer mortgage. RES_mortgage, COM_mortgage, Consumer, and Business are proportions of residential mortgage, commercial mortgage, consumer loan, and business loan to total loan. Merger is a dummy variable that takes the value of one if the CU was engaged in a merger in the past three years.

Table 1: Data Definitition

Name	Description
Asset Growth	Growth of asset year over year
SIZE	Log of total asset
$SIZE^2$	Square of demeaned log of asset
CIR	Operating expense over operating income
NTR	Non-interest income to total income
LA	Loan to asset ratio
DPL	Deposit to loan ratio
CAP	The ratio of total capital to total asset
PLL	The ratio of loan loss provision to gross loan
ALL	The ratio of allowance for losses to gross loan
NPL	The ratio of gross impaired loan to gross loan
Merger	Dummy variable, which is 1 if the CU was involved in a merger in the past three years
RES_mortgage	Percent of Residential Mortgage Loans
COM_mortgage	Percent of Commercial Mortgage Loans
Consumer	Percent of Consumer Loans
Business	Percent of Leases & Business Loans

We have 1,427 firm-year observations between 2007-2019 for which we have most of the required information available. In this data set, the largest number of firm-year observations is from Ontario (28%) followed by British Columbia (26%). Among the prairie provinces, Manitoba has the largest firm-year observations (16%), Saskatchewan has the second-largest observations (14%), and Alberta has the lowest number of observations (10%). The Atlantic provinces represent between 1-2% of the observations. All the accounting-based variables are winsorized at 1% to address the extreme outlier problem. Table 2 presents the summary statistics of the data. From this table, we see CUs grew an average of 6.9% during this period, however, some CUs during this period faced negative growth. Although our data covers the top 100 CUs, there is a huge variation in size. On average, our sample CUs generated 22.7% of their operating income from non-interest income, with some CUs as high as almost 70%. Over 82% of the CU assets in our sample are composed of loans and almost all of them use some non-deposit sources to fund loans. We observe variation in cost efficiency (measured by CIR). During this period CUs maintained above a 7% capital asset ratio on average, but there are CUs that held less than the minimum capital ratio. Residential mortgages are the single largest loan category followed by commercial mortgages.

Table 2: Descriptive Statistics

Variables	N	mean	p50	St. dev	min	max
Asset Growth	1427	0.069	0.060	0.070	-0.103	0.664
SIZE	1427	6.278	6.009	1.176	4.526	10.050
$SIZE^2$	1427	1.401	0.620	2.338	0.000	15.268
NTR	1427	0.227	0.216	0.079	0.038	0.693
LA	1427	0.821	0.838	0.070	0.518	0.925
DPL	1426	1.098	1.081	0.135	0.691	1.683
CIR	1427	0.782	0.793	0.107	0.412	1.098
CAP	1328	0.072	0.068	0.018	0.037	0.162
PLL	1427	0.001	0.001	0.002	-0.003	0.015
NPL	1406	0.006	0.003	0.008	0.000	0.073
ALL	1425	0.003	0.003	0.003	0.000	0.024
RES_mortgage	1425	0.551	0.587	0.221	0.000	1.000
COM_mortgage	1425	0.197	0.209	0.118	0.000	0.553
Consumer	1424	0.101	0.089	0.088	0.000	1.000
Business	1422	0.025	0.000	0.053	0.000	0.414
Merger	1426	0.117	0.000	0.322	0.000	1.000

Table 3: Correlation

	Asset Growth	SIZE	SIZE²	NTR	LA	DPL	CIR	CAP	PLL	NPL	ALL	RES_ mortgage	COM_mort-gage	Consumer	Business
SIZE	0.16														
SIZE²	0.06	0.71													
NTR	0.06	0.15	0.08												
LA	0.11	0.32	0.11	0.02											
DPL	-0.16	-0.41	-0.21	0.03	-0.88										
CIR	-0.07	-0.19	-0.15	0.21	0.05	-0.01									
CAP	-0.12	-0.09	-0.03	-0.16	-0.32	0.18	-0.41								
PLL	0.03	-0.01	0.04	0.08	-0.01	-0.01	0.01	0.00							
NPL	0.05	0.06	-0.05	0.06	0.08	-0.10	-0.02	-0.01	0.23						
ALL	0.04	0.01	0.04	0.07	-0.07	0.04	-0.06	0.08	0.49	0.45					
RES_mortgage	-0.01	-0.02	0.02	0.00	0.16	-0.16	0.11	-0.08	-0.05	0.05	0.10				
COM_mortgage	0.16	0.36	0.19	-0.06	0.11	-0.14	-0.15	-0.02	0.04	0.11	0.16	0.03			
Consumer	-0.04	-0.07	-0.02	0.13	-0.12	0.09	-0.01	0.12	0.11	0.12	0.24	0.01	-0.15		
Business	-0.06	0.00	0.05	-0.03	-0.16	0.11	-0.09	0.15	0.04	0.11	0.10	-0.13	-0.10	0.16	
Merger	0.26	0.19	0.07	0.02	0.14	-0.18	0.06	0.00	0.02	0.11	0.04	0.02	0.14	0.00	-0.09

From Table 3, presents pair-wise correlations among the variable used in this study. We find that there are three sets of correlations greater than 30%. First correlations between the three proxies of credit risk are highly correlated as expected. Second, two proxies of the economies of scope (DPL and the LA ratio) are also highly correlated. Third, the correlation between SIZE and SIZE2 is quite high (although we normalize SIZE by the mean SIZE when constructing SIZE2).

3.2 Dynamic Panel Data Model

The maximum number of years a CU is represented in our data set is twelve years, while the average time a CU is represented in our dataset is over six years. There are two econometric problems we need to address from our resulting panel data: first, our depended variable (growth) can be persistent, and second, endogeneity arising from the omitted variable in model specification and reverse causality. A dynamic panel data model can address these methodological problems (Arellano and Bond, 1991, Arellano and Bover, 1995, and Blundell and Bond, 1998).

$$y_{i,t} = \alpha + Ay_{i,t-1} + X_{i,t}B + u_i + \varepsilon_{i,t} \quad (1)$$

Here i and t are indexes for CUs and time, respectively. yi,t is a vector of CU growth, Xi,t is a matrix that includes SIZE, SIZE², NTR, CIR, PLL (or other measures of credit risk), loan portfolio composition, *Merger*, and control variables. Other than *Merger*, all other variables in the model are contemporaneous observations. Managerial decisions may influence all the variables that are included in Xi,t. As a result, a part of Xi,t may be endogenously determined, which can be addressed using a dynamic panel data model.

