

An Overview of the Canadian Banking System: 1996 to 2015

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September 7, 2016

Abstract

From 1996 to 2015, total assets at Canadian banks and foreign banks operating in Canada grew four-times in size. This growth occurred with neither a significant regulatory change, such as the repeal of Glass-Steagall, nor the introduction of new business lines, such as wealth management or investment banking. Using data from CANSIM and a little used dataset from OSFI, this article explains how the Canadian banks earn revenue, fund business activities, and pay expenses. The success of the Canadian banking system can be attributed to: 1) a focus on retail and branch-level banking, 2) a preference for deposit-financing, and 3) minimizing costs, particularly noninterest expenses. This paper seeks to provide a broad overview of the data, accounting rules, and trends in Canadian banking.

1 Introduction

In 2014, the Canadian banking system was made up of 25 domestic banks, 24 foreign subsidiaries, and 27 foreign bank branches operating in Canada. However this might give a false impression of market concentration in Canada. Just six large banks, known colloquially as the Big Six¹ controlled approximately 90% of total banking assets from 1996 to 2015. Although each of the Big Six banks enjoys its own specialties and comparative advantages, they share many common and quantifiable characteristics. These banks all have large international exposures and investments, particularly in the United States. [Damar et al. \(2016\)](#) found that when foreign jurisdictions tighten local prudential measures the Canadian banks will increase lending, particularly when capital requirements are increased. Each of these banks has a branch network that spans the Canadian provinces, they pool resources to pay for a common system of payments, and they offer a full range of services and lending which fits the definition of an universal bank. There was a major financial crisis in the United States that is generally understood to have begun in 2007, with the most severe parts of which ending in 2009. The Big Six mostly survived this crisis, and subsequently they have made record profits. The purpose of this paper is to identify past banking trends and those trends that remain ongoing. This can provide insight, not just to the operations of the banks in Canada, but to global banking trends that are apparent in the United States and overseas.

Figure 1 summarizes aggregate bank assets. Clearly, the Big Six Canadian banks

¹The 'Big Six' refers to Bank of Montreal (BMO), Canadian Imperial Bank of Canada (CIBC), Toronto Dominion (TD), Bank of Nova Scotia (BNS), Royal Bank of Canada (RBC) and the National Bank of Canada (NB). If the latter is removed then the prior banks are known as the 'big-five'.

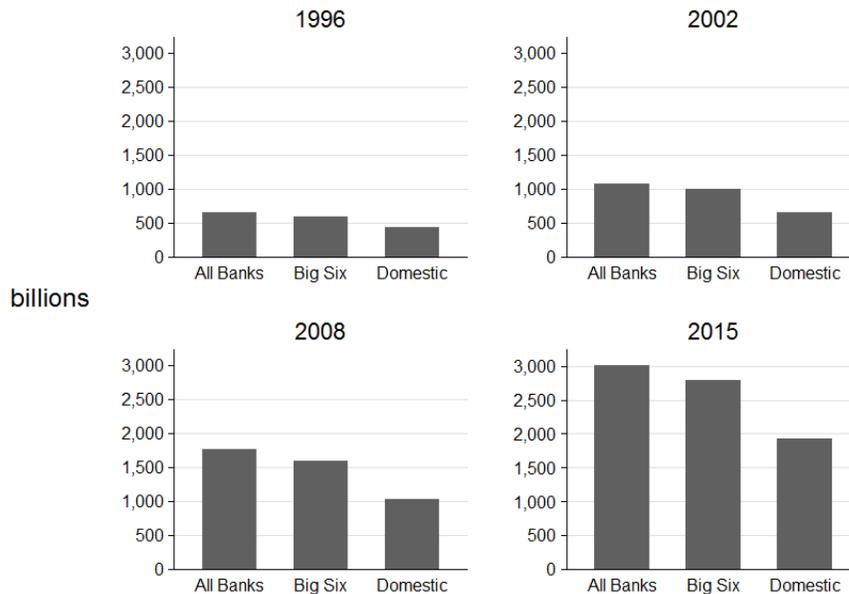


Figure 1: Financial assets

Note: Calculates financial assets as the sum of loans and securities. It is presented in billions of nominal Canadian dollars. Domestic assets were those securities issued by, or funds loaned to, an entity at a Canadian address. Sources: OSFI, assets with a Canadian address came from CANSIM.

dominate the banking system. Furthermore, figure 1 demonstrates the large amount of foreign exposure that Canadian banks have on the balance sheet. Recently, a number of Canadian banks have been expanding rapidly in the United States.² Figure 2 shows how the balance sheers of members of the Big Six grew over time. In 1996, CIBC was the largest Canadian bank, with RBC, and recently it expanded many operations into the United States. In 2015, CIBC had become significantly smaller than four of the other banks, and it had sold its US operations. This was due largely to legal penalties and trading losses during the financial crisis of 2007-'09. Despite this, the CIBC grew average real assets from \$200 billion in 1996

²TD has been quickly expanding retail branch network in the U.S. northeast. RBC recently purchased City National, one of the largest banks and wealth managers in Los Angeles. BMO continues to expand through the Mid-West from its base in Chicago.

to over \$400 billion in 2015. TD was the second smallest bank in 1996, yet, with help from a merger with Canada’s largest trust company, Canada Trust, had become the largest bank along with RBC. It continues to expand its operations in the U.S. north-east.

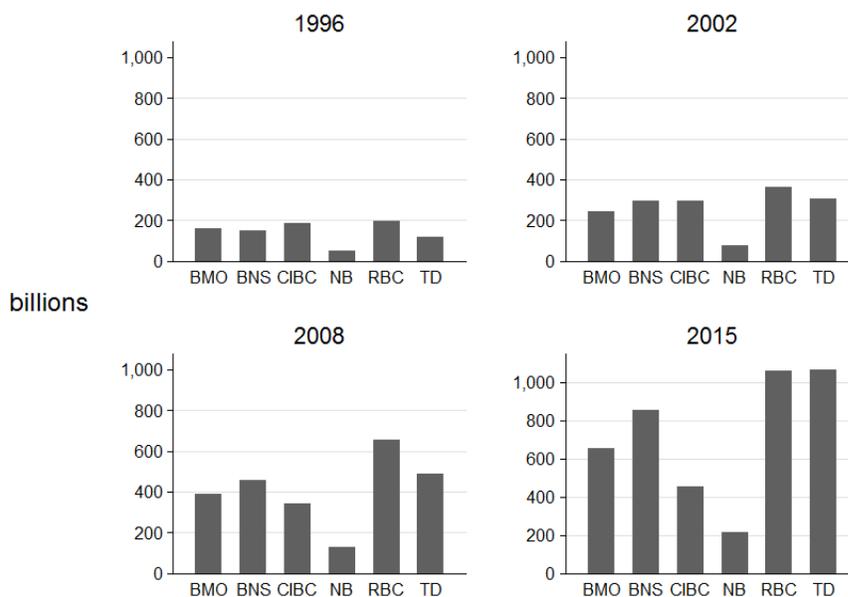


Figure 2: Total assets

Note: Shows total assets in billions of real 2012 Canadian dollars by bank. Source: OSFI

Data available from the office of the Superintendent of financial institutions (OSFI) does not differentiate between activities in Canada and in other countries, at least not with the data that is public available.³ Statistics Canada collects loan information according to the mailing address of the borrower, or in the case of securities, the issuer. More detailed information is sometimes available in the bank annual reports however even this information is typically relies on recipient ad-

³There is a separate filing for assets that are recorded in either Canadian branches, Canadian subsidiaries or Canadian head office accounts.

dresses rather than where business activities actually occur. These factors make it difficult to separate activities that occurred in Canada from those that occurred in other countries. However each Canadian bank must file regulatory reports in the United States detailing their American business activities. The information is public information available,⁴ so this offers a potential work-around, as far as activities in the United States are concerned. OSFI publishes assets and liabilities in domestic and foreign currency. A researcher could assume that any asset in a foreign currency likely occurred in a foreign country but is difficult to say how accurate this assumption would be. At times between 1996 and 2015, the foreign currency data appears to have missing observations and inconsistencies, particularly during the financial crisis of 2007-'09, that are not easily corrected.

For the purposes of this paper, and in light of the difficulty in separating Canadian business activities from international activities, I define the Canadian banking system as any Canadian domestic bank and any foreign bank's business activities (or assets) reported to OSFI. This might seem somewhat odd but it coincides with the data available under the OSFI 'Total All Banks' category. As figure 1 suggests, it is unlikely that any of the results herein would differ if only the Big Six banks or all domestic banks were used. One advantage of this definition is that it includes HSBC Canada, which has grown significantly to become the seventh largest bank, and the largest foreign bank operating in Canada. Total assets at the bank accounted for \$20.3 billion in 1996 and \$90.8 billion in 2015 while the National Bank, smallest of the Big Six, accounted for \$215 billion in 2015.

⁴Quarterly U.S. bank holding company information can be found in the FR Y-9C regulatory filing available from the Chicago Federal Reserve website or the Wharton Research Data Services (WRDS)

Compared to the banking system in the United States, there is much less publicly available information on the Canadian banks. Both OSFI and statistics Canada, with data from the Bank of Canada and OSFI, make banking information available to the public⁵. Statistics Canada has aggregate banking information while OSFI has both individual bank information and conveniently aggregated information. OSFI only makes some of the information that it collects available to the public. A complete description can be found by perusing the many regulatory filing requirements which are listed on the OSFI website. Unlike the US Federal Reserve, which collects data with a mandate to assist researchers, OSFI has no such mandate. This presents something of a roadblock to analyzing the Canadian banking system. Fortunately, since 1996, the OSFI website has publicly available information on the income statement, balance sheet, impaired loans reports, Basel capital requirements, and derivative positions.⁶

Using the information described above, I present a summary of the Canadian banking system during the 1996 to 2015 time period. The paper is organized according to the monthly and quarterly accounting statements, which are published by the banks and approved by a major accounting firm, and regulatory filings submitted to OSFI and made available on the OSFI website⁷. Section 2 highlights the asset-side of the balance sheet which gives insight into the loan portfolio of a bank.

⁵Statistics Canada's CANSIM database can be found at <http://dc.chass.utoronto.ca/chasscansim/> while the OFSI data can be found at <http://www.osfi-bsif.gc.ca/Eng/fi-if/dti-id/Pages/default.aspx> under financial data.

⁶Unfortunately, this is not made readily accessible to outside researchers. On January 22, 2003 I received the following reply to my request for OSFI public information in a .txt or .xls format: "...the data is not available in any format other than that which is provided on the website. In addition, it is not our role to provide the public with analytic or other types of reports on the financial data." Consequently, spent consider effort downloading, sorting, and collating the data into usable time series and cross-sections.

⁷<http://www.osfi-bsif.gc.ca/Eng/wt-ow/Pages/FINDAT.aspx>

In real terms, the number of assets in the Canadian banking system has nearly doubled twice in the past twenty years. In 1996 there were average annual assets of \$1220.1 billion real 2012 Canadian dollars at the Canadian banks or at foreign banks operating in Canada. By the end of 2015, this number increased to \$4428.9 billion, and it was continuing to increase into 2016. The Canadian banking system contains a smaller proportion of business loans and a greater proportion of mortgages and consumer loans than it did in 1996. This reflected a shift toward household-lending. Section 3 focuses on revenue, specifically net interest income and noninterest income. During the pre-crisis 2000's, it appeared that noninterest income was going to surpass net interest income on loans and securities. Net interest income reflects the role of a bank as intermediary between lenders and borrowers, and it seemed possible that the rise in noninterest income reflected the Canadian banks move to an originate-and-distribute business model. However this trend reversed during, and subsequent to, the financial crisis of 2007-'09. Section 4 is divided into two subsections: the first, subsection 4.1, focuses on how banks fund their business activities and how much it costs. The Canadian banks rely primarily on two sources of funds: deposits from individuals, whose levels remained steady during the financial crisis, and wholesale deposits, which declined by over \$50 billion in 2009.⁸ Subsection 4.2 shows the kind of noninterest expenses Canadian banks pay. Labour expense is the largest single component and a consistent fraction of noninterest expense. Section 5 explains the accounting behind bad loans and how these are measured on the balance sheet, income statement, and the impaired loans report. Section 6 discusses some of the issues around risk-weighted assets

⁸As explained in subsection 4.1, what might be called senior debt in other jurisdictions, GICs for instance, is often included in fixed-term deposits.

(RWA). Specifically, how RWA were calculated over the sample period, and how effective RWA were as a measure of risk; both as a measure of aggregate risk in the banking system and as a measure of comparing risk at banks. Section 7 concludes.

2 Balance sheet assets

A traditional role of a bank is to act as an intermediary between depositors (savers) and borrowers. Using double-entry accounting, the deposits appear as liabilities while the loans appear as assets on the balance sheet, so the balance sheet can tell us about the sources of funding, and it can tell us something about who is borrowing and who is lending. However it should be noted that other bank activities often circumvented the balance sheet. The lend-and-distribute or market-oriented business model packages loans into securities which were then sold to third parties. Collateralized debt obligations (CDOs) and mortgage-backed securities (MBS) were classic examples and became infamous during the financial crisis of 2007-'09. These items were often held off balance-sheet despite exposure to potential losses. Lines of credit, which may not be drawn on, were frequently held off-balance sheet. Investment banks raise funds for corporate clients by 'placing' new and seasoned debt and equity offerings with third-party investors. There exists no commensurate asset associated with these activities although regulators and accounting standards have changed to attempt to account for at least some of the risks of securitization, while issuing new securities through an IPO poses little risk of insolvency to an investment bank. The following section explains and summarizes the balance sheet information available through OSFI.

