Effect of income diversification on Canadian credit union performance.

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Abstract

The main objective of this thesis is to measure the impact of income diversification on Canadian credit union performance. Although credit union functions as an integral part of the Canadian economy, very few studies have focused solely on the Canadian credit union. Core money lending activities are still the primary source of earning, but the scope of non-interest income is increasing. In this thesis, we use return on asset (ROA) and risk-adjusted return on asset (RAR_{ROA}) as a measure of profitability and risk-adjusted profitability in our model. In the robustness test, we use return on equity (ROE) and risk-adjusted rate of return on equity (RAR_{ROE}) as our profitability metrics. In this thesis, the coefficient of non-interest income reflects the impact of non-interest-bearing activities on credit unions' performance. We see that the effect of revenue diversification for ROA and RAR_{ROA} are positive. It suggests that non-interest-bearing activities have a strong positive relationship with our dependent variable. We see a similar kind of relationship with ROE and RAR_{ROE}. We find that income diversification has a more substantial impact on larger credit unions than smaller ones.

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Chapter 1

Introduction

"Before the arrival of the credit union, people who were from the poor background or the working-class background couldn't borrow from banks. Credit unions are champions of low-income and working-class people." (John Hume, Nobel Peace Prize winner 1998, Irish politician).

Credit unions play a crucial role in the Canadian economy by meeting financial needs for Canadians, and they support small businesses in many ways. They are the second-largest loan providers to small businesses throughout Canada (Ketilson et al., 2009). One in every three Canadians is a credit union member. Canada has the world's largest per capita membership of credit unions (Fairbairn et al., 1997). In recent times, technological transformation and restructuring have provided opportunities for financial institutions to generate noninterest income (Goddard et al., 2008). Theoretically, earnings from diversified sources should provide stability in profitability because financial institutions can introduce many services within the current infrastructure with little added cost (Carpenter, 2020). The main advantage of fee-based revenue is that it requires small capital and thus brings higher leverage over financial assets (Chiorazzo et al., 2008). When banks fail to generate sufficient income from operating activities, the loss can be offset by increasing noninterest income significantly (Lopez et al., 2020). Although there are benefits for credit unions in generating noninterest income, it can increase competition with those entities that do not have core banking services and provide similar services (Brunnermeier et al., 2020). Existing research produces non-similar conclusions regarding the effect of noninterest income on financial institutions' performance. Nevertheless, the proportion of noninterest-bearing-activities is increasing in the product portfolio (Laeven et al., 2007). Today noninterest income includes a wide variety of earnings that banks or credit unions can earn through their secondary services. Some examples of today's noninterest earnings are income or loss derived from selling real estate loans on the secondary market, gain (loss) associated with hedged items (investments), income or expense resulting from the sale or other disposition of fixed assets, and all miscellaneous non-operating income such as overdraft fees, credit card fees, transaction service fees and safekeeping fees (Carpenter, 2020).

The main objective of our thesis is to measure the impact of income diversification on Canadian credit unions' performance. The regulatory environment for credit unions in Canada is different than that of the US. In the US, credit unions are regulated federally as well as statewide, while in Canada, all credit unions are regulated provincially. The deposit insurance scheme is also different between Canada and the US (Mamun, 2021). In the US deposit guarantee amount is centered around $250,000 while in Canada it differs province to province. In Ontario & all Atlantic provinces except Prince Edward Island, the amount is $250,000. For Prince Edward Island the amount is $125,000. For Quebec it is $100,000 for British Columbia, Alberta, Saskatchewan and Manitoba deposit guarantee is Unlimited. The mindset of the regulators are different in Canada than in the US. Canadian regulations focus on safety and soundness of the credit union, while US regulations focus on accessibility, anti-money laundering, privacy and consumer protection. In 2019 there were over 6,000 credit unions in the US, while in Canada, only 251 credit unions were operating outside of Quebec (Credit Union Community and Economic Impact Report, 2020). It is easy for Canadian regulators to monitor credit unions more thoroughly than their US counterparts. Due to the high level of scrutiny, Canadian credit unions are more risk-averse. So findings based on US credit union data will not be applicable for Canadian credit unions.

Noninterest income fits perfectly in the junction where customers demand more services, and financial institutions create new income opportunities. The scope of noninterest income is increasing day by day. Credit unions provide traditional banking services such as chequing and saving accounts, mortgages, business loans and investment advice, and access to ATMs etc. Credit union members have access to thousands of ATMs across Canada. Credit unions provide a more member-friendly approach while providing all the traditional banking services. Members of the credit unions are not just customers; they are owners as well. Members own the credit unions, so credit unions' objectives are aligned with their clients' welfare. In general, credit union conducts their business to provide support to their clients (Fried et al., 1993). Although a credit union offers all essential financial services, its' business model is different than that of banks. (Fried et al., 1993).

Profit of a credit union stays in the community where the credit union is located. In 2019, Canadian credit unions distributed 21.2 % of loans to small and medium-sized businesses, whereas the market shares of the banks are 19.6% for RBC, 17.1% for Scotia bank, 15.4% for TD bank, 9.3%

for BMO and 8.6% for CIBC bank (Credit Union Community and Economic Impact Report, 2020). Credit unions have affected the agricultural sector strongly. Credit unions distributed 1.3% of agricultural loans (Credit Union Community and Economic Impact Report, 2020). Almost all loans that have been provided by credit unions have been issued under the Canadian Agricultural Loan Act (CALA) – a loan guarantee program that offers better credit access to farmers to start and develop their farms (Credit Union Community and Economic Impact Report, 2020). As credit unions are administered locally, their head offices are also established in the areas where they operate, and for this reason, professional jobs are distributed in all regions of Canada. For banks, 73% of jobs are concentrated in large cities, whereas for credit unions, only 25.3% of jobs are concentrated in large cities (Credit Union Community and Economic Impact Report, 2020).

We have introduced several dependent variables such as return on asset (ROA), return on equity (ROE), risk-adjusted rate of return on asset, and risk-adjusted rate of return on equity, as measures of profitability and risk-adjusted profitability. Our dataset includes all Canadian credit unions (excluding Quebec) with asset values of at least $100 million. Our data coves the period 2002 - 2019 inclusive to have a reasonable period to measure credit union performance.

There are five chapters in this thesis. Chapter 1: Introduction, Chapter 2: Literature review, Chapter 3: Data & empirical model, Chapter 4: Analysis and Chapter 5: Conclusion. In the next chapter, an extensive literature review has been conducted.

Chapter 2

Literature review and research question

A credit union has consideration beyond its profit, making a credit union a trustworthy partner for the local community. Credit union works within a framework that encourages them to work for the communities' sustainable development through friendly policies approved by its members (ICA 2004). Credit unions are relatively new phenomena compared to banks, but their popularity is increasing exponentially because of their relevance. Credit unions are the only financial institutions that provide services in over 700 rural communities without banks (Mavenga et al., 2012). Historically, the sole purpose of a bank was to make a profit. At that time, banks used to provide loans to business establishments and rich individuals. Poor and needy people do not have access to the bank loan. Bank refuses to provide loans to poor people at the time of their need. This led underserved people to accumulate their wealth and launch credit unions. Alphonse Desjardins established the first credit union in Canada, the Caisse Populaire in de Levis, in 1901 (Mavenga et al., 2012). During the 1930s, at the time of great depression, local farmers faced challenges with the banks to manage their financing, and these events motivated farmers to form groups and establish local credit unions. The large banks did not have branches in remote areas, and there were perceptions that banks were only interested in serving the urban communities. This led to the formation of credit unions and they grew quickly in distant communities (Fairbairn et al., 1997). To develop the agricultural sector, it is crucial to provide structural support and financial aid when necessary. If we look globally, we see rural credit unions play a significant role in ensuring the sustainable growth and development of the agricultural sector. This, in turn, enhances the stability and accomplishment of rural communities. When credit unions in these communities flourish, the local communities grow because credit unions aim to provide user-friendly services to their stakeholders, including the people in the communities (Cabo et al., 2012; Fried et al., 1993). A study conducted in China concluded that rural credit unions increase agricultural output (Nan et al., 2019).