4.0 EMPIRICAL RESULTS AND POLICY IMPLICATION

4.1 Economies of Scale and Scope

Table 4 presents the result of our analysis of the two testable hypotheses (H1, H2) that follow from Tschoegl's (1983) LPE theory. We find that the coefficient of the lag of growth is positive and statistically significant. This implies that the growth is persistent over time for the CUs, which is counter to our second hypothesis (H2). Tschoegl (1983) argues that consistently positive correlated growth implies advantages gained in one period carry over in the next period. For CUs these advantages may come from innovation, especially technological innovation, or from monopolistic access to markets. In addition, Tschoegl (1983) suggests that the source of persistent growth could be the quality of management. In our estimate the parameter estimate varies between 5% to 10% which implies that the persistence in growth is quite low.

We separately test SIZE in column 1 and both SIZE and SIZE^2 in column 2 to ensure a high correlation between SIZE and SIZE^2 is not producing wrong inferences. We find that SIZE is positive and significant[11]. Thus, we cannot accept the hypothesis that the growth rate of each CU over some period is independent of its size, counter to our first hypothesis (H1). We find that there is non-linearity in the relationship, and the quadratic SIZE term is negative and significant, which implies larger CUs experience slower growth. These findings are in line with Alhadeff and Alhadeff (1964), Yeats, and Rhoades (1974). Careful examination of the parameter estimates of SIZE and SIZE^2 reveal all CUs in this study are experiencing diseconomies of scale. All the models control for both time effect (using year dummy) and provincial effect.

We expand on our model to include proxies for economies of scope, namely NTR, LA, and DPL. In models 3-5 we introduce one proxy of the economies of scope at a time to ensure correlation between these proxies does not produce wrong inferences. These models do not include SIZE^2. Among these economics of scope variables, our primary interest is in the NTR (non-interest or fee income). We find that higher non-interest income has a positive impact on growth. NTR should be lower for a traditional CU as it would generate more of its income from interest income. So, our results imply that CUs that have generated larger portion of its income from non-interest activity has achived higher growth during the sample period. On the other hand, we find neither DPL nor the LA ratio affect growth. These results imply that whether CUs fund more of their loan from deposit or from borrowed funds do not affect its growth and the degree to which CUs asset portfolio is composed of loans also do not impact its growth. Models 6-8 include SIZE^2 and our results stay robust.

In models 9-11, we test how loan portfolio composition affects growth. We introduce four variables, all expressed as the percentage of a loan category relative to total loans: *RES_mortgage*, *COM_mortgage*, *Consumer*, and *Business*. We find that a CU's loan portfolio composition does not affect its growth. In Table 4, the AR (1) test shows the existence of first-order autocorrelation, and the AR (2) test shows that there is no second-degree autocorrelation. The Hansen test of over-identification shows that under the null hypothesis all instruments are valid.

Table 4: Economies of scale, scope, and growth

Here Asset Growtht-1 is the lag of the dependent variable. SIZE is log of total asset and SIZE2 is the square of total asset minus the mean of total asset over the sample period. NTR is non-interest income to total income, LA is loan to asset ratio and DPL is deposit to loan ratio. RES_mortgage, COM_mortgage, Consumer, and Business are proportions of residential mortgage, commercial mortgage, consumer loan and business loan to total loan. Robust standard errors are in the parentheses below the estimate.

Variables	(1) Asset Growth	(2) Asset Growth	(3) Asset Growth	(4) Asset Growth	(5) Asset Growth	(6) Asset Growth	(7) Asset Growth	(8) Asset Growth	(9) Asset Growth	(10) Asset Growth	(11) Asset Growth
Asset Growth $_{t-1}$	0.05225*	0.09915**	0.07157*	0.07077**	0.07012*	0.09866***	0.10212**	0.09520**	0.10819***	0.10894***	0.10759***
	(0.030)	(0.042)	(0.041)	(0.041)	(0.040)	(0.041)	(0.042)	(0.041)	(0.040)	(0.040)	(0.039)
SIZE	0.04026***	0.02982***	0.03651***	0.04060***	0.03834***	0.02831***	0.02808***	0.02678***	0.01562***	0.01601***	0.01454***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)
SIZE^2		-0.00975***				-0.01000***	-0.00978***	-0.00963***	-0.00350***	-0.00357***	-0.00325***
		(0.003)				(0.002)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)
NTR			0.14393**			0.11370**			0.04868*		
			(0.061)			(0.055)			(0.027)		
LA				-0.08937			0.03922			0.00852	
				(0.071)			(0.064)			(0.033)	
DPL					-0.00214			-0.04955			-0.02555
					(0.044)			(0.037)			(0.021)
RES_mortgage									-0.00057	0.00041	-0.00368
									(0.008)	(0.008)	(0.007)
COM_mortgage									0.02082	0.01980	0.02303
									(0.018)	(0.017)	(0.018)
Consumer									-0.00949	-0.01486	-0.01249
									(0.017)	(0.018)	(0.018)
Business									-0.01777	-0.01270	-0.02102
									(0.022)	(0.024)	(0.025)
Constant	-0.17561***	-0.09492***	-0.18996***	-0.10228*	-0.15935**	-0.11643***	-0.11638**	-0.01984	-0.02751*	-0.02325	0.02269
	(0.033)	(0.024)	(0.034)	(0.058)	(0.069)	(0.027)	(0.054)	(0.055)	(0.016)	(0.027)	(0.036)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,471	1,720	1,720	1,720	1,719	1,720	1,720	1,719	1,714	1,714	1,714
Number of UIN	193	207	207	207	207	207	207	207	207	207	207
AR(1) test p-val	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test p-val	0.709	0.290	0.473	0.509	0.463	0.307	0.266	0.303	0.228	0.222	0.225
Hansen test for over-identification	170.8	188.1	183.8	185.3	188.2	184.6	192.7	187.4	168.5	172.3	168
Hansen test p-val	1	1	1	1	1	1	1	1	1	1	1

*** p<0.01, ** p<0.05, * p<0.1

4.2 Role of Efficiency, Capital, and Credit Risk

Table 5: Role of Capital, Credit Risk and Efficiency on Growth

Here Asset Growtht-1 is the lag of the dependent variable. SIZE is log of total asset and SIZE2 is the square of total asset minus the mean of total asset over the sample period. NTR is non-interest income to total income, CIR is cost to income ratio, CAP is capital to asset ratio, Total Capital Ratio is total risk-based capital ratio, NPL is non-performing loan, PLL is provision for loan losses, and ALL is the allowance for loan losses. Robust standard errors are in the parentheses below the estimate.