Canadian banks must file a consolidated balance sheet with OSFI on the last day of every month. The consolidation is something of a two-edged sword. It makes it easy to observe all the bank assets in one place and translated into Canadian currency, but it makes it very difficult to parse the information into geographic or operational components. On January 31, 2016, the Canadian banks held a total of just over \$5 trillion of which \$2.6 trillion worth was denominated in foreign currency. Banks held these in gold, bank notes and deposits with regulated financial institutions (cash and cash equivalents). They also held securities: Canadian treasury bills and longer term government bonds, other debt securities and equity. Each balance sheet item is reported net of any impaired loans.⁹ There are 17 sub-categories of loan types in the regulatory filings so I will not list each of them here, but in brief there are loans to domestic and foreign governments, loans to financial companies such as investment dealers, reverse repurchase agreements (repos), and loans to deposit-taking financial institutions. Banks report consumer loans that are secured by residential property, secured by other types of property and those that are unsecured. Loans to corporations and small businesses are pooled together while some of these are secured by residential property. However most are directly secured by other assets or unsecured loans although if the loan is nonrecourse then the lender can make a claim on any property, so it could be indirectly secured by property. There are residential mortgages some of which are insured and some of which are uninsured. There are a small number of reverse mortgages, nonresidential mortgages and New Home Act (NHA) MBS pooled and unsold mortgages. These are securitized mortgages sold to the Canadian Mortgage and Housing Corporation (CMHC) but the sale has not yet been recognized under the new IFRS accounting

⁹Section 5 describes impaired loans in detail.

standards introduced in 2011. Previously, these unsold, securitized mortgages were held off-balance sheet. This was good for bank profitability because banks did not need to hold any off-setting, and costly, liabilities. However under the new accounting regime, these MBS became more costly. In 2015, these averaged \$178 billion, or 17% of residential mortgages.

In response to the increase in balance sheet assets from IFRS, the banks began to explore options for less expensive funding, including covered bonds. These types of bonds are cheap because they are secured, or collateralized, by both bank equity and a portfolio of loans. This portfolio is 'ring-fenced', that is the most senior claim on these assets goes to the covered bond holder, from other claimants. The bank needs to maintain the value of the collateral above a minimum level, so at times the bank may need to add new assets in order to replace those that no longer held sufficient value. Hence they are extremely low-risk. Covered bonds are extremely popular among European banks and investors.¹⁰ [Ahnert et al. \(2016\)](#) provide a theoretical analysis on the implications of secured funding for a banking system. Because the bank needs to maintain the collateral underlying the covered bonds they have a strong incentive to screen and monitor the loans to make sure that they are of good quality. Given the experience of securitization during the financial crisis, this aspect of covered bonds could have a positive effect on financial stability. On the positive side, [Ahnert et al. \(2016\)](#) found that covered bonds allowed for less expensive financing which increased investment and financial stability. However they also find that as more covered bonds are issued, the burden of risk is placed on unsecured depositors and creditors. So in the event of a negative shock, depositors,

¹⁰In July 2016, the Canadian Imperial Bank of commerce raised \$1.8 billion of funds from a covered bond sale of six-year debt denominated in euros. The yield to maturity was -0.009%.

and the institutions that provide deposit insurance, i.e. the federal government of Canada and the Canadian Deposit Insurance Corporation (CDIC), would be more exposed than they would otherwise be if covered bonds were not a major source of bank funding. Section 4 discusses other sources of bank funding and liabilities in detail.

Table 1: Aggregate assets

Loans to:	Assets (billions)			Relative proportion		
	1997	2006	2015	1997	2006	2015
Financial institutions	16.9	22.8	74.4	1.45%	1.06%	1.60%
Businesses	262.8	253.4	566.6	22.6%	11.7%	12.2%
Residential mort.	214.1	422.9	1214.8	18.4%	19.6%	26.2%
Commercial mort.	13.9	33.8	85.6	1.19%	1.57%	1.85%
Consumer	101.7	249.9	550.3	8.73%	11.6%	11.9%
Total	609.4	982.9	2491.6	52.3%	45.5%	53.7%
Cash and securities:						
Cash equivalents	94.7	107.7	268.1	8.12%	4.99%	5.78%
Can. gov't securities	95.4	148.1	247.7	8.18%	6.86%	5.34%
Bonds	82.1	252.3	424.0	7.05%	11.7%	9.14%
Equity	32.5	186.5	245.8	2.79%	8.64%	5.30%
Reverse repos	106.8	173.4	501.2	9.16%	8.03%	10.8%
Total	411.4	868.0	1686.9	35.3%	40.2%	36.4%
Other assets:						
Derivatives	60.4	149.9	327.5	5.18%	6.94%	7.06%
Net physical capital	9.5	10.4	15.8	0.81%	0.48%	0.34%
Banker's acceptances	42.2	46.6	73.9	3.62%	2.16%	1.59%
Other assets	30.3	97.6	42.0	2.60%	4.52%	0.91%
Total				12.2%	14.1%	9.9%
Total assets	1165.4	2158.2	4637.6	100%	100%	100%

Note: all numbers are shown in billions of (nominal) Canadian dollars. All proportions are relative to total assets. Business loans include leases. Derivatives are recorded at fair value. Source: OSFI.

Table 1 presents information on the average annual balances among the Canadian banks for the years 1997, 2006, and 2015. The most prominent change was increasing size of the balance sheet which, as illustrated in figure 1, was driven by

the Big Six. In nominal terms, the Canadian banks and foreign banks operating in Canada had assets four times the size in 2015 than in 1997. Mortgages as a percentage of total assets increased by only 1.33% from 1997 to 2006 but increased 6.59% from 2006 to 2015. New IFRS accounting rules increased this value by 177\$ billion, yet if we subtract this total off both total assets and residential mortgages we found that residential mortgages still accounted for 23.3% of bank total assets in 2015. This remained a substantial relative increase over 2006 and it reflected an increase in real estate prices, particularly in Toronto and Vancouver. The relative size of equity, both direct-equity and securities, and bond securities relative to total assets was highest in 2006 at 20.4%, prior to the financial crisis. This was substantially higher than the 9.84% in 1997 which was made-up mostly of bonds. The relative increase in corporate and non-Canadian government securities and the relative decline in business loans could represent a move towards market oriented activities, such as securitization. However this conclusion is not supported by the aggregate revenue illustrated in table 2. The revenue entry that included securitization was the same relative size in 2015 as it was in 1997. Another possible explanation is that, beginning in the 1980's, the business cycle appeared to become less volatile, specifically inflation and output. [Stock and Watson \(2003\)](#) referred to this phenomenon as 'the Great Moderation', and it was made popular in a speech by Ben Bernanke in 2004.¹¹ This sustained decline in volatility encouraged many investors to acquire assets with higher yields, and consequently more risk, than they would have in 1997 when 8.12% of assets were held in cash. To conclude, the relative increase in loans to households, and the relative decrease in business loans,

¹¹The speech can be found here: <http://www.federalreserve.gov/BOARDDOCS/SPEECHES/2004/20040220/default.htm>

reflected the continued focus on retail and branch banking.

Figure 3 illustrates the composition of the loan portfolio in four, relatively usual, time periods. The aggregate loan portfolio and the loan portfolio of each of the Big Six are presented. Business loans were the most volatile with peaks and troughs that lagged the business cycle. In fact, business loans peaked during the second fiscal quarter of 2009 while other securities, including equity, peaked during the third and fourth fiscal quarter of 2007. There could be a number of possible explanations as to why this might be the case. It was not clear to markets that the United States was in a recession until the fall of 2008,¹² so that banks were readily able to sell these assets when U.S. and Canadian banks began to suffer stress in the summer of 2007. It is certainly easier to sell assets if there is a pre-existing secondary market, and the secondary market for equity securities is much stronger than that for loans, or even corporate bonds.¹³ Business loans contain many idiosyncratic and opaque features, and this makes it difficult to sell to third parties. Possibly, these loans remained on the balance sheet until they reached maturity, at which point they expired, and then bank could choose not to rollover the debt.

Liquid assets, which include government securities, reverse repos and cash equivalents, represented 25.5% of all assets in 1997. Government securities were in high

¹²This is not to suggest that no one had realized the recession had begun or that many U.S. banks were in trouble, but rather that market participants did not unanimously believe that a downturn had begun, and that few understood the extent of the forthcoming slow-down. Economists and government officials gave conflicting opinions, yet it was not until December 1, 2008 that the National Bureau of Economic Research announced that U.S. employment had peaked in December of 2007. This was tantamount to official recognition that the United States was in an economic recession.

¹³For a brief discussion on the illiquidity of corporate bond markets, see the FRED Blog from the U.S. Federal Reserve of St. Louis in 2015: <https://fredblog.stlouisfed.org/2015/10/illiquidity-in-the-bond-market/>. Even the market for U.S. government securities can have periods of illiquidity.

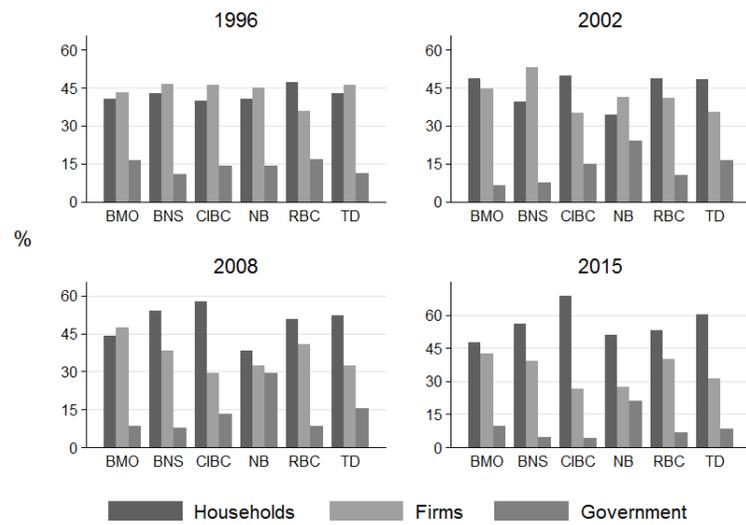
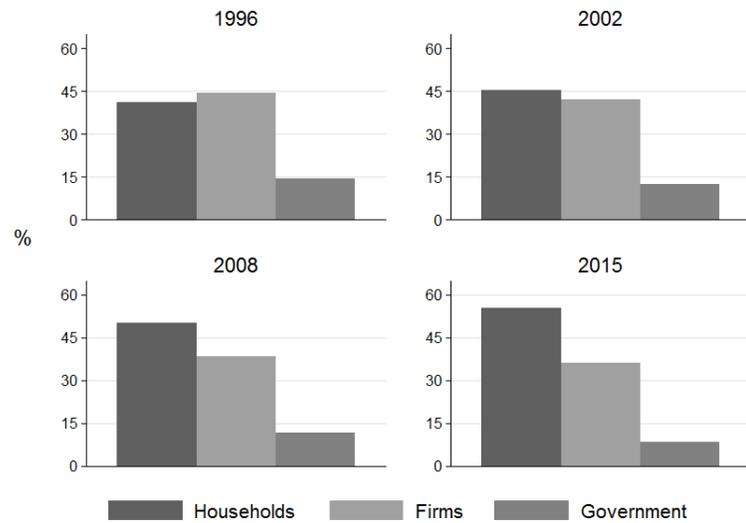


Figure 3: Aggregate loans

Note: Annual aggregated average loan balance is a percentage of average total loans. Households include residential mortgages, consumer loans, and unsold NHA MBS. Firms are the sum of business loans, reverse repos, and commercial mortgages. Government includes domestic loans and securities, and foreign government loans. Source: OSFI.

demand during the financial crisis of 2007-'09. In 2008, the banks held an average of \$194 billion in Canadian government securities, and this went up to \$315 billion

the following year. This was because the Canadian governments issued more debt as tax revenue declined, but also because there was a ‘flight-to-quality’ episode that the Canadian banks partook of. Figure 4 shows the amount of Canadian government debt held by the banks, in real 2012 Canadian dollars, and the average return on that debt. With the collapse of Lehman Brothers in September of 2008, there was a flight to quality, i.e. low-risk assets, as the Canadian banks sold their equity positions and purchased safe¹⁴ Canadian government bonds. After the crisis and commensurate with the transition to IFRS accounting standards, the banks sold these securities or allowed them to mature without replacement, and they were replaced on the balance sheet with NHA-MBS.

Derivative assets are held at fair value on the balance sheet while changes in value are recorded in other comprehensive income, which is not shown here. There is a corresponding derivative liability that is also held at fair value on the balance sheet. IFRS 9 Accounting standards are strict about when hedging can offset derivatives and consequently both the asset and liability entry can be removed from the balance sheet. This partly explains why the derivative assets and derivative liabilities were relatively large compared to the net difference, which should not be confused with hedging. There was a negligible correlation between trading revenue and the average level of derivatives on the balance sheet over the sample, so it becomes difficult to connect these two balance sheet items to trading revenue. Net physical capital (Land, buildings, and equipment, less accumulated depreciation) also includes improvements to bank branches, whether the property is rented or owned directly. Land and buildings are depreciated using the straight-line method

¹⁴In Canada, federal, provincial, and municipal bonds have proven safe enough but this was not necessarily the experience in European countries and among some U.S. municipalities.

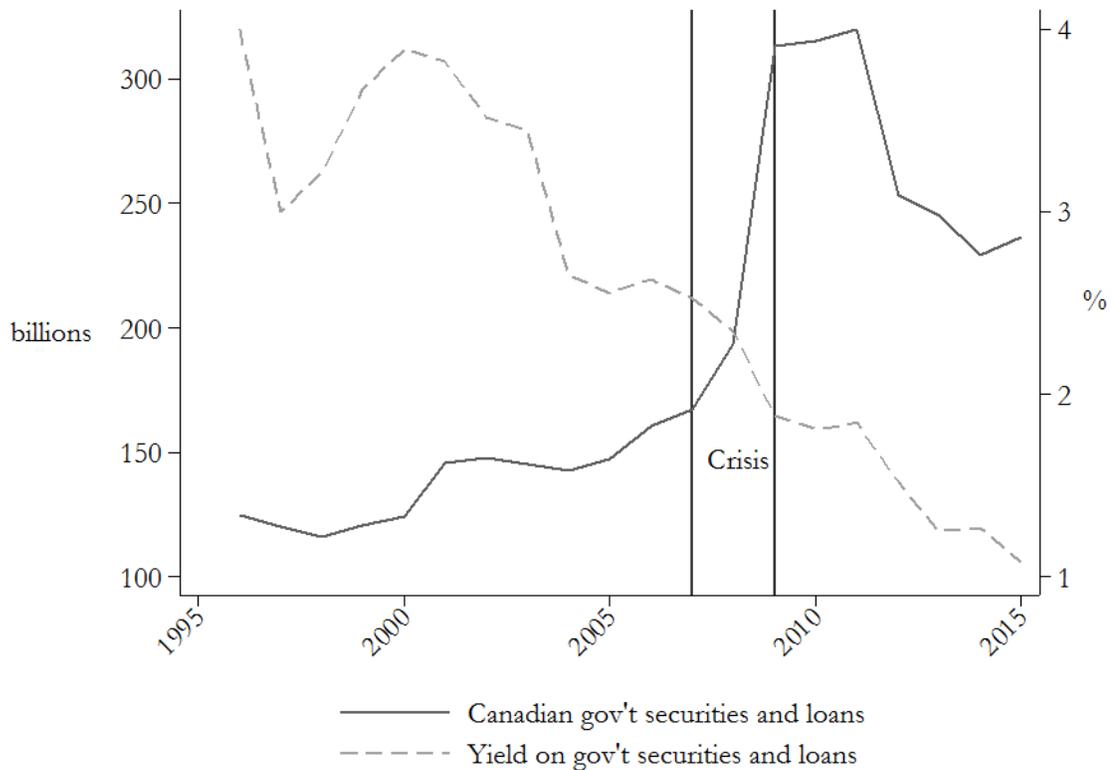


Figure 4: Canadian government securities and yield

Note: The average quarterly balance is shown in real 2012 Canadian dollars. Canadian government securities included those issued by the federal, provincial, and municipal levels of government. Following the adoption of IFRS Accounting standards, there was an immediate drop in Canadian government securities. Source: OSFI

while the method of depreciation for equipment varies by bank. Some banks used the straight-line method while others used a combination of the straight-line and double-declining methods. Maturities on equipment were typically 2-5 years, and occasionally 8 years while the depreciation on buildings could be as long as 30 years. Banks were willing to allow depreciation to accumulate upwards of 70% of the initial cost, so the net value can be a misleading indicator regarding the amount of physical capital in use. In 2015, physical capital made up less than .3% of all

bank assets and has been declining over the sample period. This either reflected a more efficient use of physical branch space combined with the decreasing cost of computing power, or a greater reliance on renting rather than owning property¹⁵. Other assets was calculated by subtracting each of the categories listed in table 1 from total assets. This category included insurance related assets, accrued interest, prepaid or deferred charges, goodwill, and intangibles. It also included a sundry list of assets such as foreclosed real estate, recoverable losses from hold-ups, and defined benefit pension assets.