Credit unions serve the communities, and this approach affects credit unions both positively and negatively. Credit unions enjoy their members' loyalty, but they limit themselves in rural areas, restricting their growth opportunities (Fried et al., 1993). Credit union's existence and survival are

crucial for rural communities because a glaring number of people are out-migrating from rural communities, which poses severe challenges to the existing structure of the communities. The shifting demographic increases the per capita cost for infrastructure and services, so it is vital for the community that credit unions succeed (Mann, 2005).

Noninterest income is an additional source of income that a financial institution can earn when providing additional services. Different financial institutions need different strategies to deal with this income source. Large organizations have more resources and infrastructures to utilize the opportunity. Larger credit unions can realize better earnings than their smaller counterparts through economies of scale (Fried et al., 1993). Because of their capacity, larger credit unions can offer more services at a favourable price and can use more technology. Usually, large credit unions have more expertise, more knowledgeable staff, and more experience dealing with innovation and market evaluation. Large credit unions enjoy a favourable position in terms of market share. These factors help large credit unions tap into more noninterest income than their small counterparts (Fried et al., 1993). The longer any credit union stays in business, the more they learn. The more experience any credit union has, the more efficient it is to handle any situation. Large credit unions also have more capital to tackle any contingency. This all helps large credit unions to operate more efficiently. Hence, large credit unions can offer more competitive packages to their members (Hessou, 2017).

At present, the financial sector is very competitive. To survive this competitive market,financial instutions need to find innovative ways to earn income. Observing the current trend, we see that nowadays, US financial institutions earn 42% of operating earnings from noninterest income, and this earning figure was 20% in 1980 (Goddard et al., 2008). The scope of earnings is increasing in many ways. Financial institutions provide diversified services, such as investment banking, venture capital and insurance underwriting, and commission-paying services. The financial institutions are earning a significant amount of fees from these services and are retaining customers through these other services, which in turn increases their core earning (DeYoung et al., 2004). By analyzing operating strategy, scholars found out a tectonic shift in strategic behaviour in the financial sector (Clark et al., 2007). Because of its importance and scope, researchers are now exploring new dimensions regarding noninterest income such as business strategy, market competitiveness, market saturation, technological transformation, and market modification (Gallo et al., 1996; Lepetit et al., 2008; Mercieca et al., 2007).

In this thesis, we have tried to measure the relationship between non-interest income and credit union performance. We have chosen popular metrics as a measure of profitability. We use both ROA and ROE as an indicator of profitability. Measuring short-term performance is different from measuring long-term performance. Our thesis has tried to determine long-term financial institutions' performance, and ROA and ROE are the two most widely used metrics to measure this (Hagel et al.,2013). To measure profitability, researchers have used many methods, but ROA and ROE are the two most popular choices (Alibadi et al., 2013). To determine overall performance, one needs to look through many angles. ROA and ROE provide us with that opportunity. In the balance sheet, two major sections are asset and equity. Many indices are prone to financial mechanisms, and for this reason, it is vital to measure credit union performance through different indicators. When we measure credit union performance through ROA and ROE, it provides us with a very comprehensive overview.

Many studies have been conducted to determine whether diversification through non-interest income increases overall performance. It has been found that financial institutions with more noninterest income have higher overall risk, but with additional customer base and better intermediary activities, overall productivity and efficiency of the financial institutions increase (Brunnermeier et al., 2020). When credit unions provide additional services, they need to deal with more intermediary activities, which produce valuable information with few extra costs. With better information, firms enjoy the synergistic effect from economies of scope. Large credit unions can achieve better economies of scope through their existing infrastructure (Diamond, 1991; Petersen et al., 1994; Stein, 2002). Credit unions should balance their activities between diversification and specialization. Because over-diversification can hamper credit union performance. Financial institutions need to achieve a certain level of specialization to thrive in a competitive environment (Bárcena-Ruiz et al., 1999; Holmstrom et al., 1991). Although existing literature produces mixed conclusions regarding the effect of noninterest income on credit union performance, a good deal of literature suggests that diversification through noninterest income provides cost efficiency for many US credit unions (Laeven et al., 2007). The non-interest income effect has been scrutinized using different approaches and styles, and the results are contrasting, but many studies suggest that benefits from diversification are possible when combining activities provide synergistic effect (Benston et al., 1995). Noninterest income can be in many forms through various activities. Through proper utilization of noninterest income, credit unions can achieve greater cost efficiency,

larger size, and reduce several risk components (Rogers et al., 1999). On the other hand, if a credit union becomes too reliant on non-interest income, it will increase the overall volatility of its profit margin (Stiroh, 2004). Although many studies suggest a negative relationship between the non-interest income and financial institution performance, surprisingly, firm franchise value tends to accelerate with a surge in noninterest income (Baele et al., 2007). Observing research conducted on European financial institutions, we find that non-interest income has a positive effect on earning and stability (Kohler, 2015). Another study suggests that European financial institutions have gained significant benefits through diversification. Large cooperatives are the main beneficiaries of this income diversification (Meslier et al., 2014).

Local demographics play a crucial role in credit unions' success. The attitude of local people towards their financial institutions is the key factor that shapes the credit union's strategy and structure. The number of products sold to each client represents the intensity between client and their financial institutions (DBRS, 2011). Having large diversified offerings might not be beneficial if it does not satisfy customers' needs. Creating an encouraging attitude towards financial success and literacy can motivate customers to grow relationships with their financial institutions. It is the right way to retain customers with carefully crafted financial solutions that help clients accomplish economic success (Arnold, 2012). Study shows that over-diversification is risky for the firm that is not equipped with an adequate contingency plan. The same diversification strategy is not suitable for small and large credit unions at the same time. Diversification increases risk, and large credit unions are better equipped with risk management capacity (Goddard et al., 2008). Local demography has a stronger impact on credit unions than on large banks. Banks operate their business in large urban areas, but credit unions operate in less densely populated rural areas. Any changes in policy, currency rate, and interest rate affect the community capital market, affecting credit unions (Conexus Credit Union, 2009). Unlike banks, credit unions deliver customized solutions for their members. Banks, on the other hand, try to increase their customer base through branch expansion (DBRS, 2011). Many external factors affect credit unions through spiral effects. Monetary policy at the regulatory level affects consumer behaviour, interest rate, and the housing market, affecting personal savings. Due to these uncontrollable external environments, credit unions are prone to be affected by factors beyond their level (Conexus Credit Union, 2009). On the positive side, there are some added advantages from the board of directors' point of view. The board of directors of any credit union comes from

within the community, and they are also the members of that credit union, which reduces clashes among stakeholders (DBRS, 2011).