Variables	(1) Asset Growth	(2) Asset Growth	(3) Asset Growth	(4) Asset Growth	(5) Asset Growth	(6) Asset Growth	(7) Asset Growth	(8) Asset Growth	(9) Asset Growth	(10) Asset Growth	(11) Asset Growth	(12) Asset Growth
Asset Growth $_{t-1}$	0.102***	0.104***	0.104***	0.099***	0.103***	0.102***	0.091***	0.092***	0.093***	0.119***	0.118***	0.120***
	(0.037)	(0.036)	(0.037)	(0.033)	(0.033)	(0.032)	(0.035)	(0.034)	(0.035)	(0.041)	(0.040)	(0.041)
SIZE	0.019***	0.019***	0.019***	0.021***	0.022***	0.022***	0.015***	0.016***	0.015***	0.018***	0.019***	0.019***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
$SIZE^2$	-0.005**	-0.005**	-0.006**	-0.007***	-0.008***	-0.008***	-0.005**	-0.006**	-0.006**	-0.006**	-0.006**	-0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
NTR	0.108**	0.113**	0.114**	0.102**	0.099**	0.103**	0.125**	0.127***	0.121***	0.125**	0.120***	0.125**
	(0.048)	(0.045)	(0.047)	(0.043)	(0.039)	(0.042)	(0.049)	(0.045)	(0.047)	(0.052)	(0.046)	(0.049)
CIR				-0.128***	-0.131***	-0.119***	-0.178***	-0.178***	-0.168***	-0.103***	-0.105***	-0.098***
				(0.034)	(0.034)	(0.034)	(0.037)	(0.037)	(0.037)	(0.033)	(0.032)	(0.033)
CAP	-0.639**	-0.590**	-0.644***				-1.037***	-0.992***	-1.005***			
	(0.251)	(0.248)	(0.246)				(0.267)	(0.261)	(0.255)			
Total Capital Ratio										-0.040	-0.040	-0.030
										(0.038)	(0.037)	(0.034)
NPL	0.241			0.267			0.177			0.251		
	(0.357)			(0.344)			(0.365)			(0.352)		
PLL		1.206			1.182			0.228			0.481	
		(2.292)			(2.212)			(2.206)			(2.227)	
ALL			1.569			1.032			0.995			0.641
			(1.285)			(1.119)			(1.265)			(1.298)
Constant	-0.046	-0.051	-0.055	0.023	0.018	0.007	0.413***	0.137**	0.128**	-0.003	-0.009	-0.017
	()	()	()	()	()	()	()	()	()	()	()	()
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,179	1,187	1,185	1,251	1,265	1,263	1,179	1,187	1,185	1,077	1,084	1,082
Number of UIN	176	176	176	180	180	180	176	176	176	162	162	162
AR(1) test p-val	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test p-val	0.273	0.279	0.288	0.420	0.430	0.425	0.472	0.469	0.464	0.271	0.289	0.271
Hansen test for over-identification	160.1	159.1	159	158.8	161.2	165.4	156.6	155.7	154.7	148.9	152.2	152.4
Hansen test p-val	1	1	1	1	1	1	1	1	1	1	1	1

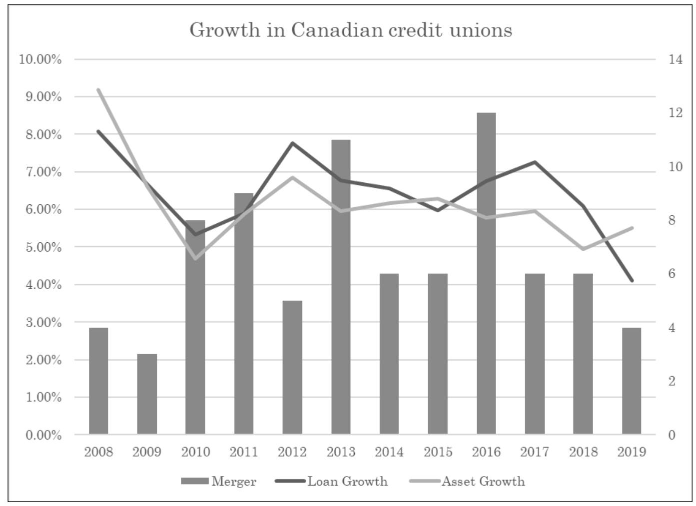
*** p<0.01, ** p<0.05, * p<0.1

In Table 5 we add CIR, capital ratio (CAP and Total Capital ratio), and credit risk proxies (NPL, PLL, and ALL) to our basic model presented in Table 4. Since CAP and CIR have high correlation (Table 3), we include only CAP in models 1-3 and find that CAP has a negative impact on growth. A likely explanation for the reported result is that CUs with a lack of opportunity to expand lending end up with a higher capital ratio. Naturally, these CUs would grow slowly compared to other CUs. This lack of opportunity can result from being located by smaller population centres for smaller CUs, or an outcome of restriction on cross-border expansion for larger CUs. Goddard et al. (2002) also report similar results. They argue that a higher capital ratio shows CUs operating overly-cautiously and choosing to build up reserves rather than exploiting potentially productive investment opportunities. Goddard et al. (2004) report that banks that maintain higher capital ratios record lower profitability. In models 4-6 we include CIR but drop CAP and find that cost-efficient CUs generate higher growth. This finding is similar to Goddard et al. (2002), who also report that cost efficiency is an important determinant of U.S. CU growth. In models 7-9 we include both CIR and CAP, it does not change our previously reported result on how they affect growth.