3 Income statement revenue

The balance sheet offers a snap-shot of some, but not all, assets and liabilities. To understand what services a bank provides, it is necessary to turn to the income statement. There are many ways of parsing business activities in a bank; each of the Big Six has an annual report which does just that. An intuitive approach is to begin with intermediation, sometimes known as the ‘traditional’ banking activity. Indicating its importance, interest revenues and expenses make-up the first series of entries on the OSFI income statement. The primary role of a financial intermediary is to earn income by loaning funds to borrowers while safeguarding the funds of savers. Banks lend to clients which include firms, households, governments, and government agencies. Households borrow in two large categories: mortgages and consumer loans, the latter of which is sometimes secured by property or other assets such as automobiles. Naturally, banks fund these activities with deposits along

¹⁵Looking at the Canadian bank annual reports, it appears that not all real estate leases were capitalized on the balance sheet. See McKeown 2015.

with equity, repos, and subordinated debt (bonds). Banks may (or may not) pay interest on deposits but these are anything but homogenous; they vary in terms of interest rates, minimum balances, and terms of withdrawal. In fact, on any given day there are a bewildering array of guaranteed-investment certificates (GICs) and other products posted on the Globe and Mail markets section. On August 3, 2016, the Canadian Imperial Bank of Commerce (CIBC) alone offered nine short-term non-registered deposit contracts as well as a larger number of registered deposit contracts and those with longer maturities. The minimum balance ranged from ranged from \$1,000 to \$250,000. Depending on whether the GIC was redeemable or whether the maturity was 30 or 270 days, the deposit rate ranged from 0.05% to 0.4% simple interest.¹⁶

Figure 5 shows the net interest rate spread on different types of loans which is calculated as revenue per asset type less the average interest expense of all interest-paying liabilities. Loans to businesses have the highest spread, and it is the most volatile. During the financial crisis, there was a steep decline in the interest spread while concurrently, the spread on asset classes with fewer relative impaired loans, such as residential mortgages, commercial mortgages, and consumer loans, all increased. What mechanics caused the spread on business loans decline? There are two likely possibilities. First, the amount of outstanding high-interest bearing loans may have decreased. Business loans peaked in the first and second quarter of 2009, yet the banks could have chosen not to roll-over the riskier loans when they came due. Second, many of these loans went bad, the interest was never collected, and

¹⁶This can be found in the Globe and Mail: markets section and is provided by CANNEX Financial Exchanges Limited. http://www.globeinvestor.com/servlet/Page/document/v5/data/rates?pageType=gic_short&tax_indicator=R&page=1

the banks eventually lost a portion of the principal. On October 31, 2009 there were \$12.7 billion business loans that had failed to make a payment in the previous 90 days and at which point a loan is classified as impaired. This was up from \$3.3 billion on the same day in 2007. By comparison, the number of impaired residential mortgage loans was \$1.1 billion on October 31, 2007 and \$3.1 billion on October 31, 2009. This is despite the fact that table 1 shows that in 2006, 19.6% of total assets were residential mortgages while business loans accounted for just 11.7%. The spread on business loans likely declined as high-risk loans failed to pay.

With hindsight, we can infer a certain level of risk based on these spreads. It seems residential mortgages were, on average, the least risky followed by commercial mortgages. The highly collateralized nature of these mortgages can significantly reduce, but certainly not eliminate, the risk. In Canada, mortgages were full-recourse loans, meaning that borrowers must repay the mortgage in full, or lenders can make claims on the borrower's other assets¹⁷. Canadian federal regulation requires that the minimum down payment on a mortgage is 5% of the value of the loan, and any mortgage must have a down payment of at least 20% otherwise insurance is mandatory. Banks and other lenders purchase insurance on mortgages through the Canadian Housing and Mortgage Corporation (CMHC), and pass the cost onto the borrower. While CMHC is the largest insurer of mortgages in Canada, there are also private providers.¹⁸ Naturally, the collateral is worth more when the real estate prices are constant or increasing. If the value of the real estate underly-

¹⁷In some U.S. jurisdictions, the law of the land was non-recourse mortgages which encouraged borrowers and exacerbated lending losses.

¹⁸Genworth Canada and Canada Guaranty (formerly AIG United Guaranty) are the two largest private insurers. It is interesting that these two private firms were able to compete with what was a government monopoly designed to encourage home-ownership, essentially a subsidy program. Yet the presence of private firms suggests that CMHC pricing was imperfect.

ing these mortgages declined then losses could be much more severe. For the most part, the Canadian banks avoided subprime lending in the United States which saw a severe downturn in real estate prices in specific geographic areas. By contrast, the Canadian real estate market mostly levelled off during the financial crisis, and subsequent to 2010, continued to increase through to the end of 2015.

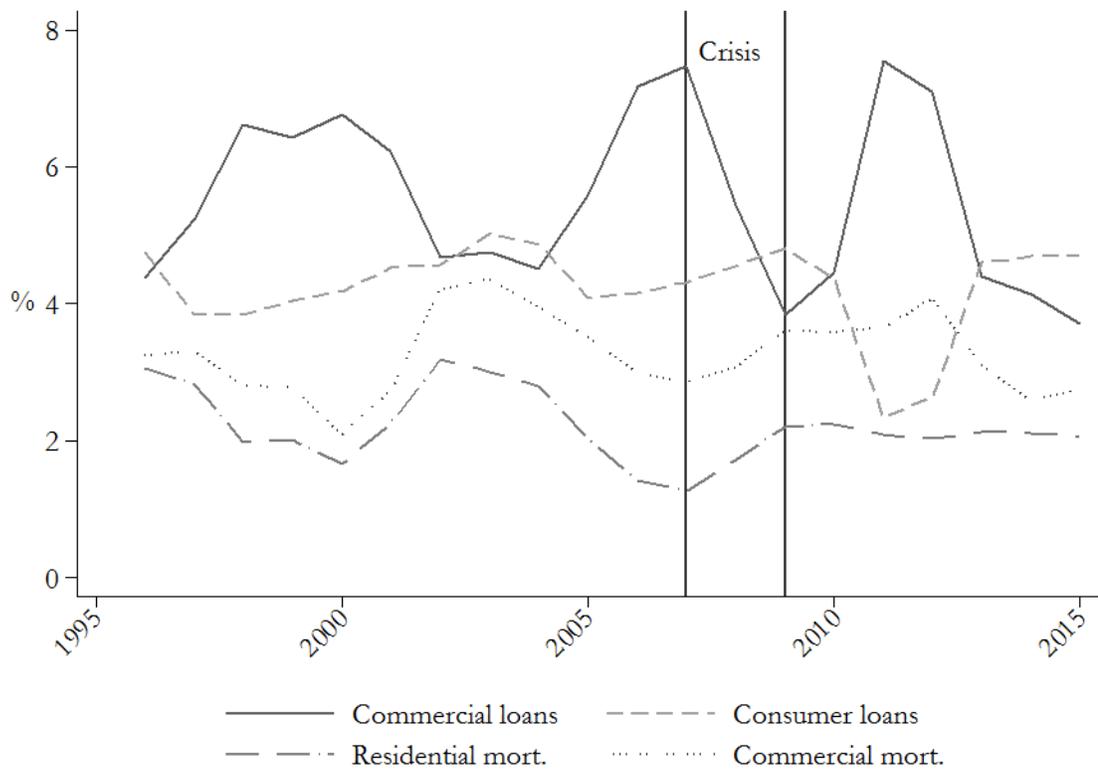


Figure 5: Average interest rate spreads

Note: Each interest rate spread is calculated as revenue per asset less interest expense per interest-paying liability. Source: OSFI

Similarly, banks provide loans to firms and accept firm deposits. It can be advantageous to a bank if they observe payments to and from a client, and even more so if the client runs her own business. This gives the bank an information advan-

tage over rivals and allows them to cater loans and other financial services that are well-suited to the taste and financial position of the client. Banks are skilled at maintaining relationships with current clients. A UK Competition and Markets Authority (CMA) report¹⁹ found that only 3% of individuals and 4% of firms switched banks in any given year, and the average bank-client relationship is 16 years. This phenomenon partly explains how more established banks, such as the Big Six, continue to dominate financial systems even with increased competition from new rivals and increased disruption from new technology. For a comprehensive survey on relationship banking and bank switching costs, see [Greenbaum et al. \(2015\)](#) chapter eight and [Berger et al. \(2014\)](#) chapter two.

To both firm and household depositors, banks offer a range of financial services for a fee. To separately identify each service, I use the noninterest income categories from the regulatory bank filings to OSFI. Summary income statements are filed quarterly in fiscal periods ending the last day of January, April, July and October; the last of which is the year end. Banks collect fees on deposit accounts such as transaction charges, cheques, and overdraft penalties (service charges on retail and commercial deposit accounts). They collect fees on certain debit and credit cards (credit and debit card service fees) and on certain loans and credit lines (mortgage, standby, commitment, and other loan fees). For a price, they facilitate payments between separate legal entities (acceptance, guarantees, and letter of credit fees) or to facilitate international trade (foreign exchange revenue other than from trading²⁰).

¹⁹”Making banks work harder for you”, UK Competition and Markets Authority, August 9, 2016. http://www.agefi.fr/sites/agefi.fr/files/fichiers/2016/08/cma_overview-of-the-banking-retail-market_9_aout.pdf

²⁰This category is largely made-up of branch level foreign currency purchases. Larger orders go through the Capital Markets traders. The exchange rate quoted on any trade depends on client characteristics such as creditworthiness, simplicity of the transaction and past trades.

Some of these activities, such as bankers acceptances, are traditional activities that can be traced back a long way back through banking history. While credit card and debit card fees are clearly more recent additions to the income statement.²¹

In the 1992 amendment to the Bank Act of Canada, the Canadian banks were allowed to compete with cooperatives and trusts in the wealth management industry. Previously, this industry was populated by smaller, independent firms.²² The Big Six banks were able to leverage their brick-and-mortar branches and then later the online platforms to entice depositors to purchase investment products such as mutual funds. Banks could underwrite their own mutual (investment) funds and securities while collecting commissions and fees. They could also offer investment management and custodial services. Traditionally, bank regulators were not concerned about wealth management because the products are owned by the client, and hence they do not appear on the balance sheet. Losses are passed directly on to the client. Consequently, little aggregate data is available beyond the revenue reported to OSFI and what banks choose to reveal in their annual reports, and this information is not always comparable year-to-year or bank-to-bank.

Finally, the Big Six also offered insurance however there remained a strong, separate insurance industry in Canada. The insurance companies successfully petitioned the Canadian government to pass a law that prevented Canadian banks from selling insurance products in a bank branch. This highlights the importance of the

²¹I would argue that banks have always facilitated financial transactions and charged fees for the privilege. Debit and credit cards also facilitate financial transactions, and it is not, in my opinion, a discontinuity from traditional activity, but adopting new technology to provide better service.

²²"How the Big Six banks won the battle for Canadians' wealth", *Tim Kiladze* July 27, 2013, *Globe and Mail*. The author reports the Big Six control as much as 90% of all the assets in retail brokerage accounts might be controlled by the Big Six.

bank branch network to the success of the Canadian banks. Insurance companies in Canada make-up the largest non-bank financial industry, and they recognized that it posed an existential threat to their business. Suppose a customer walks into a branch to secure a mortgage on a new home or an automobile loan on a new car. The bank would have a first-mover advantage to also offer the client insurance on the new assets, and the client could accept the offer with a great deal of convenience, no searching costs. The bank could even package the loan and the insurance together. This rule limited the growth of the bank insurance subsidiaries, and it remained a limited enterprise, yet still accounted for a net profit of \$4 billion in 2015.

The activities and associated revenues detailed above revolve around the bank branch and depositors. The law against selling insurance in bank branches highlights the importance that a bank's branch, even over its online network, has on its ability to expand into non-traditional activities, both in Canada and around the world. This network originated as a means to collect deposits and to, primarily, issue loans to businesses, but since then it has spread into many other business activities. According to the Canadian Bankers Association,²³ there were 6348 bank branches in Canada and of these, 2000 were rural and small-town branches. They own 18,711 automated banking machines (ABMs) in Canada which processed 741 million transactions in 2015 and they facilitated 698.2 million online banking transactions in 2014. The control and operation of a network of brick-and-mortar branches, automated banking machines, and online platforms with so many financial services on offer can satisfy many the requirements of a client, and it gives the

²³This information was last updated on July 26, 2016

banks a comparative advantage over monoline financial companies. Although the internet is changing the way home buyers arrange mortgages, the CMHC mortgage consumer survey of 2016 found that most buyers arranged their first mortgage in a bank branch (39%) followed closely by online (31%). Previous studies, conducted annually by the Canadian Association of accredited market professionals, found that 45% of new home buyers visit only one lender. This illustrates the importance that a pre-existing client relationship can have in offering products.