Most researchers have conducted their analysis based on US and international credit union data. Based on Canadian credit union data, very few studies have been done (Almehdawe et al., 2020). Canadian credit unions are playing a crucial role in shaping the Canadian rural economy in multiple ways. Technology is shaping our everyday lives. Financial firms need to come up with innovative approaches to cope with the new environment. To understand credit unions' contribution to Canadian society and their relationship with new sources of earnings, more studies are needed. Motivated by this philosophy, I tried to find out the answer to the following research question, **Does income diversification has effect on Canadian credit union performance?**

Chapter 3

Data and empirical model

3.1. Data source and research background:

We have collected data from the following private source (https://canadiancreditunion.ca/) and from regulator's website. We have considered all Canadian credit unions (except Quebec) that have an asset of at least 100 million. We have taken data from 2002-2019, and our sample size is 1818 (credit union year observations). Taking Canadian credit unions with an asset of at least 100 million in our research, our data covers credit unions that control more than 90% of assets of the Canadian credit union industry. In 2019, there are 153 credit unions that have an asset of at least 100 million. In 2019 top 100 credit unions are accountable for 93% of the total credit union sector consolidated asset in Canada (except Quebec) (Largest 100 credit union report, CCUA, Q4 2019). Our model used ROA and RAR_{ROA} as our key performance indicators. Along with ROA, another popular metric to measure financial institutions' performance is ROE (Alibadi et al., 2013). Together ROA and ROE provide a comprehensive overview of the credit union's upcoming perspective.

3.2. Research design:

The main goal of this thesis is to measure the effect of income diversification on Canadian credit union performance. In our first model, we have used return on asset (ROA) and risk-adjusted return on asset (RAR_{ROA}) as dependent variables. Our independent variables are noninterest income ratio (NONSH), Herfindahl index for NONSH (HHI_NONSH), capital-asset ratio (KA), logarithm of total assets (lnA), changes in LnA (δlnA), changes in the logarithm of gross provincial product (δlnGPP), and changes in the logarithm of population (δlnPOP).

We adopt the Goddard, Mckillop and Wilson (2008) & Saunders, Anthony and Walter (1994) approach to address our research question. Our second and third models tested the relationship between credit union performance and loan to asset ratio (LA) and deposit to loan ratio(DL).

In the second model, we have substituted LA with NONSH to check how maintaining traditional asset portfolio impacts credit union performance. In the third model, we have substituted DL with NONSH to check how maintaining traditional funding source impacts credit union performance. According to Saunders, Anthony and Walter (1994), NONSH, LA, and DL are three scope-related ratios through which synergistic effect can be measured. For this reason, we have used these ratios in our models. In all three models, we have introduced interaction variables to check the effect for different-sized credit unions.

ROA provides signal regarding the credit union's operational efficiency, and through this indicator, we get to know how much the credit union is earning in terms of its' total assets (Peterson et al., 2008). There are many other indicators to measure a credit union's performance, but ROA is the best metrics among them (Alibadi et al., 2013). On the other hand, by using return on equity (ROE), we get to know how much the credit union is returning to its' equity holders, and it signals the potential growth of the credit union (Peterson et al., 2008). We have used return on asset (ROA) and risk-adjusted rate of return on asset (RAR_{ROA}) as dependent variables in our primary model and return on equity (ROE) and risk-adjusted return on equity (RAR_{ROE}) as dependent variables in our robustness test.

Our first model,

$Y = \beta + \beta_1 NONSH + \beta_2 (1\text{-}HHI\_NONSH) + \beta_3 lnA + \beta_4 \delta lnA + \beta_5 KA + \beta_6 \delta lnGPP$

$+ \beta_7 \delta lnPOP + \epsilon$ ……………………………………………………………(3.1)

Where Y = either ROA or RAR_{ROA}

for robustness test, we replace ROE and RAR_{ROE} as the dependent variables.

We have also introduced two additional models to test the impact of loan to asset ratio (LA) and deposit to loan ratio (DL) in terms of overall performance and risk-adjusted-performance. L/A is calculated as ratio of net loan to total asset. D/L is calculated as a ratio of total deposit to net loan

In our equation, the coefficient β_1 will reflect the impact of ratio of noninterest income over credit union performance and the coefficient β_2 will estimate the impact of credit unions' own

extent of diversification on performance. In a credit union, total income derives from both interest-bearing and noninterest-bearing activities. The coefficient β_1 will cover the part of income generated from noninterest-bearing activities.

For any credit union, the nature of business plays a critical role in its success. For credit unions, their business model can be focused on either core interest-bearing activities or can be diversified. To address this diversification issue, we have incorporated the Herfindahl index. The coefficient β_2 will reflect the impact of the level to which credit union maintains diversification between core interest-bearing and non-interest-bearing activities. Herfindahl index can be used to measure the level of concentration both for the industry and for individual credit union (Rhoades,1993).

We are using lnA to control the asset size of the firm. δlnA will be used to control for the growth of asset size of the firm. So $\beta_3$will measure the effect of asset size on dependent variable and β_4 will measure the effect of the growth of asset size on dependent variable.

If KA (capital asset ratio) is high for any credit union, then that credit union is acting overcautiously, and they are not using their capital at the optimal level. Bank (or credit union) can still be profitable with a high KA, but they would earn more if they used their capital more efficiently (Berger, 1995). If the KA is too low, then the credit union is conducting business in a risky way. With a low KA, the bankruptcy cost will be high for a credit union. An alternate interpretation can be that a credit union with a high KA has too much idle capital on hand and bears the cost of capital with no earning. Maintaining high KA for a long time might slow credit union growth. In our model, $\beta_5$will measure the effect of KA on dependent variable.

Macroeconomic conditions have a substantial impact on business activity (Doms et al., 2007). Past literature finds that economic growth and financial institutions' profitability are positively related (Doms et al., 2007). When the economy grows, so does the financial sector. On the other hand, during a recession, profitability of credit unions are affected in two ways. First, due to decreased economic activity, profitability erodes. Second, during the recession, a low-interest rate is a common phenomenon that negatively impacts performance (Klein et al., 2018). Profitability of credit unions are interconnected with their customers' economic

condition. So, with local economic growth, individuals and, financial industry tend to perform better (Doms et al., 2007). In our model, $\beta_6$will measure the effect of gross provincial product (GPP) on dependent variable.

All types of businesses are very reactive to changes in size and structure of surrounding demographics (Berlemann et al., 2014). A large population indicates the possibility of a large customer base. Depending on the local demographic, every business needs to adjust its business model. To address this, we incorporate δlnPOP into our model. In our model, $\beta_7$will measure the effect of changes in population in province on the dependent variable.

Financial sector is an information and service intensive industry and due to significant setup and infrastructure costs, there is scope for economy of scale. Following Saunders, Anthony and Walter (1994) we examine the effect of LA and DL on credit union performance,

Our second model,

$Y = \beta + \beta_1 LA + \beta_2(1\text{-}HHI\_LA) + \beta_3 lnA + \beta_4 \delta lnA + \beta_5 KA + \beta_6 \delta lnGSP + \beta_7 \delta lnPOP + \epsilon$ ……..(3.2)

Where Y = either ROA or RAR_{ROA}

For robustness test we replace ROE and RAR_{ROE} as the dependent variables.