We further examine the impact of credit risk using three proxies: PLL, ALL, and NPL. We find that credit risk does not affect growth. In addition to risk we also examine how risk based capital ratio effects growth. Provincial regulators across Canada have not fully implemented the risk-based capital ratio. For example, Atlantic CUs are still not subject to maintaining any set risk-based capital ratio. As a result, when we replace CAP in models 10-12 with Total Capital Ratio (risk-based), we drop all the firm-year observations of Atlantic CUs (the reduction of observations and number of UIN for these three models reflects this). Unlike CAP, Total Capital Ratio is not significant. Similar to Table 4, we detect the existence of the first-order autocorrelation, but not the second-degree autocorrelation.[12]

4.3 Merger: 'The Elephant in the Room'

Figure 1: Merger and Growth



Given our finding that there are gains to scale in our sample, ongoing consolidation seems highly likely in Canada's CU industry[13]. This is evident in the data; between 2008 and 2019, the number of CUs outside Quebec reduced by over 50% while the top 100 CUs hold 12% more of the system's total assets in 2019 compared to 2008. When a CU acquires another CU, it will grow mechanically (measured in total asset or loan, as is clear from Figure 1). But the important policy question is whether the larger size generate future growth? In Table 7, we examine the effect of the merger on growth. In model 1, we include a dummy variable, *Merger*, which is equal to 1 if the CU was engaged in a merger in the past year. We initially find this variable has no impact on growth; however, we realize that it may take time to observe the impact of the merger on growth. Therefore, in model 2, we use another dummy variable (*Merger3*) which takes the value of 1 if the CU is involved in a merger in the past three years (instead of the past one year). However, coefficient estimate of *Merger3* is also not significant. In models 3 to 5, we include additional controls introduced in the previous section. Our conclusions on CAP, CIR, SIZE, $SIZE^2$, and lag growth stay the same.

Table 6: Merger and Growth

Here Asset Growth$_{t-1}$ is the lag of the dependent variable. SIZE is log of total asset and SIZE^2 is the square of total asset minus the mean of total asset over the sample period. NTR is non-interest income to total income, CIR is cost to income ratio, CAP is capital to asset ratio, Total Capital Ratio is total risk-based capital ratio, NPL is non-performing loan, PLL is provision for loan losses, and ALL is the allowance for loan losses. Merger is a dummy variable that is equal to 1 if the CU acquired any CU in the past year and Merger3 is a dummy variable that is equal to 1 if the CU acquired another CU in the past three years. Robust standard errors are in the parentheses below the estimate.

Variables	(1) Asset Growth	(2) Asset Growth	(3) Asset Growth	(4) Asset Growth	(5) Asset Growth
Asset Growth $_{t-1}$	0.119***	0.105***	0.093***	0.094***	0.095***
	(0.036)	(0.033)	(0.034)	(0.035)	(0.034)
SIZE	0.024***	0.026***	0.014***	0.014***	0.014***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
SIZE^2	-0.008***	-0.008***	-0.005**	-0.005**	-0.005**
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
NTR	0.136**	0.132**	0.109**	0.110**	0.111**
	(0.056)	(0.057)	(0.043)	(0.047)	(0.045)
Merger	-0.017				
	(0.010)				
Merger3		-0.005	0.001	-0.001	-0.000
		(0.010)	(0.009)	(0.009)	(0.009)
CIR			-0.166***	-0.165***	-0.158***
			(0.034)	(0.034)	(0.033)
CAP			-0.918***	-0.950***	-0.938***
			(0.220)	(0.230)	(0.220)
PLL			-0.058		
			(2.036)		
NPL				0.161	
				(0.360)	
ALL					0.848
					(1.230)
Contant	-0.111***	-0.116***	0.137**	0.136**	0.126**
	(0.032)	(0.036)	(0.055)	(0.054)	(0.055)
Year Dummy	Yes	Yes	Yes	Yes	Yes
Province Dummy	Yes	Yes	Yes	Yes	Yes
Observations	1,179	1,187	1,185	1,251	1,265
Number of UIN	176	176	176	180	180
AR(1) test p-val	0.000	0.000	0.000	0.000	0.000
AR(2) test p-val	0.273	0.279	0.288	0.420	0.430
Hansen test for over-identification	160.1	159.1	159	158.8	161.2
Hansen test p-val	1	1	1	1	1
***p<0.01, **p<0.05, *p<0.1					

Table 7: Difference in Growth between Acquirer CU and PSM matched CU

Treated CU is the CUs involved in a merger and Control CU is the matched peers based on the PSM. Growth_1y is growth calculated over one calendar year after the completion of merger and Growth_2y is growth calculated over two calendar years after the completion of merger.

Panel A: Growth_1y						
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Control CU	30	0.078	0.012	0.063	0.055	0.102
Treated CU	30	0.127	0.040	0.218	0.046	0.208
Difference in mean growth		-0.049	0.041		-0.131	0.034
Panel B: Growth_2y						
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Control CU	27	0.156	0.020	0.102	0.115	0.196
Treated CU	27	0.266	0.048	0.250	0.167	0.365
Difference in mean growth		-0.110	0.052		-0.215	-0.006

4.4 Re-Examination of the Effect of M&A on Growth

Our analysis thus far suggests, that mergers do not affect growth. This apparent counter-intuitive result flies in the face of the fact that during this study period, we tracked more than seventy merger events involving CUs (mostly as acquirers) in our data set. As a result of these mergers, more than one hundred and fifty CUs disappeared during this period. One of the shortcoming of the method used above is that it compared the growth of acquiring CU with the all CU in our dataset. Several studies (Barber and Lyon, 1996; Loughran and Ritter, 1997; Ghosh, 2001; Fee and Thomas, 2004; Powell and Stark, 2005; Behr and Heid, 2011) that investigate post merger operating performance difference take a different approach in evaluating performance change following merger. These studies argue that effective method to detect operating performance improvements after a merger is to compare the merged firms against a peer group matched on pre-merger performance using Propensity Score Matching (PSM). Rosenbaum and Rubin (1983) first introduced PSM and many bank merger studies use it for evaluating the effects of mergers (Egger and Hahn, 2010; Behr and Heid, 2011). We adopt this approach, to identify a peer CU for every acquiring CU, such that they are similar in size and pre-merger growth, but the peer CU did not acquire another CU during that period. As such in this study merger is the "treatment". Only the acquirer would experience the impact of this treatment on growth. This method allows us to produce comparative analysis on growth without worrying about skewing group statistics by including credit unions very different from the acquirer. Shipman et al. (2017) argue that PSM reduces concerns over functional form misspecification, which is a major concern in multiple linear regression if the treated and untreated are significantly different.