Having discussed banking activities at the branch-level, our focus now moves toward those activities associated with the head office. Canadian banks organize capital markets where, traditionally, they facilitate the interaction of lenders and borrowers. Prior to 1987, Canadian commercial banks were not allowed to operate in capital markets, as this was the purview of investment banks. Despite this regulatory protection, Canadian investment banks never grew to the size of their American counterparts. [Bordo et al. \(2015\)](#) explained that the political economy in the early years of the United States favoured state, rather than federal, control of banks. Indeed, prior to the American Civil War, the U.S. federal government was relatively weaker compared to the state governments and much weaker than the 1867 Canadian federal government would be relative to the provinces. The ability of U.S. states to create, regulate, and protect a separate, state-level banking system prevented the creation of large multi-state financial companies and commercial banks. As a response to this diffuse banking system with multiple regulatory regimes, large firms preferred to fund business activities through issuing securities, which could be sold across state-lines, rather than borrowing directly from relatively small banks. By issuing securities, small U.S. banks enjoyed more diversified portfo-

lios than may have been otherwise possible. However this preference for securities over lend-and-hold loans also created a large capital market for issuing securities. Later, in 1933, the Glass-Steagall act forced the separation of U.S. investment banking from commercial banking, similar to Canada. However the greater demand for securities led to investment banks in the U.S. becoming relatively larger and more important to the financial system.

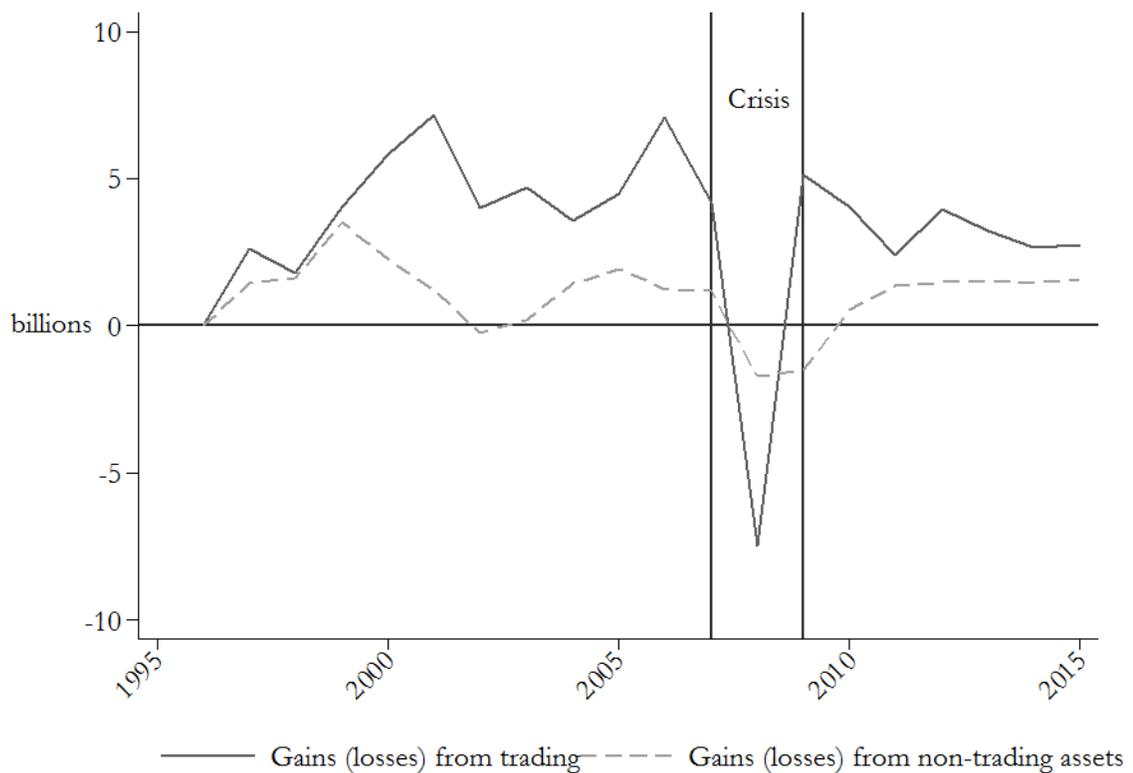


Figure 6: Aggregate trading revenue

Note: Realized and unrealized gains and losses are in real 2012 Canadian dollars. Trading revenue makes up less than 10% of operating revenue but is also volatile. Most trading losses in 2008 were attributable to CIBC. Source: OSFI

Banks use excess funds to purchase government bonds (Securities issued or

guaranteed by Government of Canada, provinces, municipal or school), corporate securities and foreign government securities (Other Securities), and deposit funds with other financial intermediaries (Deposits with regulated financial institutions). They earn capital gains on available-for-sale securities (Gains (Losses) on instruments held for other than trading purposes) and engage in proprietary trading (Trading Income).²⁴ Trading revenues are highly volatile and vary significantly between different banks. Figure 6 shows trading revenue and gains (losses) on non-trading assets. Trading revenue makes up less than 10% of operating revenue, which is quite small, however it can create serious, even existential, losses. In 2008, most trading losses were attributable to just one bank, CIBC, which suffered approximately \$7.7 billion in trading losses during 2008 and 2009. The capital markets division of CIBC in the United States was exposed to monoline lenders and the Sub-Prime Crisis in the United States, and consequently they agreed to sell all U.S. operations to Oppenheimer Holdings Inc. in November of 2007. Unfortunately for CIBC, the agreement did not prevent the trading losses in figure 6.

Like the large American commercial and investment banks, the Canadian banks also securitize assets and sell them to third parties. In 2015, the big six Canadian banks held over \$150 billion in mortgages that had been securitized and not yet recognized as sold to CMHC under the National Housing Act (NHA)²⁵²⁶ Lastly, the banks earn fees on underwriting new and seasoned security issues and on in-

²⁴Prior to the financial crisis of 2007-'09, Basel regulation gave a slightly lower capital requirement on trading assets than available-for-sale securities, so it is hard to disentangle which securities were actually trading and which were bought-and-held.

²⁵The Canadian federal government passed the National Housing Act in 1944 with the purpose of providing a housing program for returning World War II veterans.

²⁶The IFRS accounting standards introduced new rules about accounting for securitized assets, specifically about when a security can be recognized as sold.

stigating mergers and acquisitions between firms. These last three activities are aggregated in the OSFI data as "Other" revenue under noninterest income; these activities have a high amount of volatility in earnings. Unfortunately, OSFI chose to aggregate these capital market activities into one entry which limits the available information on the size and profitability of securitization.

Table 2 summarizes revenue for the years 1997, 2006, and 2015. These years are chosen because they are somewhat uneventful and therefore typical, and there is no recession at the time. Thus they represent a snapshot of the Canadian banking system in what might be thought of as a 'normal' period, every nine years. Investment banking is highly volatile and this is reflected in 2006 when over 10% of aggregate bank income came from these activities, but in most years this was approximately 5%. The year 2006 is something of a high water mark for non-interest income in the Canadian banking system. More than 50% of all net revenue came from noninterest activities. Among others, [Calmès et al. \(2004\)](#) posited this trend indicated a shift towards market-oriented banking activities such as proprietary trading and securitization. However subsequent to the financial crisis of 2007-'09, the trend towards noninterest income has reversed. In 2015, noninterest income was 44.3% of all net revenue and from 2006 to 2015 the amount of net interest income has more than doubled from \$34 billion to \$72 billion. Wealth management has grown with the size of the Canadian banks and makes up more than 20% of all net revenues.

The bottom of table 2 shows revenue information for different loans and the average three month T-bill rate is included for comparative purposes. Lending to businesses is the most traditional Canadian banking activity; prior to 1967, the

Table 2: Aggregate Revenue

	Revenue (billions)			Relative proportion		
	1997	2006	2015	1997	2006	2015
Noninterest income						
Fees on deposit accounts	2.18	4.04	5.82	5.6%	5.9%	4.5%
Card fees	1.64	2.84	6.19	4.2%	4.1%	4.8%
I-banking, securitization, misc.	1.87	7.23	6.33	4.8%	10.5%	4.9%
Insurance	0.43	2.55	4.29	1.1%	3.7%	3.3%
Foreign exchange fees	0.59	1.50	1.95	1.5%	2.2%	1.5%
Wealth management	7.01	14.44	27.12	18.0%	20.9%	20.9%
Acceptances & loan fees	2.08	2.57	5.76	5.3%	3.7%	4.4%
Non-interest income	15.79	35.18	57.45	40.6%	51.0%	44.3%
Net interest income	23.09	33.76	72.30	59.4%	49.0%	55.7%
Operating income	38.88	68.94	129.75	100%	100%	100%
Trading revenue	2.09	6.52	2.86			
Non-trading gains on securities	1.16	1.14	1.63			
Earnings before taxes	12.89	26.77	45.86			
Net income	8.11	21.09	37.25			
Interest income	1997	2006	2015	1997	2006	2015
Deposits with FI	4.51	4.04	0.91	7.0%	4.2%	0.8%
Can. gov't securities	2.86	3.89	2.68	4.4%	4.1%	2.5%
Other securities	7.87	17.67	11.87	12.2%	18.5%	11.1%
Consumer loans	8.23	19.25	30.82	12.7%	20.2%	28.9%
Business loans	24.97	27.18	26.17	38.6%	28.5%	24.5%
Residential mortgages	15.18	21.04	30.81	23.5%	22.1%	28.9%
commercial mortgages	1.05	2.21	3.13	1.6%	2.3%	2.9%
Gross interest income	64.68	95.29	106.69	100%	100%	100%
Average 3m T-bill rate	2.93%	3.94%	0.52%			

Note: all numbers are shown in billions of (nominal) Canadian dollars. Noninterest income proportions are relative to the sum of net interest and noninterest income, referred to as operating income. This excludes trading revenue and gains (losses) on non-trading assets. Interest income proportions are relative to gross interest income. Gross interest income includes dividends. Foreign exchange fees excludes forex trading revenue. Source: OSFI.

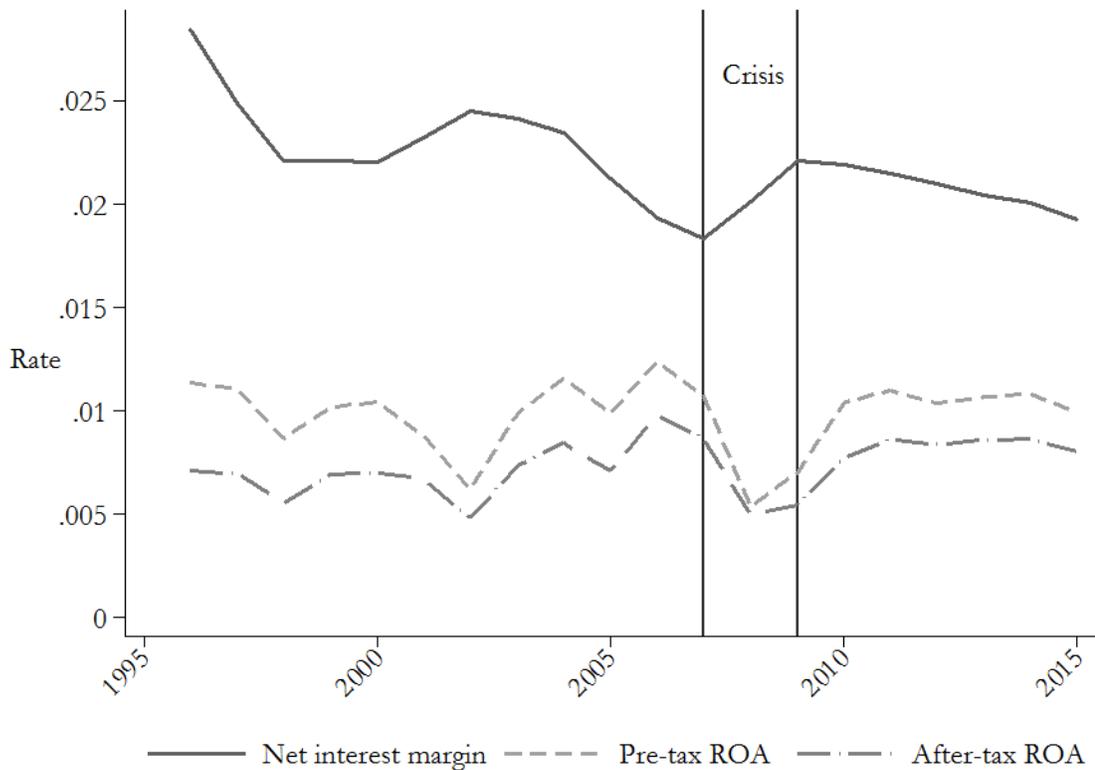


Figure 7: Return on assets and net interest margin

Note: Net interest margin is calculated as net interest income divided by interest and dividend earning assets. Source: OSFI

Canadian banks were not allowed to make mortgage or consumer loans. While the US banking system preferred to fund business activities through the securities markets, the Canadian banks often acted as intermediaries: providing loans and keeping them on the balance sheet. In 1997, business loans accounted for almost 39% of all interest revenue. But in 2015, this fell to 24.5% of gross interest revenue. During the financial crisis of 2007-09', the automotive financial companies suffered severe losses. Consequently, the Canadian banks filled the void and became more active in the automobile loan market. Toronto-Dominion Bank bought the lend-

ing subsidiary of Chrysler for \$6.3-billion in 2010 and the Royal Bank of Canada spent \$3.8-billion to buy the Canadian operations of Ally. This partly explains the increasing importance of consumer loans as a source of revenue although the trend had already building for some time. Lastly, residential mortgages remain an important component of Canadian banking activities. Relative revenues suggest that the Canadian banks focused more on retail banking in 2015 than they did in 1997 or 2006.

There is currently some debate in the media and among practitioners as to whether low interest rates lead to reduced bank profitability. Clearly, when the bank rate is elevated then interest revenue will also be elevated, but these benefits should be mitigated by higher interest expenses. Figure 7 illustrates the return on assets and the net interest rate margin from 1996 to 2015. Net interest rate margin appears to be quite consistent for the the sample period. The margin hits a nadir in 2007, the year associated with the beginning of the financial crisis, but rates were relatively high and profitability was yet to significantly decline. Since 2010, the Canadian banks have earned as much or more revenue per asset than in the previous fifteen years. It is also worth noting that during the entire sample period, 1996-2015, the aggregated banking industry never recorded an aggregate loss, with a minimum return of 50 basis points. This was an impressive feat, and it makes the Canadian banking system worthy of international interest and research.