Our third model,

$Y = \beta + \beta_1 DL + \beta_2(1\text{-}HHI\_DL) + \beta_3 lnA + \beta_4 \delta lnA + \beta_5 KA + \beta_6 \delta lnGSP + \beta_7 \delta lnPOP + \epsilon$ ……..(3.3)

Where Y = either ROA and RAR_{ROA}

For robustness test we replace ROE and RAR_{ROE} as the dependent variables.

In second model, we substitute NONSH with LA. In the third model, we substitute NONSH with DL. LA ratio demonstrates the level of traditionalness of a credit union from the asset portfolio side. DL ratio demonstrates the level of traditionalness of a credit union from the funding source side. In financial sector economies and diseconomies of scale and scope affects the policy-making and strategy formulation. Along with noninterest income there are factors that have scope for economies and diseconomies of scale. Loan to asset ratio and deposit to loan ratio are two of them. There is strong correlation between DL and LA as they both have asset components by construction. To avoid multicollinearity we have used these ratios in separate models.

In our second model, the coefficient β_1 estimates the effect of LA on credit union performance. In our third model, the coefficient β_1 estimates the effect of DL on credit union performance.

3.3. Description of Variables:

In this section, we have provided definitions of all variables along with relevant elements that have been used to calculate those variables. We have provided notation for each of the variable. In the reference/source column we have provided the reference/source for those variables.

Table 3.3.1: Description of dependent variable:

Variables	Notation	Definition/descripton	Reference / source
Return on asset	ROA	ROA is a financial ratio that tells us how much profit credit union is earning in terms of its' total asset. We get ROA by dividing net income by the total asset.	Almehdawe, Khan, Lamsal, and Poirier (2020) &, Goddard, Mckillop and Wilson (2008)
Return on equity	ROE	ROE is a measure of profitability of any firm in terms of its' member's equity. We get ROE by dividing net income by the member's equity. In our analysis we have calculated member's equity in the following manner, Shareholder's equity =Retained earning+ equity share + membership special	Almehdawe, Khan, Lamsal, and Poirier (2020) &, Goddard, Mckillop and Wilson (2008)
Risk-adjusted rate of return on asset	RAR_{ROA}	RAR_{ROA} calculates the profit considering the associated risk with it. Our formula is, RAR_{ROA} = ROA/ standard deviation of ROA	Goddard, Mckillop and Wilson (2008)
Risk-adjusted rate of return on equity	RAR_{ROE}	RAR_{ROE} is similar to RAR_{ROA}. Here we also calculates the profit considering the associated risk with it. Our formula is, RAR_{ROE} = ROE/ standard deviation of ROE	Goddard, Mckillop and Wilson (2008)

In the following table 3.3.2 we have mentioned all the independent variables.

Table 3.3.2: Description of independent variables:

Variable From the model	Notation	Definition/descripton	Reference / source
Noninterest income ratio	NONSH	Ratio of noninterest income to operating income measures direct exposure effect of revenue diversification.	Saunders, Anthony and Walter (1994)
Herfindahl index (NONSH)	HHI_NONSH	The effect of diversification between core interest-bearing activity and noninterest-bearing activity measured by one *minus* Herfindahl index, $=1-(NONSH^2+(1-NONSH)^2)$	Goddard, Mckillop and Wilson (2008)
Loan to asset ratio	LA	Ratio of net loan to total asset.	Saunders, Anthony and Walter (1994)
Herfindahl index (LA)	HHI_LA	The effect of diversification between traditional asset and non-traditional asset measured by one minus Herfindahl index, $=1-(LA^2+(1-LA)^2)$	Goddard, Mckillop and Wilson (2008)
Deposit to loan ratio	DL	Ratio of total deposit to net loan.	Saunders, Anthony and Walter (1994)
Herfindahl index (DL)	HHI_DL	The effect of diversification between traditional funding and non-traditional funding measured by one minus Herfindahl index, $=1-(DL^2+(1-DL)^2)$	Goddard, Mckillop and Wilson (2008)
Capital-asset ratio	KA	We get the ratio by dividing the net worth by total asset.	Goddard, Mckillop and Wilson (2008)
Logarithm of total assets	LnA	We take natural log of total assets.	Goddard, Mckillop and Wilson (2008)
Changes in lnA	δlnA	Changes in LnA between two time period.	Goddard, Mckillop and Wilson (2008)
Changes in logarithm of gross provincial product	δlnGPP	Difference in natural logarithm of gross provincial product between two time period for the province in which the credit union is registered.	https://dashboard.saskatchewan.ca/business-economy/key-economic-indicators/gross-domestic-product#by-province-tab
Changes in logarithm of population in the province	δlnPOP	Difference in natural logarithm of population between two time period for the province in which the credit union is registered.	https://dashboard.saskatchewan.ca/people-community/people/population#by-province-tab

In the following table 3.3.3 we have provided the mean, first quartile (25th percentile), median (50th percentile), third quartile (75th percentile), minimum, maximum and standard deviation values of all the dependent and independent variables for our sample of 1818 (credit union year observations).

Table 3.3.3: Summary statistics

This table provides summary statistics for our sample of 1818 Canadian credit unions for the period 2002 – 2019 (yearly data).

Dependent variable: Return on asset (ROA), return on equity (ROE), risk-adjusted rate of return on asset (RAR_{ROA}), risk-adjusted rate of return on equity (RAR_{ROE}).

Independent variable: Noninterest income ratio (NONSH), deposit to loan ratio (DL), loan to asset ratio (LA), capital-asset ratio (KA), Herfindahl index for NONSH (HHI_NONSH), Herfindahl index for DL(HHI_DL), Herfindahl index for LA (HHI_LA), logarithm of total assets(lnA), changes in LnA(δlnA).

	Mean	First quartile (25th percentile)	Median (50th percentile)	Third quartile (75th percentile)	Minimum	Maximum	Standard Deviation
Dependent variable							
ROA	0.005229	0.0031514	0.00491	0.0068454	-0.0162	0.0296415	0.0032005
ROE	0.073963	0.0478081	0.069835	0.0982312	-0.411277	0.3317542	0.0423575
RAR_{ROA}	4.071291	1.81007	3.128547	4.851453	-2.386509	75.84404	5.266014
RAR_{ROE}	3.806338	1.771515	2.997628	4.463218	-2.448452	49.89002	4.282337
Independent variable							
NONSH	0.230906	0.1799053	0.220712	0.2791878	-0.017774	0.7304141	0.080489
DL	1.103165	1.027549	1.084425	1.156881	0.6669477	3.919114	0.147694
LA	0.819788	0.7908468	0.836175	0.8682814	0	1.04181	0.0714289
KA	0.070437	0.0587354	0.066676	0.0784606	0.0306422	0.199753	0.0180817
HHI_NONSH	0.354834	0.3487332	0.355414	0.3644944	0.3245935	0.3874739	0.0157613
HHI_DL	-0.22911	-0.258105	-0.2338	-0.1983154	-0.281999	-0.186540	0.0299172
HHI_LA	0.295684	0.290591	0.294423	0.3052628	0.2796281	0.3088183	0.0089232
lnA	6.245214	5.365612	5.983368	6.89617	4.525911	10.05007	1.137002
δlnA	0.075945	0.0338988	0.064563	0.0995393	-0.607865	2.696975	0.1025433

In above table we see mean value for ROA is .005229 or .52% with a range of (-1.6% to 2.96%). Standard deviation for ROA is .32%. For ROE the mean value is 7.39%, range is (-41.12% to 33.17%) and standard deviation 4.23%. We see ROE is much higher than ROA. This is a normal scenario because net capital in terms of total asset is approximately 8%. Also large corporations reported similar ROA and ROE ratios in their annual report. In fact in 2008-09, ROA of Bank of America was approximately 1%, where as at the same time ROE was 13% (Furhmann, 2021). Mean for NONSH is 23.09% that shows a fair amount of operating income generates from noninterest income. Standard deviation is 8.04%. Mean value for LA is .8197 which means that 82% of assets of the credit unions are composed of loans. Mean value for DL is 1.1031 means loan to deposit ratio is 90.65%. It indicates that on average 90.65% deposit is being converted into loan.