We divide our sample into two groups: CUs that engage in a merger (Merger Dummy = 1) and CUs that do not engage in a merger (Merger Dummy = 0). Then, we use a PSM model to estimate the likelihood of a random CU getting involved in merger activity. Our PSM model is a Logit model with the merger dummy as the dependent variable and a vector *X*s of independent variables. The model is presented as follows:

$$p(Xs) = prob(Merger = 1|Xs) = E(Merger|Xs) \qquad (2)$$

We find peer CUs based on size and growth (*X*s) of the acquirer in the year before the merger (Year -1)[14]. We use Equation 2 to determine a propensity score for every CU, which is a conditional probability of a CU getting involved in a merger given the *X*s. Then for each CU in the treated group, we find a peer CU with the closest propensity score. These peer CUs are the control group. We use nearest (one-to-one) neighbourhood matching. Researchers (Egger and Hahn, 2010; Lemmon and Roberts, 2010; Shipman et al., 2017) commonly use this strategy because of its simplicity. The outperformance of the CU involved in a merger over the matched peer CU then is merger effect.

In employing PSM we impose two rules. First treated and control CUs can only be matched from the same year this allows us to avoid year controls in our propensity score estimation model (Becker and Ichino, 2002). Second, we allow replacement so that a control CU can be the peer CU for multiple acquiring CUs. Matching with replacement gives more accurate matches compared to matching without replacement (Shipman et al., 2017).

Figure 2: PSM Matching, Merger and Growth Calculation

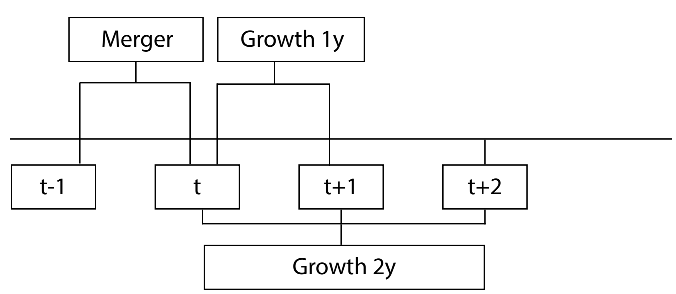


Figure 3 illustrates how we have implemented PSM and calculated growth. We match CUs from the treated and controlled group at time t-1. The merger takes place in year t. We calculate growth over two periods, between t and t+1 we label it Growth_1y, and between t and t+2 we label it Growth_2y.

Table 8: Merger Effect in Matched Sample

Growth_1y is growth calculated over one calendar year after the completion of merger and Growth_2y is growth calculated over two calendar years after the completion of merger. SIZE is log of total asset and $SIZE^2$ is the square of total asset minus the mean of total asset over the sample period. NTR is non-interest income to total income, CIR is cost to income ratio, CAP is capital to asset ratio, and PLL is provision for loan losses. SIZE, $SIZE^2$, NTR, CIR, CAP, and PLL are calculated one year before merger. Merger is a dummy variable that is equal to 1 if the CU acquired another CU. Robust standard errors are in the parentheses below the estimate.

	(1)	(2)	(3)	(4)
Variables	Growth_1y	Growth_2y	Growth_1y	Growth_2y
$SIZE_{t-1}$	0.061*	0.101***	0.018	0.051*
	(0.033)	(0.035)	(0.017)	(0.027)
$SIZE_{t-1}$ x Merger			-0.036	-0.015
			(0.055)	(0.068)
$SIZE_{t-1}^2$	-0.014	-0.027**	-0.008	-0.024*
	(0.009)	(0.012)	(0.007)	(0.013)
$SIZE_{t-1}^2$ x Merger			0.133**	0.130**
			(0.051)	(0.055)
NTR_{t-1}	0.425**	0.562***	0.335***	0.452**
	(0.191)	(0.205)	(0.109)	(0.169)
NTR_{t-1} x Merger			-0.329	-0.399
			(0.345)	(0.445)
CIR_{t-1}	-0.589*	-0.800*	-0.215	-0.820**
	(0.347)	(0.426)	(0.196)	(0.389)
CIR_{t-1} x Merger			-0.712	-0.086
			(0.557)	(0.686)
CAP_{t-1}	-0.001	-0.001	0.000	0.000
	(0.002)	(0.001)	(0.001)	(0.001)
CAP_{t-1} x Merger			-0.003	-0.003
			(0.004)	(0.006)
PLL_{t-1}	-22.158	-29.884	-6.982	-29.637
	(16.501)	(20.753)	(11.453)	(20.140)
PLL_{t-1} x Merger			-2.518	49.600
			(27.292)	(29.711)
Merger	-0.050	-0.057	0.905	0.153
	(0.036)	(0.053)	(1.000)	(1.189)
Contant	0.117	0.084	0.033	0.397
	(0.216)	(0.336)	(0.159)	(0.309)
Province Dummy	Yes	Yes	Yes	Yes
Observations	57	51	57	51
R-squared	0.280	0.411	0.642	0.664
***p<0.01, **p<0.05, *p<0.1				

In Table 7, we present the growth calculated for the treated CU and control CU. In panel A we present descriptive statistics of Growth_1y. The difference in mean growth shows that treated CUs (i.e., those that merged) grew faster than controlled CUs. However, the corresponding two-tailed p-value is 0.245, which is greater than 0.05. Thus the difference between the average growth of control CUs and the average growth of treated CUs is not different from 0 in time t+1. In panel B, we present descriptive statistics of Growth_2y. The difference in average growth shows that treated CUs grew faster than controlled CUs. The one-tailed test shows that the growth of treated CU is larger than the growth of controlled CU (p-value of 0.019). This implies that the treated CU has higher growth than the controlled CU when growth is calculated between year t and year t+2. In summary based on PSM matched sample we find that the CU engage in merger and acquisition grew faster than its peer CU, in a two-year period following the merger (Growth_2y), but we can not find evidence of a difference in growth rates in the first year following a merger (Growth_1y).