4 Liabilities and expenses

4.1 Liabilities and funding

This section discusses bank liabilities, interest, and noninterest expenses. Banks have many options when it comes to funding business activities; they are often experimenting with new methods, most recently with covered bonds and contingent capital (coco's). Each source of funds has its own characteristics based on maturity, price, risk, and unique features. OSFI records five overarching categories of interest-paying funds: demand and notice deposits, fixed-term deposits, repos, subordinated debt, and 'other' liabilities, the sum of everything else including, but exclusive to, covered bonds, contingent convertibles, and any senior debt. The data that OSFI collects is unique to Canada and not necessarily comparable with data in other jurisdictions. For example, there is no public information on whether a dollar of deposits is insured or uninsured. Those deposits owed to a person or firm with less than \$100,000 total deposits at the bank would be insured by the Canadian Deposit Insurance Corporation (CDIC). Neither is there information on deposits owed to a person or firm with more than \$100,000 at that bank. Similarly frustrating, there is no breakdown on deposits regard the contract size or time-to-maturity. Fixed-term deposits with a longer time-to-maturity (over a year) and a large face-value are much more like senior secured debt than they are deposits, but under OSFI regulations they are included in the same category as a 90-day fixed-term deposit. Beginning in 2009, notice and demand deposits were no longer separately recorded on the balance sheet. The income statement includes information on only four broad categories of interest expense: demand and notice deposits, fixed term

deposits, subordinated debt, and all others. Separate notice and demand deposit expenses are not available to the public.

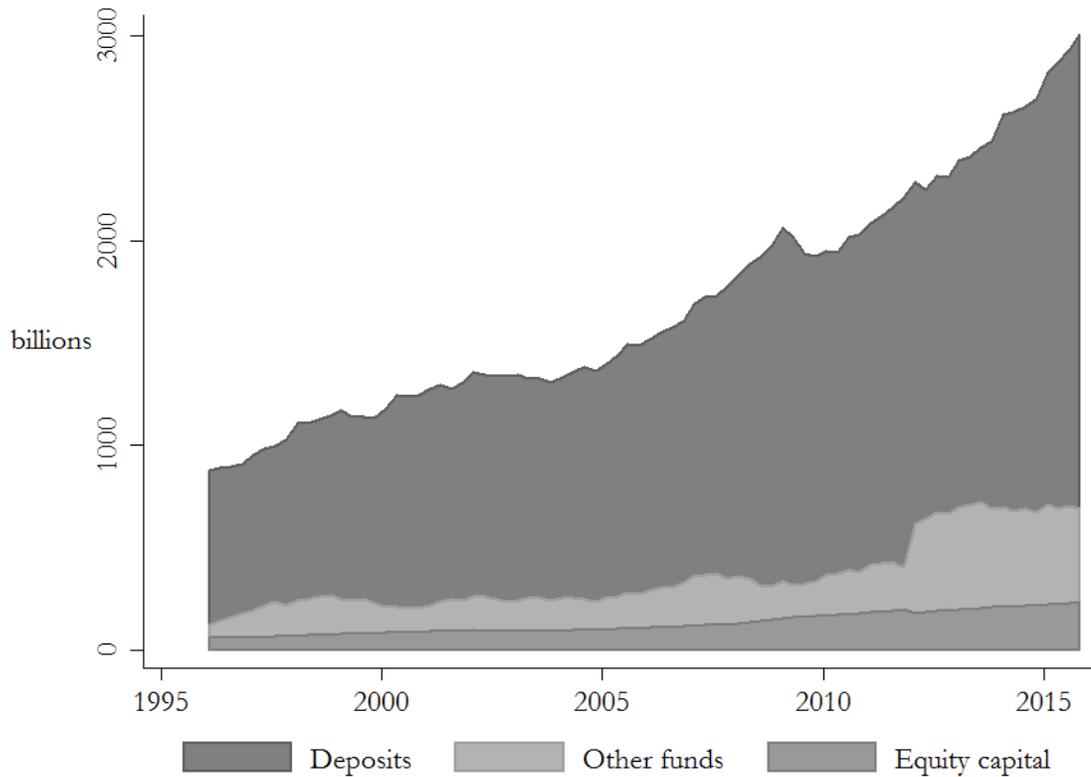


Figure 8: Aggregate funding

Note: Demand, notice and fixed-term deposits account for over 70% of funding since 2000. There is a sharp increase in other funds concurrent with the transition to IFRS accounting standards in 2011. Source: OSFI.

Demand deposits are, as expected, available immediately upon request unlike notice deposits, whether a chequing account or non-chequing account, can only be withdrawn after a certain number of days. OSFI defines notice deposits as having a notice of withdrawal less than 90 days otherwise they are considered fixed-term deposits. Clients who want their funds earlier, either face a penalty, such as the loss

of interest income, or are prevented from withdrawal. Deposits are recorded by the legal entity of the depositor. These categories include the federal, provincial, and municipal levels of government in Canada, deposit-taking institutions, individuals, and ‘others’. This final category includes every legal entity not previously listed, generally this includes what are called wholesale deposits.²⁷ These sophisticated, institutional investors, such as public and private companies, pension funds, hedge funds, and non-deposit-taking financial institutions, make up the largest source of funds for Canadian banks. The average interest paid on fixed term deposits, such as GICs, closely follow the bank rate. However one obvious advantage, as figure 9 suggests, the longer maturity of fixed-term deposits shields depositors from rapid changes in the bank rate. Subordinated debt, being the first to suffer losses in the event of insolvency, is the most expensive. The remaining interest expense entry, ‘other’, includes payments toward repos and more senior bond issues, including covered bonds, which have different risk profiles and maturities; it can be interpreted as a portfolio of miscellaneous debt-instruments.

²⁷It also include foreign governments or their agencies, if there are any. However it is probably safe to assume that these represent a negligible sum of the total, and that most of these deposits are from institution investors.

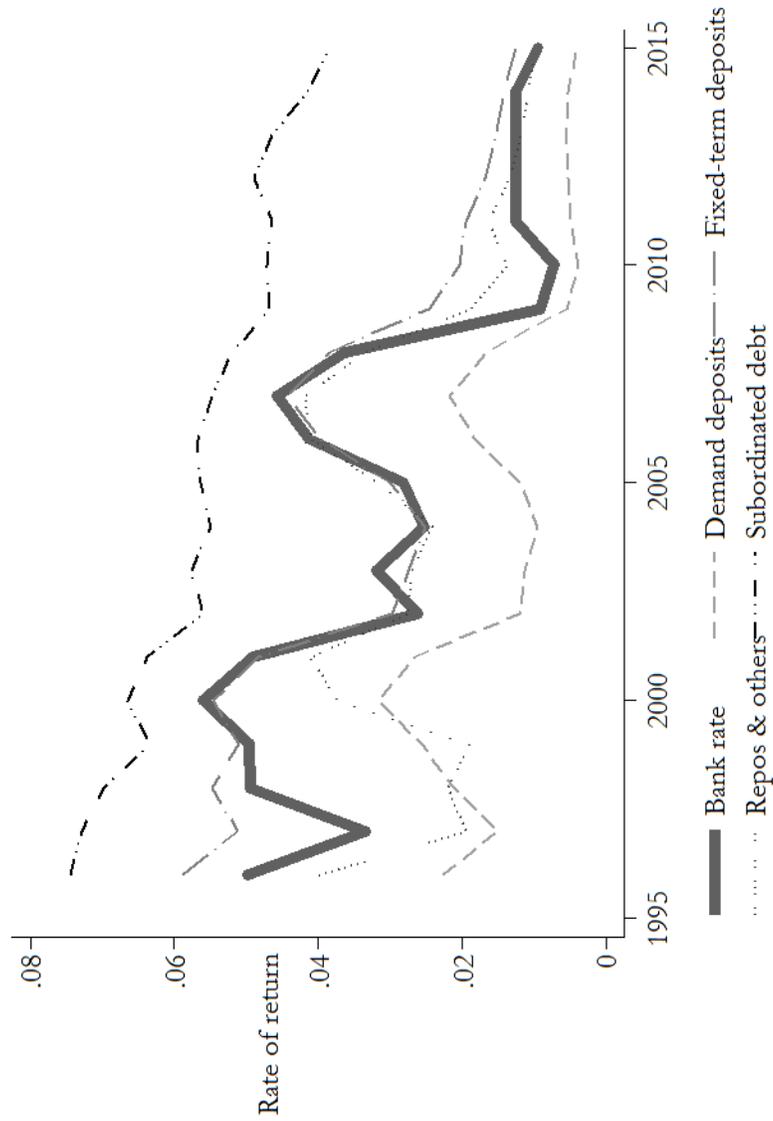


Figure 9: Average interest expense rates

Note: All rates are shown in their annual average, including the bank rate, following the Canadian banks fiscal year end of October 31st. Demand deposits also includes notice deposits with fewer than 90 days to maturity. Fixed term deposits, such as GICs, closely follow the bank rate. Repos have short-term maturities, no more than 30 days and often just 1 day, and typically trade at a few basis points above the bank rate. Subordinated debt (bonds) are subordinated to the claims of the depositors, hence the high yield. Source: OSFI.

As previously stated, deposit accounts in Canada with less than \$100,000 are insured by CDIC, and these funds are mostly held by individuals and small businesses. For this reason, many individuals keep accounts at multiple banks to ensure that their deposits are insured. Individual deposit funding was the least disrupted during the financial crisis of 2007-'09, so it is regarded as a reliable source of funds. [Demirguc-Kunt et al. \(2013\)](#) found that during the financial crisis, banks with more deposits were rewarded with higher stock market returns. However attracting new deposits remain competitive and time-consuming.²⁸ Figure 10 illustrates how the level of individual deposits evolved over time. Households, sometimes referred to as retail deposits,²⁹ began to prefer demand and notice deposits over fixed-term deposits beginning in 1999 and this trend accelerated after the financial crisis of 2007-'09. In December of 2008, the Canadian banks had \$143 billion nominal Canadian dollars worth of demand deposits from individuals and \$232 billion worth of notice deposits, chequable and non-chequable.

Wholesale deposits are those from businesses, pension funds, and other sophisticated investors. These deposits are beyond the insurance maximum of \$100,000 as a result they can be safely regarded as uninsured. Contract terms are idiosyncratic and negotiable although the average price is close to the bank rate as illustrated in figure 9. Wholesale deposits should not be confused with wholesale funding, which includes wholesale deposits as well as repos, and commercial paper. [Huang and Ratnovski \(2011\)](#) found that, with costless but noisy signals from monitoring, wholesale fund depositors are more likely to withdraw funds and force inefficient

²⁸See the UK CMA report cited in section 3

²⁹OSFI separately identifies deposits from individuals. Sometimes I shall refer to this category as retail deposits.

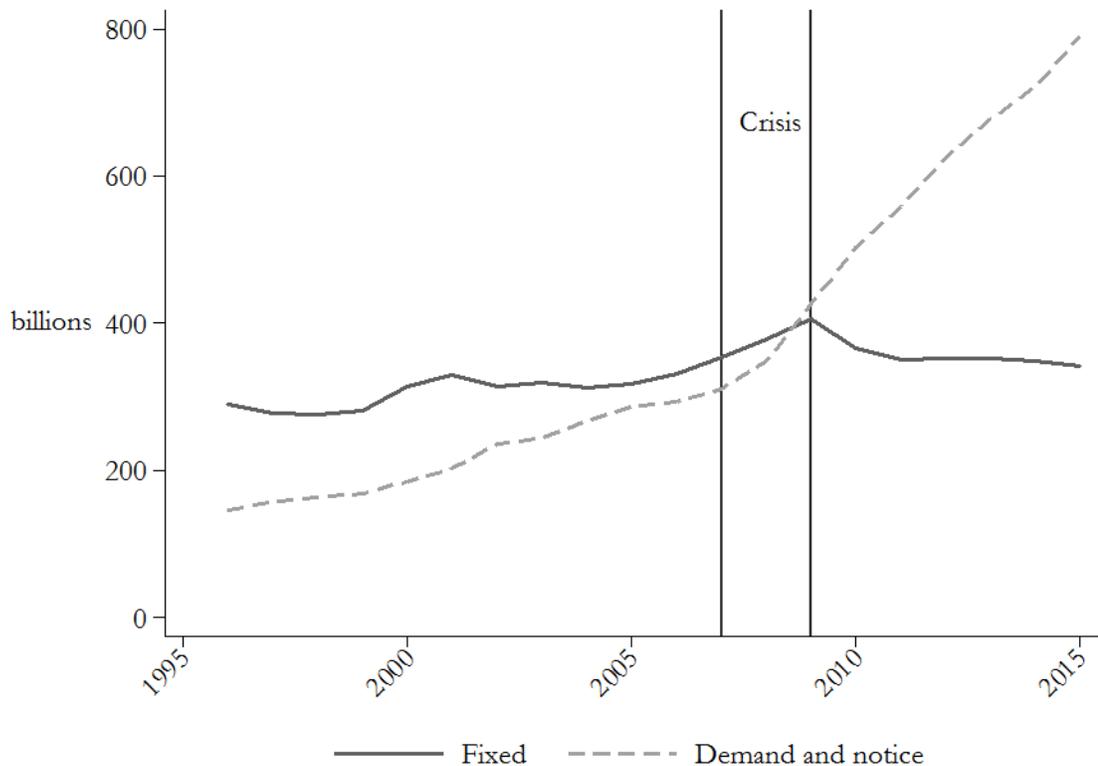


Figure 10: Deposits of individuals

Note: Deposits are in real 2012 Canadian dollars. Source: OSFI

liquidations than insured depositors. Figure 11 illustrates the amount of wholesale deposits in the Canadian banking system, split between deposit-taking institutions, fixed-term wholesale deposits, and demand and notice wholesale deposits.. In the beginning of 2009, there was a significant decrease in the amount of fixed-term wholesale deposits concurrent with a slight decrease in demand and notice wholesale deposits. This is commensurate with a gradual decline in deposits from deposit-taking institutions. The total amount of deposits at the Canadian banks, and at foreign banks operating in Canada, peaked during the first fiscal quarter of 2009 and did not return to that level until the first quarter of 2011.