Table 3.3.4: Correlation matrix

In this table we present the Pearson correlation matrix of both dependent and independent variables.

Variable: Return on asset (ROA), return on equity (ROE), risk-adjusted rate of return on asset (RAR_{ROA}), risk-adjusted rate of return on equity (RAR_{ROE}), Herfindahl index for NONSH (HHI_NONSH), Herfindahl index for DL(HHI_DL), Herfindahl index for LA (HHI_LA), logarithm of total assets (lnA), changes in LnA (δlnA), noninterest income ratio (NONSH), capital-asset ratio (KA), loan to asset ratio (LA), deposit to loan ratio (DL), population, gross provincial product (GPP).

	ROA	**ROE**	**RAR_{ROA}**	**RAR_{ROE}**	**HHI_NONSH**	**HHI_LA**
ROA	1					
ROE	0.8770*	1				
RAR_{ROA}	0.2907*	0.2603*	1			
RAR_{ROE}	0.3098*	0.3060*	0.7889*	1		
HHI_NONSH	0.1165*	0.2043*	-0.0602	-0.0196	1	
HHI_LA	0.1411*	-0.1805*	-0.0365	-0.0527	-0.1807*	1
HHI_DL	0.0486	-0.1021*	0.0732*	0.0471	-0.4642*	0.4730*
LnA	0.0477	0.1233*	-0.0467	-0.0961*	-0.0428	0.0401
δlnA	0.0937*	0.1637*	0.0241	0.0349	0.0839*	0.1097*
NONSH	0.0509	0.1118*	-0.1154*	-0.1352*	0.1807*	0.0319
KA	0.4271*	0.0245	0.1329*	0.0773*	-0.1262*	0.0610*
LA	-0.1098*	0.0307	-0.0258	-0.0615*	0.0199	-0.0959*
DL	0.0739*	0.0093	0.0238	0.0489	0.0394	0.0384
Population	0.0546	-0.027	0.0408	-0.0051	-0.1922*	0.0625*
GPP	0.0847*	0.1132*	0.0188	0.0301	-0.1477*	-0.1521*

	HHI_DL	LnA	δlnA	NONSH	KA	LA	DL	Population	GPP
HHI_DL	1								
LnA	0.0251	1							
δlnA	-0.0347	0.1669*	1						
NONSH	-0.0829*	0.1298*	0.0546	1					
KA	0.0726*	-0.143*	-0.118*	-0.0942*	1				
LA	0.0455	0.3241*	0.0969*	0.0507	-0.3659*	1			
DL	-0.0842*	-0.3604*	-0.0807*	0.0117	0.1987*	-0.7898*	1		
Population	0.1322*	0.1175*	0.0074	-0.1034*	0.1247*	-0.0444	0.0312	1	
GPP	0.0333	0.0271	0.0686*	0.0052	-0.0515	0.0059	0.0122	0.1867*	1

Here, we see for most of the cases independent variables are not strongly correlated neither in positive nor in a negative way. In dependent variable, we see strong correlation between ROA and ROE and between RAR_{ROA} and RAR_{ROE}. This is expected as both of them have profit element in it. In independent variable, we see moderate correlation between HHI_DL and HHI_NONSH and HHI_DL and HHI_LA. None of them has been used in the same model. HHI_NONSH has been is used in the first model while HHI_LA and HHI_DL have been used in second and third models respectively. We have strong relationship between DL and LA and both of them has been used in different model. Independent variable that we use in the same model does not have moderate or strong correlation among them.

Chapter 4

Analysis

The main goal of this research is to test the impact of income diversification on Canadian credit union performance. In table 4.1.1, we provide an estimate for sample for the first model. In tables 4.2.1 and 4.3.1, we provide the estimate for the second and third models. In table 4.2.1, we substitute NONSH with LA, and in table 4.3.1, we substitute NONSH with DL.

We have conducted the Hausman test to check whether we should use the fixed effect model or random-effect model. Our test shows that fixed effect model is suitable for all three models.

4.1. Multivariate analysis of first model (NONSH):

Our first model tests the relationship between credit union performance and non-interest income ratio (NONSH).

Table 4.1.1: Estimation for sample: first model (NONSH), data period (2002 – 2019, yearly).

Dependant variable = Return on asset (ROA), risk-adjusted rate of return on asset (RAR_{ROA}).

Independent variable = Non-interest income ratio (NONSH), Herfindahl index for NONSH (HHI_NONSH), large credit union intercept (large**),** medium credit union intercept (medium), large credit union NONSH (large_NONSH**),** medium credit union NONSH (medium_NONSH), logarithm of total assets (lnA), changes in LnA (δlnA), capital-asset ratio (KA), changes in population in the province (δln Population), changes in gross provincial product (δln GPP).

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	RAR_{ROA}	**ROA**	RAR_{ROA}
NONSH	0.00426***	1.378**	0.00411**	0.478
	(3.464)	(2.454)	(2.500)	(0.631)
HHI_NONSH	-0.00597	-6.345***	0.0139***	5.355***
	(-1.282)	(-2.985)	(3.420)	(2.859)
Large			-0.00200***	-1.482***
			(-3.553)	(-5.722)
Small			0.00133**	0.657***
			(2.547)	(2.724)
Large_NONSH			0.00220	3.502***
			(1.028)	(3.551)
Small_NONSH			-0.00159	-1.341
			(-0.730)	(-1.336)
LnA	-0.00215***	-1.145***		
	(-10.67)	(-12.42)		
δLnA	0.00138***	0.552**	0.00161***	0.676***
	(2.660)	(2.338)	(3.056)	(2.779)
KA	0.0506***	15.27***	0.0453***	13.10***
	(8.251)	(5.457)	(7.223)	(4.532)
δln Population	0.0293*	18.30***	-0.0115	-4.545
	(1.930)	(2.637)	(-0.782)	(-0.671)
δln GPP	0.00716***	2.887**	0.0125***	5.948***
	(2.742)	(2.423)	(4.812)	(4.989)
Constant	0.0157***	11.77***	-0.00387**	1.126
	(5.962)	(9.811)	(-2.389)	(1.509)
Observations	1,817	1,800	1,817	1,800
t-statistics in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