For regulators and policymakers, the important question arising from the result presented in this section is whether differential growth between treated and controlled CUs arises from the merger or from other factors (Size, NTR, CIR, CAP, etc.) discussed in previous sections. In Table 8 we present evidence of how mergers effect Growth_1y and Growth_2y. The sample comprises only acquiring CUs and their matching peers. These are OLS regressions with robust standard errors. $SIZE_{t-1}$, $SIZE^2_{t-1}$, NTR_{t-1}, CIR_{t-1}, and CAP_{t-1} are values of SIZE, $SIZE^2$, NTR, CIR, and CAP measured one year before the merger for the acquiring CU and the corresponding values of the treated CU during the same time (year). *Merger* is a dummy variable that takes the value of 1 if the CU was involved in a merger. In model 1, we find that SIZE, NTR, and CIR are significant, however, $SIZE^2$ is not significant. In model 2, we find that SIZE, $SIZE^2$, NTR, and CIR are significant. These parameters are consistent with our previous results (Table 4 - Table 7). In both these models, we find that *Merger* is not significant. In models 3 and 4, we include an interaction dummy (*Merger*) with all the continuous variables. We find that the interaction between *Merger* and $SIZE^2$ is positive and significant, which implies that while mergers do not directly affect future growth, it work through the quadratic term of the SIZE channel. However, we do not find evidence of mergers effecting growth through the economies of scope channel. Given our limited data on mergers, a future study with more data may shed light on this channel.

5.0 CONCLUSION

In this research, we use data from the largest 100 Canadian CUs to identify the determinants of growth. Most recent studies that empirically examine CU growth use the U.S. or European CU data. We argue that given the differences in regulatory framework, deposit insurance scheme, competition within the CU industry, and competition from commercial banks, the results from U.S. or European studies may not apply to Canadian CUs. Exploring the size and growth relationship, we find clear evidence of diseconomies of scale. Our results differ from the findings of studies by Murray and White (1983) and Kim (1986), which report overall economies of scale for British Columbia CUs, implying that the scale efficiency for Canadian CUs has changed over time[15]. In exploring whether the economies of scope are important for CU growth, we mainly focus on non-interest income. We find that non-interest income is important for CU growth. Previous literature (Roger & Sinkey, 2009; Hunter & Timme, 1986) suggests that only larger banks are well equipped to venture into non-traditional (e.g., wealth management service, insurance underwriting, etc.) non-interest activity and there are economies of scale for such services. This finding implies that so long as CUs have the scale to justify a fee-based service on a cost-revenue basis it can help their growth. We also find that persistence in growth is positive, but the coefficient is less than unity. The implication being a CU that grew in the past will continue to grow in the future, but on average, the rate of growth will be slower.

We find that during our study period, more cost-efficient CUs grew faster than their peers; CUs with higher capital ratios grew slower. We argue that a higher capital ratio is evidence of fewer growth opportunities (e.g., less loan demand because of a limited market) or a sign of a more cautious approach to growth. However, when we replace the total capital ratio with risk-based capital ratio, this effect disappears. All the provincial regulators in Canada have not yet adopted risk-based capital ratio and the earliest adopter (Saskatchewan) only introduced such a requirement in 2016. We recommend that a future study should revisit our result. Our results show that credit risk does not have any effect on growth and neither does loan portfolio composition.

During our study period, the number of CUs in Canada has reduced by over 50% mainly because of mergers. Recent studies investigating determinants of growth in CUs do not investigate the impact of a merger on growth. In our dynamic panel regression, we do not find any impact from a merger in the past year or past three years on the current growth of a CUs. Following the recent studies that investigate the impact of a merger on performance, we use the PSM method to create a peer group of non-acquiring CUs that have comparable size and growth one year before the merger. In this matched sample, we find that acquiring CUs do not statistically out-grow peers when we calculate growth over one-calendar year after completion of the merger. However, when we calculate growth over two calendar years, acquiring CUs out-grow their peers. It is possible that we do not detect any out performance in the first year because acquiring CUs needs time to streamline their operations following a merger. Analyzing the determinant growth over one and two calendar years following the merger in the sample of acquiring CUs and their matched peers, we find that a merger only affects the growth through the quadratic term of the size.

To summarize, we report all the CUs in our sample are facing diseconomies of scale. Since we looked at only the 100 largest Canadian CUs, this suggests that they may be fully utilizing gains to scale in the provincial market. This finding could explain why the largest CUs in Canada are moving to a federal charter (e.g., UNI Financial Corp. and Coast Capital) or creating banking subsidiaries (e.g., Vancity, Alterna Bank, and Motusbank) that can operate across Canada. However, a move to federal jurisdiction comes at a cost (regulatory cost, etc.) and with risk (the potential uncertainty); such a move may not be justifiable for many or most CUs presently. For those CUs for whom the marginal benefit of the federal charter does not outweigh the cost, but who still seek to grow, we show that mergers may be an avenue to achieve this result, which explains why we observe massive consolidation in the Canadian CU industry. Our recommendation is that provincial regulators work closely with CUs to explore new opportunities to generate non-interest income. Provincial regulators might also work out a way for CUs, who cannot justify federal continuance to engage in cross-border (provincial border) mergers. Absent these efforts, the system risks losing size diversity and end up with only federal CUs and very large provincial CUs . A consequence of such a trend would create a complicated situation with provincial deposit insurance programs for CUs and with the intra-province lending/liquidity facility.

ENDNOTES

[1] The author has benefited from discussion with Marc-Andre Pigeon (Johnson Shoyama Graduate School of Public Policy, University of Saskatchewan), Jordan van Rijn (CUAN), Luis G Dopico (Filene), Min Muang (Edwards School of Business) and 2021 Seminar participants at Canadian Centre for the Study of Co-operatives.

[2] CUs in Canada operate under provincial jurisdiction and their operation is limited to within the province.

[3] https://www.cumanagement.com/articles/2019/11/canadian-credit-union-expansion

[4] https://ccua.com/about-credit-unions/facts-and-figures/largest-100-credit-unions/

[5] https://usaskstudies.coop/documents/pdfs/2021.02.16_ccsc_efficiency-and-autonomy-recasting-the-credit-union-merger-debate.pdf

[6] There are scenarios where one CU is involved in multiple acquisitions in one calendar year, since our data is annual, we consider them as one merger event. In addition, there are instances where a merger can involve more than two entities. An extreme case is an amalgamation that involved 13 Caisse Populaires in Ontario in 2018.

[7] The common feature of nontraditional activities is that they produce fee income rather than the interest income associated with more traditional banking activities (page 27).

[8] Boyd and Graham (1988) measure value based on a hypothetical combination of different financial service firms. Allen and Jagtiani (2000), Lown, et al. (2000), and Estrella (2001) use simulation to estimate value.