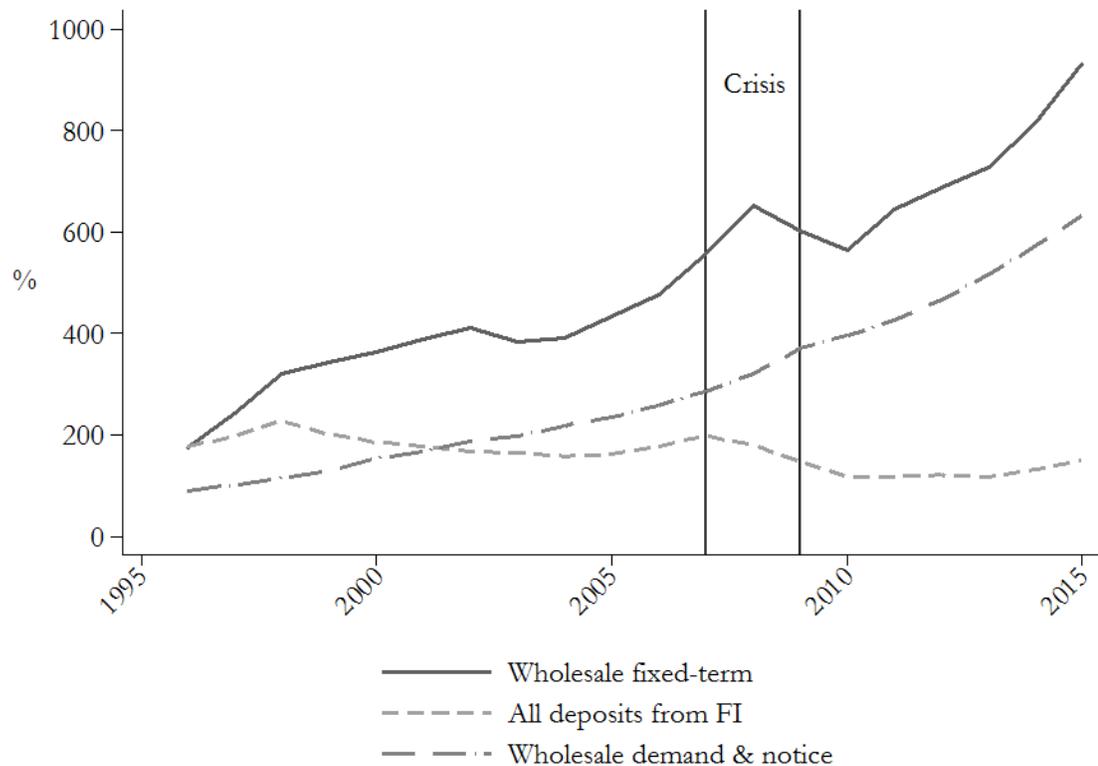


Figure 11: Selected deposits

Note: Wholesale demand & notice deposits are taken from the 'other' category in OSFI balance sheets. This is mostly institutional deposits (corporations, pension funds, and investment funds). Wholesale fixed-term deposits peaked in the fourth fiscal quarter of 2008. Source: OSFI.

Figure 9 shows the average interest expense rates for four categories of funding against the bank rate set by the Bank of Canada. Demand deposits also includes notice deposits with fewer than 90 days to maturity. The average fixed term deposit rate closely follows the bank rate. repos (repos) have short-term maturities, no more than 30 days – often just 1 day, and typically trade a few basis points above the bank rate. Other interest expenses include interest paid on securities borrowed for the purpose of short-selling and repos. More recently, it also includes covered bonds and cocos, but because of how OSFI reports the data, it is difficult to disentangle the

rates on these differing liabilities. Subordinated debt (bonds) is the riskiest source of funds outside of equity, hence the high yield.

Shareholders equity is broken down into a number of categories but, because not all of categories were consistently reported from 1996 to 2015, so in order to maintain comparability over time, I report only the main components: preferred shares, common shares, contributed surplus, and retained earnings. I exclude accumulated other comprehensive income and non-controlling interests which, typically, are not relatively large. Figure 12 illustrates two different sources of equity financing: those raised from new equity offerings, and those after-tax earnings retained in a bank. We can see that beginning in 1996, new equity offerings were quite flat while retained earnings were accumulating until the financial crisis. At this point, retained earnings leveled off which illustrates how there were no aggregate losses in the Canadian banking system. However that is not the same thing as no losses at all; the Canadian Imperial Bank of Commerce (CIBC) lost \$3.8 billion in the first two quarters of 2008. In response, they began issuing equity, and by 2011, they had issued approximately \$5.0 billion dollars worth of new equity.³⁰ Beginning in 2012, the aggregate banking rapidly accumulate retained earnings while issued equity stabilized.

Canadian regulation requires that each bank maintain a leverage ratio no less than 3% at all times. OSFI is also able to prescribe authorized leverage ratio requirements for individual institutions. In Canada, the regulator carries both the carrot and the stick when it comes to capital requirements. Figure 12 calculates a

³⁰As a result, CIBC became a smaller, more Canadian-focused, retail-oriented, and profitable bank. In 2012, they began a series of share repurchases, and they are currently regarded as one of the safer members of the Big Six, with a similar ratio of retained earnings to issued equity.

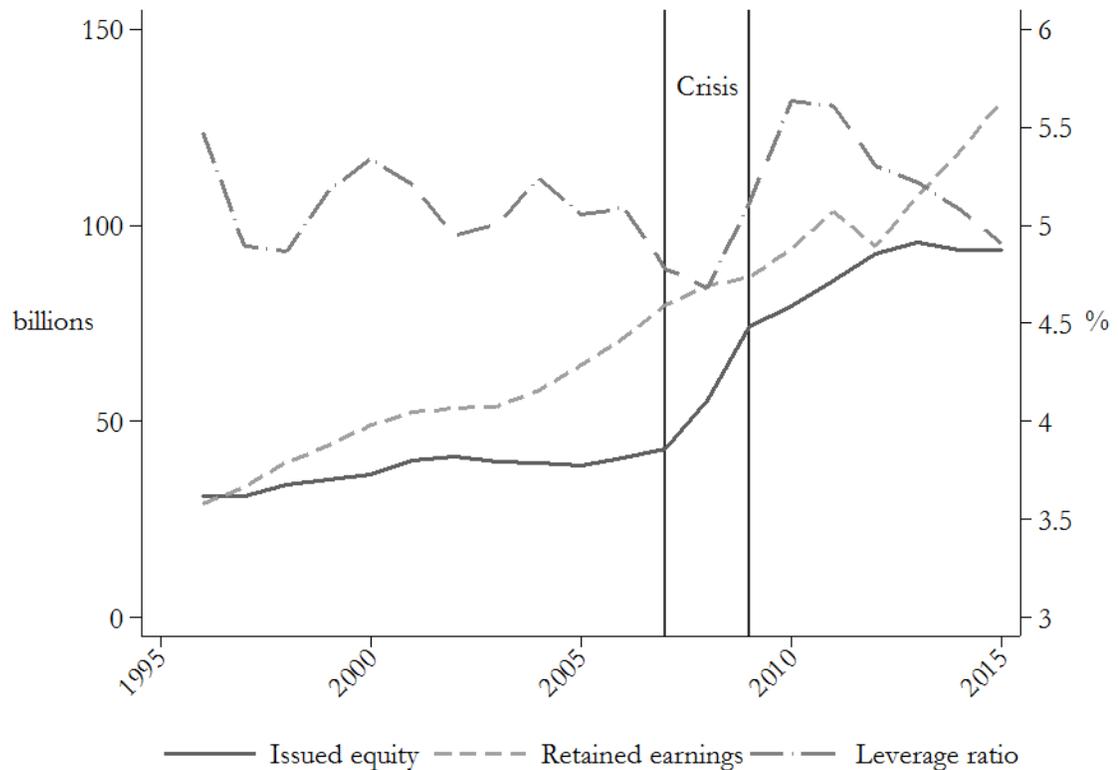


Figure 12: Aggregate equity and leverage

Note: Equity is in real 2012 Canadian dollars. The transition to IFRS accounting standards in 2011-2012 caused a one-time decrease in retained earnings. The leverage ratio is calculated as adjusted net tier 1 capital divided by the sum of total assets and impaired assets less nonfinancial assets such as goodwill and net physical capital. Source: OSFI.

leverage ratio using adjusted net tier 1 capital divided by the sum of total assets and impaired assets less the book value of all nonfinancial assets such as goodwill and physical capital³¹. The aggregate leverage ratio peaked in 2011 just prior to the introduction of the IFRS accounting standards, which the banks knew would have a detrimental effect on equity and capital ratios. Since then, the banks grew assets faster than equity which has decreased the ratio from the peak of 5.5% to

³¹It may not coincide exactly with the official capital ratio. For guidelines on leverage requirements, please see <http://www.osfi-bsif.gc.ca/eng/docs/lr.pdf>

5% in 2015. The banks are accumulating retained earnings to increase their total equity and maintain a satisfactory leverage ratio. The floor on tier 1 equity per financial asset or per risk-weighted assets creates a risk management problem for banks. If a bank were to suffer a severe loss, and break through the floor of 3%, then the regulator would, presumably³², enforce the rules and insist that the bank issue equity immediately. However banks do not wish to issue equity during periods of weakness, so, to avoid this fate, they must maintain a buffer above and beyond the floor that is sufficient to cover an unexpected and severe loss.

Table 3: Aggregate liabilities and shareholders equity

	Liabilities (billions)			Relative proportion		
	1997	2006	2015	1997	2006	2015
Retail deposits	345.5	575.8	1187.1	29.6%	26.7%	25.6%
Wholesale deposits	272.4	677.9	1635.9	23.4%	31.4%	35.3%
Deposit-taking Inst. Depo.	158.0	164.3	157.2	13.6%	7.6%	3.4%
Repos	100.3	147.0	317.4	8.6%	6.8%	6.8%
Other funds, bonds, etc.	70.3	133.7	406.3	6.0%	6.2%	8.8%
Subtotal	946.5	1698.7	3703.9	81.2%	78.7%	79.9%
Subordinated debt	23.1	29.1	34.9	2.0%	1.3%	0.8%
shareholder's equity	51.1	103.3	236.1	4.4%	4.8%	5.1%
Securities owed, sold short	61.2	122.8	176.7	5.3%	5.7%	3.8%
Banker's acceptances	42.2	46.7	73.9	3.6%	2.2%	1.6%
Derivatives	5.8	152.6	322.8	0.5%	7.1%	7.0%
Other liabilities	35.5	5	89.3	3.05%	0.23%	1.93%
Subtotal	218.9	459.5	933.7	18.8%	21.3%	20.1%
Total liabilities & equity	1165.4	2158.2	4637.6	100.0%	100.0%	100.0%

Note: all numbers are shown in billions of (nominal) Canadian dollars. All proportions are relative to total liabilities and shareholders equity. Shareholder equity is the sum of common share, preferred shares, retained earnings, and contributed surplus. Source: OSFI.

Table 3 shows how the system has fewer total deposit-taking institutional deposits but more wholesale deposits. Currently and historically, there is a core-

³²OSFI could use its judgment and not enforce the floor, but this raises the question: why have the floor in the first place?

periphery relationship between the large Canadian banks and the smaller, more regional banks, trusts, and cooperatives. If the regional institutions are short of funds then they can borrow from the larger banks which have access to the Bank of Canada's standing liquidity facilities. If the regional institutions have excess funds then they can deposit these with the larger institutions. As of August 2016, there were 17 Canadian and foreign financial institutions with access to the Bank of Canada Standing Liquidity Facility, yet there were 115 active members in Payments Canada. The fact that these deposits were stable over time could reflect the observation that it is the largest banks in Canada that have experienced the most growth. Retail deposit funding is fairly consistent over the time period, as is repo financing. The Canadian banks avoided the temptation to replace deposit-financing with repos. Superficially, demand and notice deposits, and repos share the common characteristic that both can be withdrawn on short notice while in practice insured, and perhaps uninsured, depositors are less likely to withdraw funds than uninsured, sophisticated, and short-term investors, which was the American banking experience during the financial crisis 2007-'09.

4.2 Noninterest expenses

When interest rates are low then noninterest expenses will become a larger share of total cost. This occurred in the Canadian banking system, and it can be seen in figure 13. [Dietrich and Wanzenried \(2011\)](#) found that bank profitability is largely driven by cost efficiency. Those banks that spend a larger proportion of operating revenue on labour costs, branches, computers, head offices, or legal fees are going to find it difficult to compete with more cost-effective firms. Figure 13 shows a

distinct downward trend in interest expense per asset over the sample period which one would expect given low interest rate environment that predominated these years. Noninterest expense per asset was highest in the early part of the 2000's and late 1990's, and subsequently it showed a modest decrease beginning in 2005. Since the financial crisis, it appeared relatively flat. The remainder of this section looks into more detail regarding non-interest expense.