In table 4.1.1, the coefficient of NONSH measures the relationship between noninterest income and credit union performance. In column one we show the results of our regression where ROA is our dependent variable. Here coefficient of NONSH suggests that share of noninterest income has a positive relationship with dependent variable. Goddard et al. (2008) found similar results in their analysis. The coefficient of HHI_NONSH reflects the impact of diversification between core interest-bearing and noninterest-bearing activities on credit union performance. Our finding here is that it has negative relation with credit union performance. The coefficient of lnA measures the impact of asset size on explanatory variable. Results suggest that large credit union has less profitability compared to small credit union. The coefficient of δlnA measures the impact of asset growth on dependent variable and the relationship is positive. Our findings similar to the findings of Goddard et al. (2008), where he found out faster growing credit unions perform better. Regarding KA, high capital-asset ratio suggests that a credit union is operating over-cautiously and neglecting business opportunities (Goddard et al., 2008). He also implies that low KA ratio will increase the insurance cost against bankruptcy. Managers of low-risk institutions can provide signal regarding the quality of the institution by maintaining high KA (Goddard et al., 2008). Our result suggests that KA ratio has a positive relationship with ROA. Our findings are aligned with the findings of Berger (1995) who found out that a higher capital-assets ratio has positive relation with bank performance. Coefficient of δln population suggests that growth in population has a positive impact on credit union performance. Surrounding economic condition impacts any business activity. Coefficient of δln GPP shows that there is positive impact between growth of GPP and credit union performance. Doms et al. (2007) found that provincial economic condition has substantial impact on business activity.

In column two we show the results of our regression where RAR_{ROA} is our dependent variable. Result suggests that RAR_{ROA} and non-interest-bearing activities have positive relation. Result is significant at 5% level of significance. Coefficient of HHI_NONSH suggest that the impact of diversification between core interest-bearing and non-interest-bearing activities are negative and associated with higher risk. Our findings are similar to findings of Esho at al. 2005. All other independent variables have similar relationship with dependent variable as of column one.

In columns three and four we see the impact based on credit union size. Previous studies have found that NONSH has different implications on different-sized credit unions. Generally larger

credit union has more economies of scale and can provide service more cheaply. They have more resources than their smaller counterparts, which helps them provide widespread service to their clients. As a result, it is likely that large credit unions will perform better (Wilcox, 2006). In many cases, large credit unions paid better interest to their clients than small credit unions. Because large credit unions have lower interest expenses, it is advantageous for them to pay more interest to their clients and earn more simultaneously because of their low interest costs (Wilcox, 2005). Several studies have found that large credit unions have more robust performance than their small counterparts. It also implies that larger credit union can utilize their resources more efficiently due to their economies of scale (Wilcox 2005, Wilcox 2006). To address these different impacts on different sizes, we measure the impact of income diversification on performance based on credit union size in regression analysis. We classify the credit union into three categories based on asset size. Large credit union = total asset > 800 million, medium credit union = 800 million > total asset < 200 million and small credit union = 200 million > total asset < 100 million. For this classification we have followed quartile rule. Based on above classification, approximately 25% credit unions are considered as large , 50% credit unions are considered medium and 25% credit unions are considered as small. In columns three and four we present the result of regression analysis in which we test the impact of noninterest-bearing activities on large and small credit unions. To do that we replace the size variable (lnA) with two dummy variables named small and large. These variables are intercept dummies. We also introduce large_NONSH and small_NONSH as our slope dummy. In column three, results suggest that the profit of large credit union is smaller and profit of smaller credit union is larger. This finding is consistent with our previous findings in columns one and two, where we see asset size has negative impact on credit union performance. Estimated coefficient of large_NONSH in column four imply that share of noninterest-income has positive impact on large credit unions performance. Our finding is consistent with the findings of Wilcox (2006) who suggests that large credit unions can generate higher returns due to their low operational overhead cost.

4.2. Multivariate analysis of the second model (loan to asset ratio):

Table 4.2.1: Estimation for sample: second model (LA), data period (2002 – 2019, yearly).

Dependant variable = Return on asset (ROA), risk-adjusted rate of return on asset (RAR_{ROA}).

Independent variable = loan to asset ratio (LA), Herfindahl index for LA (HHI_LA), large credit union intercept (large), medium credit union intercept (medium), large credit union LA (large_LA**),** medium credit union LA (medium_LA), logarithm of total assets (lnA), changes in LnA (δlnA), capital-asset ratio (KA), changes in population in the province (δln Population), changes in gross provincial product (δln GPP).

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	RAR_{ROA}	**ROA**	RAR_{ROA}
LA	0.00270**	1.578***	0.00243	1.753**
	(2.075)	(2.671)	(1.330)	(2.101)
HHI_LA	-0.0227***	-11.93***	-0.0361***	-19.14***
	(-3.738)	(-4.330)	(-6.002)	(-6.950)
Large			0.00144	1.177
			(0.502)	(0.900)
Small			0.000268	0.788
			(0.134)	(0.860)
Large_LA			-0.00364	-2.237
			(-1.083)	(-1.456)
Small_LA			0.000966	-0.531
			(0.394)	(-0.474)
LnA	-0.00195***	-0.933***		
	(-11.41)	(-12.02)		
δLnA	0.00134**	0.516**	0.00162***	0.646***
	(2.575)	(2.184)	(3.031)	(2.652)
KA	0.0541***	17.28***	0.0450***	12.60***
	(8.781)	(6.187)	(7.211)	(4.411)
δln Population	0.0294*	17.67**	-0.0185	-7.297
	(1.922)	(2.550)	(-1.274)	(-1.099)
δln GPP	0.00576**	2.957***	0.00723***	3.686***
	(2.302)	(2.603)	(2.833)	(3.156)
Constant	0.0175***	10.61***	0.0110***	7.506***
	(8.145)	(10.86)	(4.420)	(6.607)
Observations	1,817	1,800	1,817	1,800
t-statistics in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

Our second model tests the relationship between credit union performance and loan to asset ratio (LA). This ratio shows the traditionalness of the asset portfolio (demand side) of a credit union. Traditional financial institutions maintain lower noninterest income to total revenue compared to diversified ones (Saunders et al., 1994). The more traditional a credit union is the higher the LA ratio will be.

In column one of the above table, we show the result of our regression where ROA is our dependent variable. The estimated coefficient of LA implies that there is a positive relation between LA and credit union performance. Our findings are opposite to the findings of (Kimball, 1997; Kolari et al., 2006) who suggest that diversification provides informational advantages that helps bank to perform better. The findings are opposite for credit unions because credit unions themselves are specialized financial institutions that already have access to relatively personalized member information (Goddard et al., 2008). The coefficient of HHI_LA shows the effect of asset diversification on credit union performance. Result shows that it has negative relation with credit union performance because credit union provides their loan based on customized member information and there is little scope for informational advantage. The coefficient of lnA and δlnA measures the impact of asset size and asset growth on dependent variable. We get similar findings as of column 1 of table 4.1.1 which shows large credit union has less profitability and the relationship is positive between asset growth and credit union performance. Coefficient of KA, δln population and δln GPP shows similar findings as of column 1 of table 4.1.1 that shows all of these independent variables have positive relation with credit union performance. In column two our findings are similar to column one of this table 4.2.1.

In columns three and four we show the result of regression analysis in which we tested the impact based on asset size. As credit union is a specialized financial institution, it works with its member in a more customized way than traditional financial institution. For this reason, irrespective of size, there is not much scope of informational advantages for credit unions.