[9] DEA is a non-parametric technique that is used to evaluate the efficiency of decision making units.

[10] https://ccua.com/about-credit-unions/facts-and-figures/

[11] We find the same result when we use the number of members to calculate SIZE.

[12] The Hansen test of over-identification shows that all instruments are valid under the null hypothesis.

[13] This conclusion is similar to Saunders and Walter (1984). They predicted same for the US banking industry.

[14] As the "treatment" in our analysis is a merger event, it involves two entities, the acquiring CU, and the target CU. Behr and Heid (2011) handle this complexity by forming two peer groups, one that represents the acquiring banks and another one that represents the target banks. Then, they compare the performance of the merged bank against the combined performance of the PSM-selected counterfactual target and counterfactual acquirer as if they merged. This approach may work well for bank mergers, but it is not suitable for Canadian CU mergers since we do not have access to data of small CUs, which are most often the target of such mergers.

[15] This conclusion is based on the assumption that results of Murray and White (1983) and Kim (1986) are generalized for all CUs in Canada.

REFERENCES

Alhadeff, David and Charlotte Alhadeff. (1964). Growth of large banks, 1930-1960. *The Review of Economics and Statistics*, 356-363.

Allen, L., Jagtiani, J., 2000. The risk effects of combining banking, securities, and insurance activities. *Journal of Economics and Business* 52, 485-497.

Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58(2), 277-297.

Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51.

Apergis, N. (2014). The long-term role of non-traditional banking in profitability and risk profiles: Evidence from a panel of US banking institutions. *Journal of International Money and Finance*, 45, 61-73.

Baele, L., De Jonghe, O., Vennet, R.V., 2007. Does the stock market value bank diversification? *Journal of Banking and Finance,* 31(7), 1999-2023.

Bárcena-Ruiz, J.C. and Espinosa, M.P., 1999. Should multiproduct firms provide divisional or corporate incentives? *International Journal of Industrial Organization,* 17(5), 751-764.

Barber, B. M., & Lyon, J. D. (1996). Detecting abnormal operating performance: The empirical power and specification of test statistics. *Journal of Financial Economics*, 41(3), 359-399.

Barron, D. N., West, E., & Hannan, M. T. (1994). A time to grow and a time to die: Growth and mortality of credit unions in New York City, 1914-1990. *American Journal of Sociology*, 100(2), 381-421.

Becker, S. O., & Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The Stata Journal*, 2(4), 358-377.

Bauer, K. J., Miles, L. L., & Nishikawa, T. (2009). The effect of mergers on credit union performance. *Journal of Banking & Finance*, 33(12), 2267-2274.

Behr, A., & Heid, F. (2011). The success of bank mergers revisited. An assessment based on a matching strategy. *Journal of Empirical Finance*, 18(1), 117-135.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143.

Boyd, J., Graham, S., 1988. The probability and risk effects of allowing bank holding companies to merge with other financial firms: A simulation study. *Federal Reserve Bank of Minneapolis Quarterly Review,* 12, 3-17.

Boyd, J., Graham, S., 1991. Investigating the bank consolidation trend. *Federal Reserve Bank of Minneapolis Quarterly Review,* 15, 3-15.

Cyree, K. B., Wansley, J. W., & Boehm, T. P. (2000). Determinants of bank growth choice. *Journal of Banking & Finance*, 24(5), 709-734.

Damanpour, F., 1991. Organizational Innovation: A Meta-Analysis Of Effects Of Determinants and Moderators. *Academy of Management Journal,* 34(3), 555-590.

De Jonghe, O., Diepstraten, M., & Schepens, G. (2015). Banks' size, scope and systemic risk: What role for conflicts of interest? *Journal of Banking & Finance*, 61, S3-S13.

DeYoung, R. (1994). *Fee-based services and cost efficiency in commercial banks* (Vol. 94, No. 3). Office of the Comptroller of the Currency.

DeYoung, R.D., Rice, T., 2004a. How do banks make money? The fallacies of fee income. *Federal Reserve Bank of Chicago*, 34-51.

DeYoung, R.D., Rice, T., 2004b. Noninterest income and financial performance at US commercial banks. *Financial Review,* 39(1), 101-127.

DeYoung, R.D., Roland, K., 2001. Product mix and earnings volatility at commercial banks: Evidence from a degree of leverage model. *Journal of Financial Intermediation,* 10(1), 54-84.

Diamond, D.W., 1984. Financial intermediation and delegated monitoring. *Review of Economic Studies,* 51, 393-414.

Diamond, D.W., 1991. Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy,* 99, 689-721.

Dopico, L. G., & Wilcox, J. A. (2010). Impacts of mergers on credit union costs: 1984-2009. *Filene Research Institute*, Madison.

Wilcox, J. A., & Dopico, L. G. (2011). Credit union mergers: efficiencies and benefits. *FRBSF Economic Letter*, 28, 612.

Egger, P., & Hahn, F. R. (2010). Endogenous bank mergers and their impact on banking performance: Some evidence from Austria. *International Journal of Industrial Organization*, 28(2), 155-166.

Estrella, A., 2001. Mixing and matching: Prospective financial sector mergers and market valuation. *Journal of Banking and Finance,* 25(12), 2367-2392.

Fee, C. E., & Thomas, S. (2004). Sources of gains in horizontal mergers: evidence from customer, supplier, and rival firms. *Journal of Financial Economics*, 74(3), 423-460.

Fields, L.P., Fraser, D., Kolari, J., 2007. Is bancassurance a viable model for financial firms? *Journal of Risk and Insurance,* 74(4), 777-794.

Fried, H. O., Lovell, C. K., & Yayasan, S. (1999). The impact of mergers on credit union service provision. *Journal of Banking & Finance*, 23(2-4), 367-386.

Garden, K. A., & Ralston, D. E. (1999). The x-efficiency and allocative efficiency effects of credit union mergers. *Journal of International Financial Markets, Institutions and Money*, 9(3), 285-301.

Ghosh, A. (2001). Does operating performance really improve following corporate acquisitions? *Journal of Corporate Finance*, 7(2), 151-178.

Gibrat, R. (1931). Les inégalits économiques. *Sirey*.

Goddard, J. A., McKillop, D. G., & Wilson, J. O. (2002). The growth of US credit unions. *Journal of Banking & Finance*, 26(12), 2327-2356.