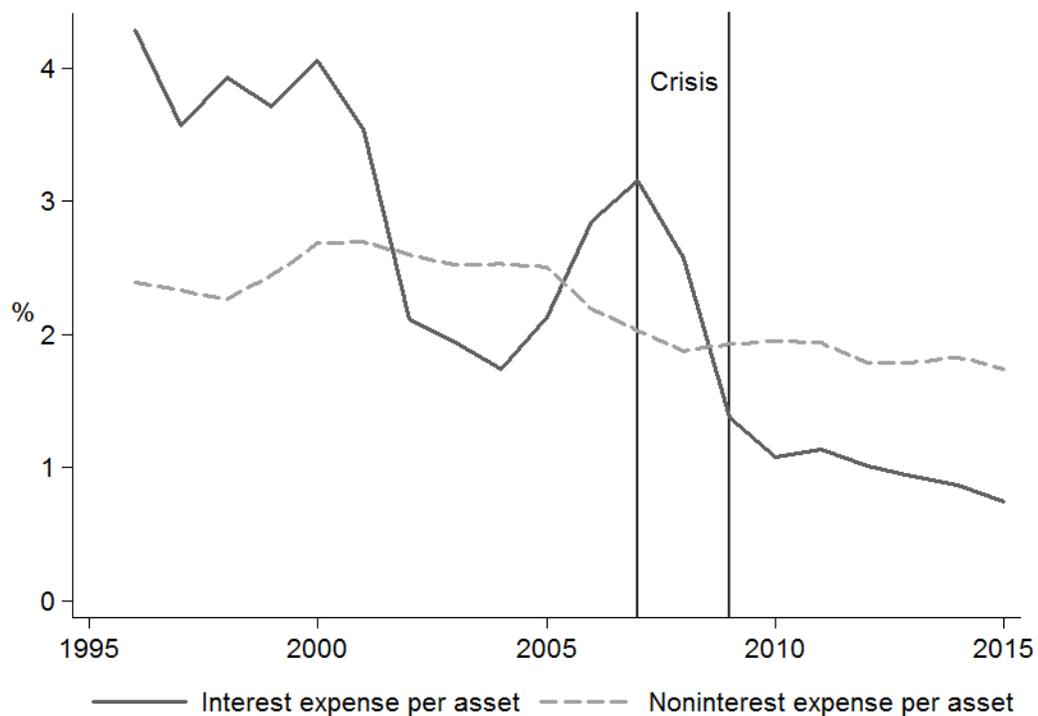


Figure 13: Cost per asset

Noninterest expense excludes taxes and the provision for credit losses. Source: OSFI

What are the components of noninterest income? OSFI collects and reports information on labour costs: salaries, pensions and other staff benefits including stock options. There are two categories for premises and equipment: first is rent,

depreciation of premises, furniture, and leasehold improvements, and second is computers and equipment. Other expenses include advertising, public relations and business development expenses, capital and business taxes, office and general expenses. Professional expenses include audit, legal, third-party management, and consulting fees. Finally, there is a category for other expenses that includes, among others, hedge ineffectiveness, theft, fraud, legal penalties, and regulatory fees. Legal penalties in the United States can be quite severe. In 2005, CIBC settled on a \$2.4 billion lawsuit settlement related to the Enron scandal.³³

Table 4 summarizes noninterest expense in the years 1997, 2006, and 2015. A striking feature is the consistency with which labour expense is a proportion of noninterest expenses, 54.4 to 56.3%. [Anderson and Joeveer \(2012\)](#) consider large bank operations in the context of a principal-agent model where rents are shared between shareholders (principals) and bank managers (agents). Using U.S. bank data beginning in 1990, they find large returns to scale but much of these are captured by bank managers. This effect is stronger for banks with a larger ratio of noninterest income to net interest income. Whether the persistence in labour expense is related to rent seeking behaviour is uncertain, but it is curious that as banks size increased this ratio changed little.

There was a relatively modest decline in the cost of premises, equipment, and computers, from 18.6% in 1997 to 16.4% in 2015. In the late 1990's and early

³³As part of the settlement, the details of CIBC's involvement are murky; CIBC has admitted no guilt. According to Neal Batson, court-appointed examiner, "CIBC aided and abetted certain Enron officers in breaching their fiduciary duties." According to the CBC, CIBC had earlier been accused of helping Enron to hide debt – August 2, 2005. As of August 2016, CIBC is in a legal dispute with the Canadian government that claims this legal penalty should be tax-exempt.

Table 4: Aggregate noninterest expenses

	Expenses (billions)			Relative proportion		
	1997	2006	2015	1997	2006	2015
Labour	14.8	26.6	43.9	54.4%	56.3%	54.4%
Rent & depreciation	2.6	3.6	6.5	9.6%	7.6%	8.1%
Equipment	2.4	4.5	6.7	9.0%	9.6%	8.3%
Subtotal	19.8	34.7	57.1	72.8%	73.4%	70.7%
Advertising	1.1	2.0	3.6	4.0%	4.3%	4.4%
General	1.9	1.9	2.4	7.1%	3.9%	3.0%
Capital tax	0.77	0.83	0.78	2.8%	1.8%	1.0%
Professional	1.1	2.3	4.3	4.0%	5.0%	5.3%
Other	2.4	5.5	12.6	9.0%	11.6%	15.7%
Subtotal	7.3	12.5	23.7	26.8%	26.4%	29.3%
Total noninterest	27.2	47.3	80.8	100.0%	100.0%	100.0%
Other noninterest expenses						
Corporate taxes	4.8	5.7	8.6			
Provision for credit losses	2.1	2.5	7.6			

Note: All values are in billions of nominal Canadian dollars. Rent & depreciation includes both rent and the depreciation on facilities owned by a Canadian bank. Equipment is mostly owned and depreciated but also includes any rental fees. Source: OSFI.

2000's, the Canadian banks invested in technology and infrastructure and concurrently decreased the relative number of branches. This was abetted by the declining cost of computing power. From 1996 to 2014, RBC, CIBC, and NB decreased the total number of branches from 3,681 to 2,824, yet BNS, TD, and BMO increased the number of branches from 3,854 to 7,324. However each bank grew real total assets from between 1.5 (CIBC) and 6.0 times (TD), a significant increase. BMO, TD, and BNS are three of the four most international and fastest growing, so it is likely that even among them there are fewer branches per client than at the beginning of the period. Automated banking machines (ABMs) allow banks to maintain a physical presence with clients at low cost. Taking information from bank annual reports, there were 13,852 ABMs among the Big Six banks in 1996, and accord-

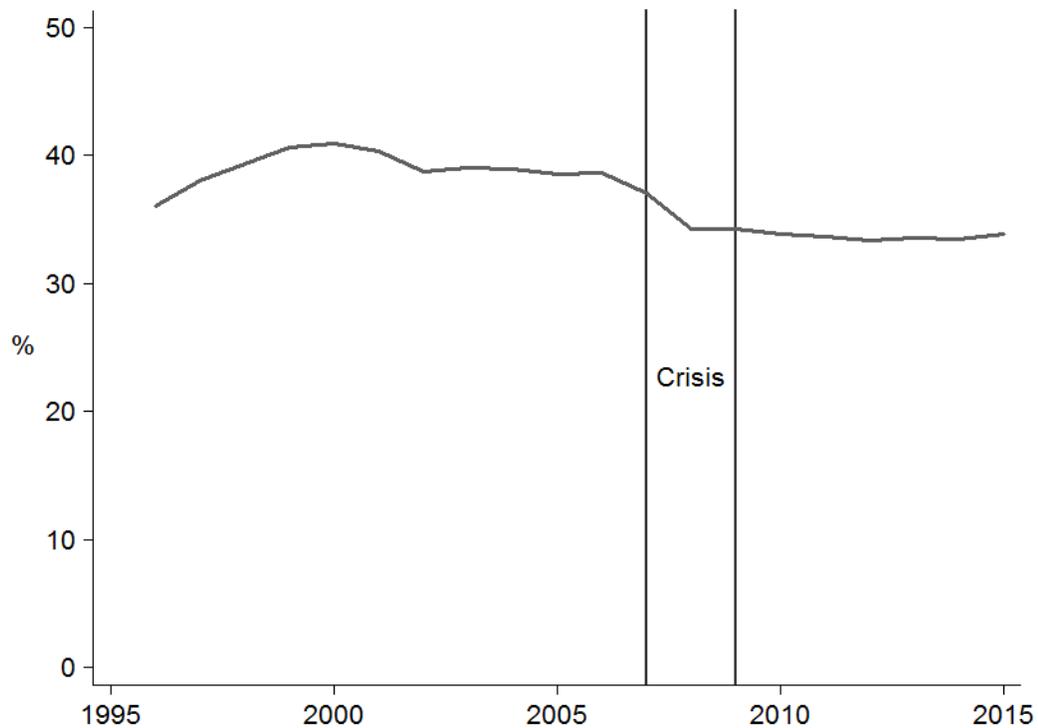


Figure 14: Labour share of operating income

Note: Operating income is the sum of net interest income and noninterest income before provisions for credit losses or noninterest expenses. Source: OSFI.

ing to the Canadian Banker’s Association, the total number in Canada increased to 18,711 ABMs in Canada on July 26th of 2016. So it seems even the number of ABMs relative to total assets and deposits has declined.

Another interesting fact was the relative increase in the cost of other expenses, which includes legal fees. As previously mentioned, the United States has levied large legal penalties on banks, much larger than anything the Canadian regulatory and legal authorities would consider. In 2015, TD, the second largest bank with a large exposure to the United States, had 20.2% of noninterest expense in this category while NB, the smallest bank with the least international exposure, had

4.4%, which was by no means an unusual value for them. Recently, two Canadian banks made international headlines with legal difficulties. TD has an ongoing and high profile fraud case in Florida while in Brazil, RBC had what the Wall Street Journal labeled the ‘Royal Bank of Canada’s Latin Misadventure.’ There are many risks, as well as rewards, when banks enter new markets, and legal risk is a serious and costly one. The summarizes the information available on the expenses that the Canadian banks face in order to provide the business activities described in section 3. The next section looks at the provision for credit loss, how it is accounted for, and how it affects the allowance for credit losses, also known as loan-loss reserves.

5 Loan losses

What accounts are affected, and what data is available, when a borrower fails to make a payment? What if a deposit at another bank is not returned on time? When it comes to bad loans, there are three accounting entries to consider: the provision for credit losses (PCL), the allowance for credit losses (ACL), and impaired assets. The provision for credit losses appears on the income statement, and it reflects the opinion of management on current and future losses. Management chooses an appropriate PCL in each quarter, and while it is a noninterest expense, it is not usually included in the total non-interest expense entry. Banks are fairly adept at predicting losses, and consequently PCL tends to lead net write-offs; this can be seen in figure 15. Net write-offs are the value of bad loans less the value of any recoverables, such as collateral or legal settlement. They are reported in the bank annual reports but they can also can be inferred using the PCL and ACL available from OSFI. It is easy to think of the PCL as a ‘flow’ that fills the ‘stock’ that is the allowance for credit

losses (ACL), sometimes called loan-loss reserves. Consequently, an increase in the PCL leads to an increase in the ACL³⁴. If the bank decides that a loan is never going to be repaid, or if the collateral is insufficient to make up the entire value of the loan, then it is a write-off, also called a charge-off. This decreases the allowance for credit losses and impaired loans. This should not affect profitability because the loss has already been accounted for on the income statement under the PCL. As one might suspect, bank analysts, media, and regulators closely observe PCL, write-offs, impairments, and allowances as an indication of the solvency and future profitability of a bank. This gives commercial banks an incentive to develop strong risk management skills.

In Canada, if a borrower fails to make a payment on time then the loan is considered to be an impaired asset. At first, nothing is publicly reported and the dilatory client is placed on a watchlist without further consequence. Depending on the situation, the lender(s) and borrower could renegotiate the terms of the loan, in which case the loan would no longer be considered impaired. Otherwise, if the borrower fails to make a payment within 90 days then the impaired asset must be reported to the regulator, OSFI, and publicly announced in the quarterly fiscal report. Loans, deposits, and securities are reported on the balance sheet net of assets that have been impaired for 90 days. The OSFI website posts a quarterly report with information on impaired assets in a few broad categories. One advantage to the researcher is that impaired assets follow an objective definition while bank management retains subjective discretion regarding write-offs and the provision for credit losses.

³⁴Sometimes bank management choose negative PCL values to reflect an improved outlook or a risk that failed to material, such as TD in the mid-2000's. A negative PCL would 'drain' ACL and increase taxable income.

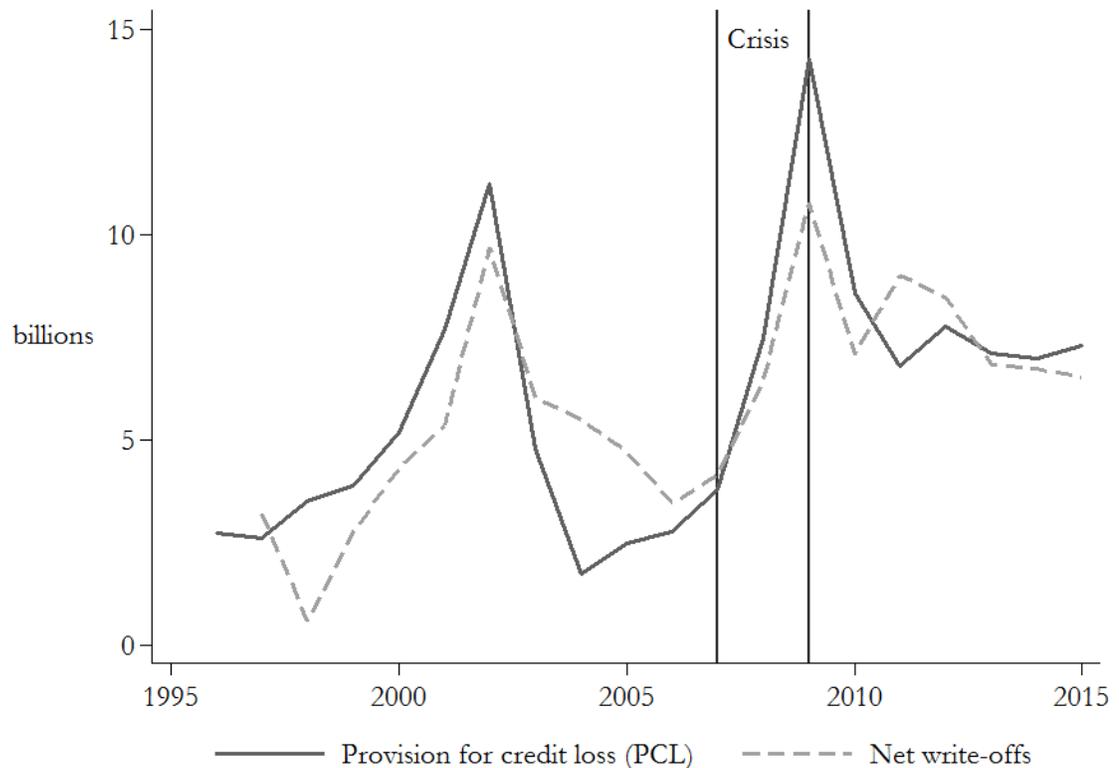


Figure 15: Provision for credit losses and net write-offs

Note: Net write-offs (net charge-offs) are calculated as bad loans less any recovered value from collateral or settlements.