4.3. Multivariate analysis of the third model (deposit to loan ratio):

In this third model we test the relationship between credit union performance and deposit to loan ratio (DL). DL ratio represents the level of traditionalness of a credit union from the funding source (supply side) side. High DL ratio implies that main source of funding is deposit, which is the most traditional source of money for any credit union. The more diversified the supply side is the lower the DL ratio will be.

Table 4.3.1: Estimation for sample: third model (DL)data period (2002 – 2019, yearly).

Dependant variable = Return on asset (ROA), risk-adjusted rate of return on asset (RAR_{ROA}).

Independent variable = Deposit to loan ratio (DL), Herfindahl index for DL(HHI_DL), large credit union intercept (large), medium credit union intercept (medium), large credit union DL (large_DL**),** medium credit union DL (medium_DL), logarithm of total assets (lnA), changes in LnA (δlnA), capital-asset ratio (KA), changes in population in the province (δln Population), changes in gross provincial product (δln GPP).

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	RAR_{ROA}	**ROA**	RAR_{ROA}
DL	-0.00120**	-0.671***	-0.000798	-0.461*
	(-2.303)	(-2.843)	(-1.338)	(-1.682)
HHI_DL	0.000610	0.980	-0.00283	-0.857
	(0.332)	(1.173)	(-1.522)	(-1.002)
Large			-0.00430***	-2.193***
			(-2.865)	(-3.186)
Small			0.00363**	1.487**
			(2.471)	(2.203)
Large_DL			0.00243*	1.359**
			(1.704)	(2.071)
Small_DL			-0.00216*	-0.928
			(-1.684)	(-1.573)
LnA	-0.00220***	-1.082***		
	(-12.86)	(-13.92)		
δLnA	0.00145***	0.573**	0.00184***	0.766***
	(2.782)	(2.419)	(3.447)	(3.121)
KA	0.0530***	16.65***	0.0419***	10.98***
	(8.579)	(5.932)	(6.680)	(3.811)
δln Population	0.0335**	19.21***	-0.0177	-7.753
	(2.173)	(2.749)	(-1.193)	(-1.138)
δln GPP	0.00680***	3.448***	0.00945***	4.841***
	(2.715)	(3.032)	(3.693)	(4.121)
Constant	0.0161***	10.28***	0.00268***	3.692***
	(11.36)	(16.01)	(2.900)	(8.691)
Observations	1,816	1,799	1,816	1,799
t-statistics in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

In column one, estimated coefficients of DL is negative. It implies that credit union which primarily depends on deposit to fund loans performs worse both at risk adjusted and unadjusted basis. Coefficient of lnA measures the impact of asset size. Result implies that larger credit union has less profitability. Our finding is similar to the findings of Saunders et al. (1994) who found that large banks are less profitable due to diseconomies of scope. For the remaining coefficients, result is similar to table 4.1.1.

In columns three and four, the estimated coefficient of large and small suggest that the profit of large credit union is smaller, and profit of small credit union is larger. We got the similar findings in table 4.1.1 column three and four. This finding is similar to the findings of Saunders et al. (1994). Estimated coefficient of large_DL and small_DL implies that small credit union performs worse when primarily depends on deposit to fund loans. This finding is similar to the findings of Berger et al. (1993) who found that larger financial institutions were more efficient in revenue efficiency.

4.4 Test of robustness:

We have conducted two robustness tests. In first robustness test we use new variant of proxies to measure financial performance and check whether the estimated result is consistent. In second robustness test we winsorize[1] data and check whether our models hold.

4.4.1 First test of robustness:

We follow Almehdawe, Khan, Lamsal and Poirier (2020) approach for our first robustness test. We introduce new variant of proxies to measure financial performance and run the regression test. In our main regression model we use ROA and RAR_{ROA} as our proxy, here we use ROE and RAR_{ROE} . In this way, we will be able to check whether our model holds if we introduce new variant of proxies to measure financial performance. Here, we will present three tables, 4.4.1.1, 4.4.1.2 and 4.4.1.3.

[1] Winsorizing has been first introduced by Charles P. Winsor (1895–1951). Winsorizing means limiting extreme values in the statistical data to reduce the effect of outliers. Source: https://en.wikipedia.org/wiki/Winsorizing

Table 4.4.1.1: Test of robustness for first model (NONSH), data period (2002 – 2019, yearly).

Dependent variable: Return on equity (ROE), risk-adjusted rate of return on equity (RAR_{ROE}).

Independent variable = Noninterest income ratio (NONSH), Herfindahl index for NONSH (HHI_NONSH), large credit union intercept (large**),** medium credit union intercept (medium), large credit union NONSH (large_NONSH**),** medium credit union NONSH (medium_NONSH), logarithm of total assets (lnA), changes in LnA (δlnA), capital-asset ratio (KA), changes in population in the province (δln Population), changes in gross provincial product (δln GPP).

	(1)	(2)	(3)	(4)
VARIABLES	**ROE**	RAR_{ROE}	**ROE**	RAR_{ROE}
NONSH	0.0589***	1.403**	0.0643**	0.592
	(3.160)	(2.570)	(2.574)	(0.801)
HHI_NONSH	-0.0455	-4.989**	0.271***	6.947***
	(-0.646)	(-2.415)	(4.387)	(3.799)
Large			-0.0247***	-1.445***
			(-2.897)	(-5.717)
Small			0.0247***	0.724***
			(3.105)	(3.074)
Large_NONSH			0.0229	3.172***
			(0.703)	(3.294)
Small_NONSH			-0.0403	-1.096
			(-1.216)	(-1.118)
LnA	-0.0333***	-1.209***		
	(-10.89)	(-13.49)		
δLnA	0.0247***	0.664***	0.0287***	0.804***
	(3.154)	(2.893)	(3.581)	(3.388)
KA	-0.110	-9.764***	-0.185*	-12.19***
	(-1.188)	(-3.591)	(-1.942)	(-4.320)
δln Population	0.353	14.70**	-0.311	-9.201
	(1.531)	(2.180)	(-1.390)	(-1.391)
δln GPP	0.103***	3.304***	0.186***	6.428***
	(2.595)	(2.853)	(4.722)	(5.523)
Constant	0.284***	13.21***	-0.0240	2.075***
	(7.143)	(11.33)	(-0.976)	(2.849)
Observations	1,817	1,802	1,817	1,802
t-statistics in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

We compare table 4.4.1.1 with 4.1.1 and check whether our result is consistent. In columns one and two of the above table our estimated coefficients of NONSH suggest that non-interest-bearing activities have a strong positive relationship with credit union performance. In columns three and four, introducing large and small as dummy variables we test the impact based on asset size. Coefficient of large and small dummy variables show large credit union has less profitability. Coefficient of large_NONSH and small_NONSH show that large credit union performs better at risk adjusted basis as the share of noninterest income increases, but no effect when performance is not adjusted for risk. We found similar conclusion in table 4.1.1.

Table 4.4.1.2: Test of robustness for second model (LA), data period (2002 – 2019, yearly).

Dependent variable: Return on equity (ROE), risk-adjusted rate of return on equity (RAR_{ROE}).