Goddard, J., Molyneux, P., & Wilson, J. O. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit and Banking*, 1069-1090.

Goddard, J., & Wilson, J. O. (2005). US credit unions: an empirical investigation of size, age and growth. *Annals of public and Cooperative economics*, 76(3), 375-406.

Goddard, J., McKillop, D., & Wilson, J. O. (2009). Which credit unions are acquired? *Journal of Financial Services Research*, 36(2-3), 231-252.

Holmstrom, B. and Milgrom, P., 1991. Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design. *Journal of Law, Economics, and Organization,* 7, 24-52.

Hunter, W. C., & Timme, S. G. (1986). Technical Change, organizational form, and the structure of bank production. *Journal of Money, Credit, and Banking,* 18, 152–156

Kim, H. Y. (1986). Economies of scale and economies of scope in multiproduct financial institutions: Further evidence from credit unions. *Journal of Money, Credit and Banking*, 18(2), 220-226.

Köhler, M. (2015). Which banks are more risky? The impact of business models on bank stability. *Journal of Financial Stability*, 16, 195-212.

Laeven, L., Levine, R., 2007. Is there a diversification discount in financial conglomerates? *Journal of Financial Economics,* 85, 331-367.

Lelyveld, I., Knot, K., 2009. Do financial conglomerates create or destroy value? Evidence for the EU. *Journal of Banking and Finance 33*, 2312-2321.

Li, L., & Zhang, Y. (2013). Are there diversification benefits of increasing noninterest income in the Chinese banking industry? *Journal of Empirical Finance*, 24, 151-165.

Loughran, T., & Ritter, J. R. (1997). The operating performance of firms conducting seasoned equity offerings. *The Journal of Finance*, 52(5), 1823-1850.

Lown, C., Osler, C., Strahan, P., Sufi, A., 2000. The changing landscape of the financial services industry: What lies ahead? *Federal Reserve Bank of New York,* 6(4), 39-55.

MacDonald, G. and Marx, L., 2001. Adverse Specialization. *Journal of Political Economy*, 109(4), 864-899.

Meslier, C., Tacneng, R., & Tarazi, A. (2014). Is bank income diversification beneficial? Evidence from an emerging economy. *Journal of International Financial Markets, Institutions and Money*, 31, 97-126.

Lemmon, M., & Roberts, M. R. (2010). The response of corporate financing and investment to changes in the supply of credit. *Journal of Financial and Quantitative Analysis*, 555-587.

McKillop, D., & Wilson, J. O. (2011). Credit unions: A theoretical and empirical overview. *Financial Markets, Institutions & Instruments*, 20(3), 79-123.

McAlevey, L., Sibbald, A., & Tripe, D. (2010). New Zealand credit union mergers. *Annals of public and Cooperative economics*, 81(3), 423-444.

Moore, W. (2005). Is Efficiency Important for the Growth of the Barbadian Credit Union Industry? *Journal of Eastern Caribbean Studies*, 30(3), 28.

Murray, J. D., & White, R. W. (1983). Economies of scale and economies of scope in multiproduct financial institutions: A study of British Columbia credit unions. *The Journal of Finance*, 38(3), 887-902.

Nathan, A., & Neave, E. H. (1989). Competition and contestability in Canada's financial system: Empirical results. *Canadian Journal of Economics*, 576-594.

Pana, Elisabete; Vitzthum, Sascha; Willis, David. (2015). The impact of internet-based services on credit unions: a propensity score matching approach, *Review of Quantitative Finance and Accounting*, Volume 44, Issue 2, (February): 329-352.

Petersen, M., Rajan, R., 1994. The benefits of lending relationships: Evidence from small business data. *Journal of Finance,* 49, 3-37.

Powell, R. G., & Stark, A. W. (2005). Does operating performance increase post-takeover for UK takeovers? A comparison of performance measures and benchmarks. *Journal of Corporate Finance*, 11(1-2), 293-317.

Puri, M., 1999. Commercial banks as underwriters: Implications for the going public process. *Journal of Financial Economics*, 54, 133-163.

Ralston, D., Wright, A., & Garden, K. (2001). Can mergers ensure the survival of credit unions in the third millennium? *Journal of Banking & Finance*, 25(12), 2277-2304.

Rogers, K., 1998. Nontraditional activities and the efficiency of US commercial banks. *Journal of Banking and Finance,* 22(4), 467-482.

Rogers, K.E., Sinkey, J. F. Jr., 1999. An analysis of non-traditional activities at US commercial banks. *Review of Financial Economics,* 8, 25-39.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.

Saunders, A., Walter, I., 1994. *Universal Banking in the US*, Oxford University Press, New York.

Schmid, M., Walter, I., 2009. Do financial conglomerates create or destroy economic value? *Journal of Financial Intermediation* 18, 193-216.

Shipman, J. E., Swanquist, Q. T., & Whited, R. L. (2017). Propensity score matching in accounting research. *The Accounting Review*, 92(1), 213-244.

Stein, J.C., 2002. Information production and capital allocation: Decentralized vs. hierarchical firms. *Journal of Finance,* 57, 1891-1921.

Stiroh, K.J., 2004a. Diversification in banking: Is noninterest income the answer? *Journal of Money, Credit, and Banking,* 36, 853-882.

Stiroh, K.J., 2004b. Do community banks benefit from diversification? *Journal of Financial Services Research,* 25(2-3), 135-160.

Tschoegl, A. E. (1983). Size, growth, and transnationality among the world's largest banks. *Journal of Business*, 187-201.

Ward, A. M., & McKillop, D. G. (2005). The law of proportionate effect: the growth of the UK credit union movement at national and regional level. *Journal of Business Finance & Accounting*, 32(9-10), 1827-1859.

Wheelock, D. C., & Wilson, P. W. (2013). The evolution of cost-productivity and efficiency among US credit unions. *Journal of Banking & Finance*, 37(1), 75-88.

Wilson, J. O., & Williams, J. M. (2000). The size and growth of banks: evidence from four European countries. *Applied Economics*, 32(9), 1101-1109.

Worthington, A. C. (2001). Efficiency in pre-merger and post-merger non-bank financial institutions. *Managerial and Decision Economics*, 22(8), 439-452.

Yeats, A. J., Irons, E. D., & Rhoades, S. A. (1975). An analysis of new bank growth. *The Journal of Business*, 48(2), 199-203.

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