**Institutional Setting**

This study focusses on the performance of Canadian Global Systemically Important Banks (G-SIBs) and Domestic Systemically Important Banks (D-SIBs). According to the Basel Committee on Banking Supervision (BCBS), G-SIBs are the top 40 banks worldwide accessed based on an indicator-based measurement approach. The indicators include the perspectives of size, interconnectedness, substitutability, complexity, and cross-jurisdictional activity. Any distress or failure of these G-SIBs would cause disruption to the global financial market and lead to significant damage on the global economy. Similarly, D-SIBs are the banks whose failure can lead to significant disruption on a nation scale. There are 6 G-SIBs and D-SIBs in Canada which forms the treatment group in this study.

The control group consists of all the 25 G-SIBs and D-SIBs in the United States, because the raise of T1CR Requirement was not fully implemented in the US until 2014 which is 4 years after the Canadian banks fully adopt to the new rules. The delay of the US new policy implantation timeline makes US banks to be a comparable baseline group to study the impact of the policy change in Canada. Thus, the data collected in this study is from 2011 to 2017 ----- pre policy change is between the first quarter in 2011 and the fourth quarter in 2013; post policy change is between the first quarter in 2014 and the fourth quarter in 2017.

The increased T1CR requirement from 4% to 6% was firstly introduced in 2010 as one of the updates from Basel II to Basel III. The new version of the Basel Accord was in response to the weaknesses of the banking system revealed during the global financial crisis, and it aimed to prevent future crises, ensuring a more resilient banking system. All the financial institutions worldwide are required to follow this accord, but the timelines of the implantations in each country vary based on their capability to adopt the changes, including the ability to raise their tier 1 capital which demonstrates a bank's ability to withstand financial stress and remain solvent. The higher T1CR is, the more resilient a bank can be. However, on the other hand, too high ratio is anticipated to hurt the profitability and growth potential of a bank, limiting the return on equity. Thus, the balance between safety and profitability is what banks and regulators aim to find. In this study, we aim to examine if the raise of T1CR requirement statistically decreases the return on equity of Canadian G-SIBs and D-SIBs using the US banks performance as a baseline.

**Data Source**

In order to comprehensively conduct the research, this study take into account of both macro-economic factors and bank wise features. The annual macro-economic factors in the two countries are from the databases hosted by the World Bank, extracted through an R package called “WDI”. The bankwise data is collected through Bloomberg Terminal which integrates all the financial reports of all banks in this study. To maximize the precision of the study, I collect the quarterly financial data as it is the most granular public available information. In general, the combined dataset from such two sources forms a 983 X 10 panel data, with 31 individual banks within 28 quarters between the start of 2011 and the end of 2017. However, some data are not available for some banks in a certain period, and this led to missing values. The summary statistic is as follow (all rounded up to 2 decimal places):

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Description automatically generated with medium confidence

**Empirical Strategy**

*Economic model*

A Difference-in-Differences (DiD) regression framework is applied to estimate the causal effect of the policy change and capital regulations on bank profitability.

The subscript `i` and `t` represents bank i at time t. Bank profitability is measured by Return on Equity (ROE), defined as the ratio of net income and Shareholders’ Equity. Higher ROE indicates more efficient management of banks’ assets and liabilities to generate earnings.

The key variables of interest include T, P and TP, an interaction term representing treated and post-treatment periods, which allow identification of the differential impact on treated banks relative to control banks over time. In this case, T=0 if the data is collected before the first quarter of 2014 while T=1 if the data is collected after the policy change since the first quarter of 2014. Similarly, P=0 for US banks in the control group while P=1 for the treated Canadian banks.

There are 8 control variables in the model, 5 measures bank-level financial conditions and 3 describe the national economy development in Canada and the US. T1C\_B is the Tier 1 capital in billions, and it represents the Tier 1 capital buffer. Leverage ratio quantifies the reliance on debt to fund operations and asset purchases in banks. Adjusted EBITDA is a bank’ earning before interest, taxes, depreciation, and amortization. Market capitalization or "market cap", is the total dollar value of a company's outstanding shares of stock. And these 2 variables are both in billions. The macro indicators including real gross domestic product (GDP), inflation (CPI), and 3-month real interest rate (RIR) are also used by the model which capture broader macroeconomic influences across the treaty group and the baseline. More specifically, GDP is measured by USD in both countries, and CPI measures the inflation level using 2010 as the base year.

αi absorbs the bank fixed effects to eliminate bias from time-invariant unobserved heterogeneity across banks. δt absorbing time fixed effects which control for all common shocks that affect all banks in the dataset at the same point in time. Standard errors are clustered at the bank level (εit), because in panel data where observations are repeated over time for each bank, it's very likely that the error terms within each bank are correlated across time; if ignoring this intra-bank correlation and use standard errors that assume independent observations, the model will underestimate the true variability of the estimated coefficients. Thus to make sure the robustness of the analysis, clustered error is necessary.

*Assumptions*

The Difference-in-Differences (DiD) analysis requires parallel pre-policy trend comparing the treatment group to the control group.To assess the robustness and the identification assumption of DiD, a plot of ROE trend comparing the Canadian G-SIBs and D-SIBs and their US comparable from 2011 to 2017 is checked. However, we cannot observe a similar trend in both the control and treatment groups before the policy change. This indicates that, even in the absence of the policy change, we cannot assume the control group would have reacted in the same way as the treatment group. Therefore, the comparison between the two groups provides weaker evidence. Potential bias may arise from this discrepancy, which could lead to an overestimation of the effect of the T1CR increase on ROE.