Independent variable = loan to asset ratio (LA), Herfindahl index for LA (HHI_LA), large credit union intercept (large), medium credit union intercept (medium), large credit union LA (large_LA**),** medium credit union LA (medium_LA), logarithm of total assets (lnA), changes in LnA (δlnA), capital-asset ratio (KA), changes in population in the province (δln Population), changes in gross provincial product (δln GPP).

	(1)	(2)	(3)	(4)
VARIABLES	**ROE**	RAR_{ROE}	**ROE**	RAR_{ROE}
LA	0.0392**	0.926	0.0335	1.196
	(1.986)	(1.610)	(1.205)	(1.467)
HHI_LA	-0.285***	-12.66***	-0.509***	-20.39***
	(-3.097)	(-4.726)	(-5.545)	(-7.574)
Large			0.0147	1.998
			(0.336)	(1.563)
Small			0.0129	0.752
			(0.423)	(0.840)
Large_LA			-0.0445	-3.251**
			(-0.869)	(-2.165)
Small_LA			0.00622	-0.328
			(0.166)	(-0.299)
LnA	-0.0318***	-1.017***		
	(-12.27)	(-13.47)		
δLnA	0.0245***	0.613***	0.0293***	0.770***
	(3.107)	(2.664)	(3.614)	(3.233)
KA	-0.0763	-8.249***	-0.226**	-13.00***
	(-0.819)	(-3.036)	(-2.372)	(-4.657)
δln Population	0.360	13.68**	-0.463**	-13.18**
	(1.556)	(2.029)	(-2.094)	(-2.031)
δln GPP	0.0783**	3.119***	0.101***	3.909***
	(2.065)	(2.823)	(2.596)	(3.425)
Constant	0.322***	13.46***	0.217***	9.911***
	(9.884)	(14.16)	(5.737)	(8.926)
Observations	1,817	1,802	1,817	1,802
t-statistics in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

We will compare Tables 4.2.1 and 4.4.1.2 here. In column one and two of the above table, coefficient of LA implies, maintaining traditional asset portfolio has positive impact on credit union performance. The coefficient of HHI_LA shows that asset diversification has negative relation with credit union performance. These results imply credit unions are specialised financial institutions and there is little scope for informational advantage. We had similar findings in table 4.2.1. In columns three and four we see estimated coefficients of large, small, large_LA and small_LA have similar result as of table 4.2.1.

Table 4.4.1.3: Test of robustness for third model (DL), data period (2002 – 2019, yearly).

Dependent variable: Return on equity (ROE), risk-adjusted rate of return on equity (RAR_{ROE}).

Independent variable = Deposit to loan ratio (DL), Herfindahl index for DL(HHI_DL), large credit union intercept (large), medium credit union intercept (medium), large credit union DL (large_DL**),** medium credit union DL (medium_DL), logarithm of total assets (lnA), changes in LnA (δlnA), capital-asset ratio (KA), changes in population in the province (δln Population), changes in gross provincial product (δln GPP).

	(1)	(2)	(3)	(4)
VARIABLES	**ROE**	RAR_{ROE}	**ROE**	RAR_{ROE}
DL	-0.0167**	-0.494**	-0.00880	-0.327
	(-2.121)	(-2.150)	(-0.971)	(-1.222)
HHI_DL	-0.00716	1.012	-0.0641**	-0.842
	(-0.257)	(1.245)	(-2.265)	(-1.007)
Large			-0.0531**	-2.662***
			(-2.330)	(-3.952)
Small			0.0508**	1.571**
			(2.271)	(2.379)
Large_DL			0.0278	1.766***
			(1.280)	(2.752)
Small_DL			-0.0277	-0.879
			(-1.418)	(-1.524)
LnA	-0.0346***	-1.171***		
	(-13.35)	(-15.47)		
δLnA	0.0258***	0.683***	0.0324***	0.905***
	(3.274)	(2.961)	(3.979)	(3.767)
KA	-0.0895	-8.799***	-0.263***	-14.70***
	(-0.957)	(-3.222)	(-2.754)	(-5.216)
δln Population	0.419*	15.23**	-0.422*	-13.71**
	(1.800)	(2.239)	(-1.872)	(-2.056)
δln GPP	0.0926**	3.624***	0.134***	5.090***
	(2.445)	(3.274)	(3.436)	(4.430)
Constant	0.304***	12.21***	0.0907***	5.128***
	(14.23)	(19.54)	(6.448)	(12.34)
Observations	1,816	1,801	1,816	1,801
t-statistics in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

We compare tables 4.3.1 and 4.4.1.3 here. In column one and two of the above table estimated coefficients of DL implies that credit union which primarily depends on deposit to fund loans performs worse both at risk adjusted and unadjusted basis. These findings are consistent with the findings in table 4.3.1. In all columns estimated coefficient shows that KA has negative relation with credit union performance. High capital-asset ratio suggests that a credit union is operating over-cautiously and neglecting business opportunities (Goddard et al., 2008). In columns three and four estimated coefficients for large, small, large_DL and small_DL suggest similar interpretation as of table 4.3.1.

Comparing table 4.1.1, 4.2.1 and 4.3.1 with 4.4.1.1, 4.4.1.2 and 4.4.1.3, we see our models provide consistent results that have been supported by previous research. A common practice in robustness test is to check how regression coefficients behave when the regression specification is modified in some way. If estimated results are consistent then it indicates the structural viability of the presented model (Lu et al., 2014).

4.4.2.Second test of robustness:

In this second robustness test, we winsorize data at 1% and 5% level and run two separate regression tests using our baseline model. By winsorizing data, we limit outliers' impact and thus get a more robust estimator (Blaine, 2018). After running regressions using the winsorized data at 1%, we see our estimated coefficients provide similar results as in table 4.1.1 Again using 5% winsorized data, we run the regression and observe that our estimated coefficients provide consistent results as of table 4.1.1.

Chapter 5

Conclusion

This research aims to measure the impact of income diversification on the performance of Canadian credit unions. We have used data of Canadian credit unions with an asset of at least 100 million from 2002 to 2019. We have considered credit unions that operate their business outside Quebec only.

5.1. Summary of findings:

Our analysis shows that noninterest income positively impacts performance of the credit union. For large credit unions, noninterest income generate higher profit compared to smaller credit unions. We introduced two additional models to see the impact of diversification from different angles. In the second model we tested how loan to asset ratio effects credit union profitability. Result shows that traditionalness of the asset portfolio has positive impact on credit union performance. In third model, we tested how deposit to loan ratio effects credit union profitability. Result shows that maintaining traditional funding source has negative relation with credit union performance. After the main analysis, we have conducted a robustness test to check the strength of our model. We have substituted the ROA with ROE and tested whether our model holds. Here we see the similar effect of income diversification on credit union performance.

5.2. Limitation, practical implication and scope for future research:

Our study did not include credit unions from the Quebec region. Chartered banks are the dominant financial institutions in most of the provinces in Canada, but in Quebec credit unions are more dominant than banks (Langan, 1988). New research can be done to see the impact province or area-wise. Governance factors such as board size and board independence are other key areas where analysis could be done. Also there is scope for comparison between US and Canadian credit unions.

With proper analysis, all the financial institutions can tap the new scope of earning from the sector. Non-interest income may become the lifeblood for many credit unions in future. Not many research have been done solely based on Canadian credit unions. This paper is one of the very few

that tries to shed light on this field. More analysis should be done to realize the full scope in this field.

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