After 90 days of delinquency, the value of the impaired asset is removed from the asset-side of the balance sheet. Going forward, one of four things can happen: first, the borrower makes the delinquent payments, and the loan is returned to the balance sheet and is no longer impaired. Second, the terms of the loan are renegotiated, and the loan is no longer considered impaired; the value of the loan is returned to the balance sheet, net of any negotiated haircut which would decrease owner's equity. Third, the bank does not believe that the loan will ever be repaid and makes a legal claim on the collateral underlying the loan. The loan becomes

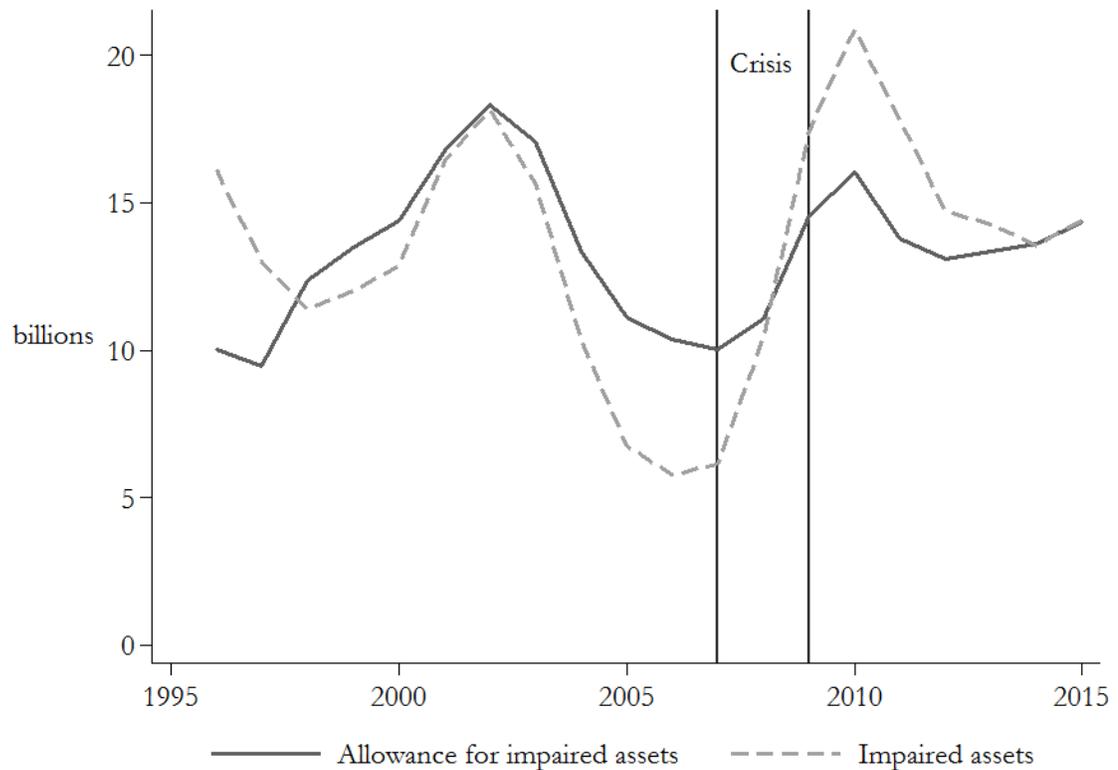


Figure 16: Allowance and impaired loans

Note: values are in real 2012 Canadian dollars. Source: OSFI.

a write-off, or charge-off, net of any recoverables, yet the asset-side of the balance sheet remains unchanged because the asset is already reported net of impaired assets. Fourth, the bank decides that there is a decent chance that the borrower will be able to make good on its payments in the near future, so the asset remains impaired. The bank retains a large degree of subjectivity when deciding if a loan might be repaid. It is the duty of the regulator and the chartered accountants who oversee the bank to validate these decisions. If the renegotiation results in a loss, or if the collateral is insufficient to make up the entirety of the value of the loan, then any losses are subtracted from the allowance for credit losses.

We can make use of the objective definition for impaired assets to measure its relationship with the provision for credit losses. Using data on the big six and HSBC Canada from 1996 to 2015, I estimate a fixed effect model with PCL as the dependent variable and two independent variables: total assets, to account for size, and total impaired assets. The coefficient on impaired assets is .066 with a robust standard error of .011, and a r-squared of 0.214, so approximately 6.6% of impaired assets were not recovered. While impaired assets do not tell the entire PCL story, there is a strong relationship between impaired loans and the PCL.

When companies use accounting rules to obtain a desired level of income, this is known as earnings management. As previously mentioned, banks enjoy a significant amount of subjective leeway in how they assign PCL. This raises the question as to whether they use the PCL expense category to manage, or ‘smooth’, earnings over time. One possible motivations is that banks can make earnings appear to be less volatile than it may actually be. [Calmès and Théoret \(2014\)](#) found that banks with lower earnings volatility tended to have higher profits. A second motivation is that a bank could decrease income and hence avoid corporate taxes, or conversely, a bank may wish to decrease PCL to inflate earnings and thus achieve a targeted level of income. [DeBoskey and Jiang \(2012\)](#) found that, using U.S. bank data from 2002-2006, bank earnings prior to PCL, and PCL were positively correlated. They concluded that banks were managing income through the PCL. However when experienced bank industry auditors, such as the Big Four accounting firms, validated the reports of a bank, this phenomenon was mitigated. Therefore skilled auditors could create value by producing accurate information on financial institutions. Using quarterly data on 18 banks that operated in Canada from 1996 to 2015, I

regressed PCL per asset on Pre-PCL net earnings per asset in a fixed-effect model. I found a coefficient of .0023 with a robust standard error of 0.0026 which is at odds with the result from [DeBoskey and Jiang \(2012\)](#)³⁵ Using the levels, restricting the sample size to the Big Six, and including total assets to control for bank size, I found that the coefficient was 0.0114 with a standard error of 0.023³⁶ which is still not significant. As a result, I found no evidence that the Canadian banks broadly, or the Big Six in particular, were using the provision for credit losses to manage their income. Since the Big Six used the Big Four accounting firms to audit their statements, this result was inline with the [DeBoskey and Jiang \(2012\)](#) study.

Table 5: Aggregate impaired loans

	Impairments (millions)			Relative proportion		
	1997	2006	2015	1997	2006	2015
Securities	385.0	14.7	0.3	3.0%	0.3%	0.0%
Consumer loans	1,076.7	1,311.5	3,841.4	8.3%	22.7%	26.6%
Business loans	9,297.9	3,466.2	5,349.8	71.6%	60.0%	37.1%
Residential mortgages	1,133.5	802.8	4,308.4	8.7%	13.9%	29.9%
Commercial Mortgages	920.0	161.3	690.7	7.1%	2.8%	4.8%
Banker's acceptances	164.6	18.1	18.2	1.3%	0.3%	0.1%
Total impairments	12,991.8	5,774.7	14,421.0			
Allowance for credit loss	9,458.8	10,375.3	14,363.2			
Provision for credit losses	2,100.9	2,500.7	7,600.2			
Impaired assets / total loans	1.7%	0.6%	0.7%			

Note: all numbers are shown in millions of real Canadian dollars. All proportions are relative to total impaired loans unless otherwise indicated. Some small categories of impairments have been excluded so the total does not necessarily add up to 100%. Source: OSFI.

Table 5 shows impaired assets by borrower or asset. In 1997, business loans

³⁵I found similar results when I used the levels and included total assets as an independent variable to control for bank size. I found the coefficient on pre-PCL earnings to be 0.0141 with a standard error of 0.0144

³⁶If I normalized by average quarterly assets and used robust standard errors then the coefficient becomes .073 with a robust standard error of 0.088.

were by far the most likely to be impaired, and while not as relatively large, was still true in 2015. This further illustrates the risky nature of commercial loans. The increase in the number of impaired residential mortgage loans is commensurate with the increase in the Canadian banking system, and the increase in the value of residential mortgages on the balance sheet. Impaired assets are an useful and objective measure of the riskiness of a portfolio however they do not account for the value of the underlying collateral. It is difficult to evaluate the riskiness of a mortgage portfolio without knowing the loan to value ratio or something about how much of the loan could be recoverable. On the other hand, there is a strong correlation between the provision for credit losses and impaired assets. Using quarterly aggregate data from 1996 to 2015., the correlation between the impaired assets and the PCL was 0.65, so an unexpected increase in impaired assets was a good indicator of future losses. Finally, we see that the ratio of impaired assets to total assets declined from 1.7% in 1997 to 0.7% in 2015. This implies a decrease in the riskiness of the aggregate bank portfolio.

For a commercial bank, bad loans are both a cost of doing business, and an existential threat. When a bank issues a credit card, they expect a significant percentage of any borrowing to never be repaid consequently they charge a high rate of interest to compensate. However as figure 17 illustrates, the PCL has a strong impact on bank profitability, but at no point in the sample period do loan-losses appear to threaten the solvency of any of the Big Six. Pre-tax ROA is reported net of trading gains (losses) and gains (losses) from non-trading assets to reduce volatility provide a clearer view of the relationship between historical profitability and PCL. First, we can observe that only CIBC and TD suffered a negative return in any given. This

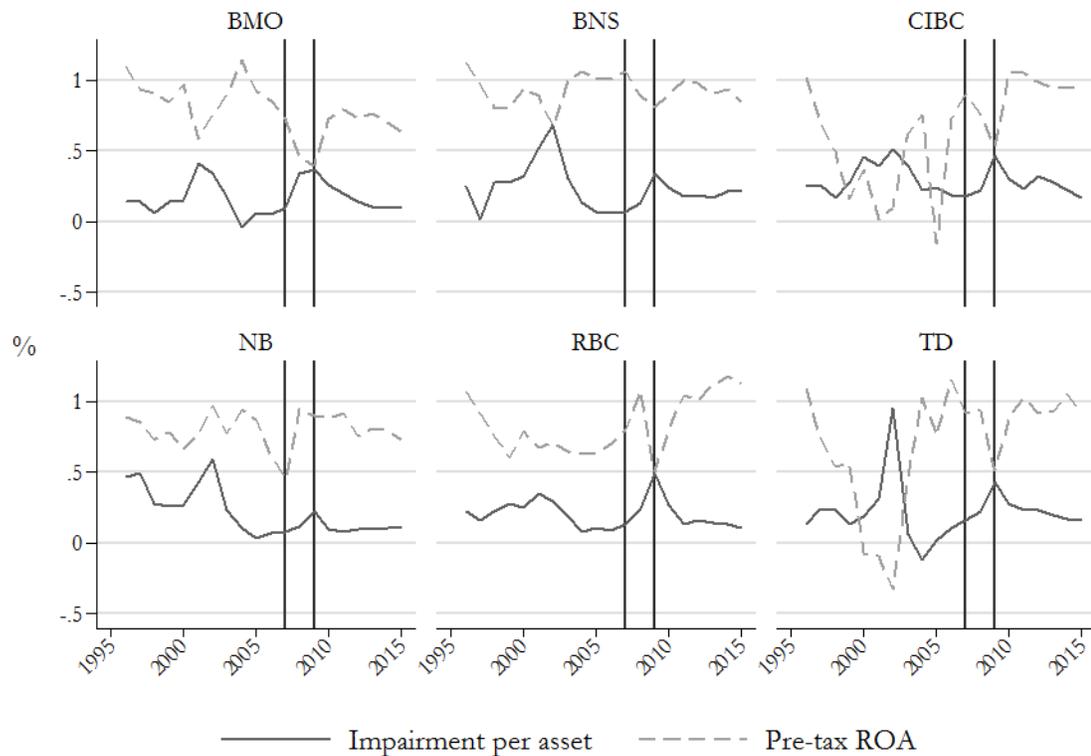


Figure 17: PCL and pre-tax income

Note: Pre-tax ROA is presented with trading gains (losses) and gains (losses) from non-trading assets removed. Source: OSFI.

happened to TD follow the Dotcom bubble and concurrent with its acquisition of Canada Trust. CIBC had a similar experience with the Dotcom bubble although the negative return was associated with the Enron legal penalty. NB and RBC avoided losses during the Dotcom bubble while BNS and NB avoided losses to their loan portfolios in the financial crisis of 2007-09'.³⁷ Mostly, we observe a direct relationship between increasing PCL and decreasing ROA. In fact, although bad loans are a cost of doing business, the PCL relative to total assets was near zero for most banks

³⁷National Bank suffered a large loss in 2007 related to the asset-backed commercial paper market in Canada. See [Chant \(2008\)](#).

from 2004 to 2007. BMO, BNS, NB and RBC were always able to maintain a pre-tax ROA of between 0.5 and 1%, which is an impressive risk management performance.

6 Risk-weighting

In the previous section, I discussed how impaired assets and the provision for credit losses could tell us something about future loan performance. However many bank losses occur through off-balance sheet items, such as lines of credit, and through proprietary trading. So far, we have failed to identify a satisfactory instrument that might help an analyst predict future losses in the trading portfolio, and there is no 'silver bullet' to remedy this problem, yet I would be remiss if I discussed the Canadian banking system without mentioning risk-weighted assets (RWA). Beginning with Basel I, banks were required to calculate total risk-weighted assets, and these were reported to OSFI through the Basel Capital Adequacy Requirements (BCAR) filing. Every asset, on and off-balance sheet, was assigned a risk-weight percentage based on the type of asset. This is a standardized approach, and many of these assigned risk-weights were, in hindsight, made to appear naive. For example, cash was assigned a risk-weight of zero, which is incontestable, but so was any form of sovereign debt, whether it was issued by Greece, Argentine or the United States of America. Mortgages were given a risk-weight of 50% of the value of the loans, regardless of the of the underlying collateral or the loan-to-value ratio. This is particularly unfortunate because it fails to account for other macro-prudential tools that encourage lending discipline. For example, some jurisdictions have strict minimum down-payments on first-time mortgages while others may have none at all. In an attempt to remedy these shortcomings, Basel II created a dual system. Smaller

banks were still allowed to file risk-weighted assets according to the standardized values however large banks were encouraged to invest in an internal ratings-based approach to measuring risk. In essence, this pushed the large Canadian banks into creating, or adopting, economic and statistical models to measure risk and RWA. OSFI then vetted these models based on what other large banks were doing, and on what assets the model was applied to. So every position at the bank, including off-balance sheet assets such as lines of credit and trading positions, was modelled and the risk exposure measured. If one bank had a quantifiable advantage in modelling risk over its competitors, OSFI had the power to lower that bank's capital requirements. Consequently, the banks were given an additional incentive to invest in costly yet sophisticated risk management systems and to hire capable risk managers.

In 2008, OSFI replaced the Capital Adequacy Component of Capital report with the Basel Committee Capital and Leverage filing (BCAR). More information was provided when the risk-weighted assets were broken down by type of risk. Prior to 1998, only the total risk-weighted assets were reported. Then in 1998, credit risk and market risk were reported in separate entries, and in 2008, operational risk was introduced and reported. Figures 18 shows that the relative proportion of total risk-weighted assets to total assets, and credit risk-weighted assets to total assets declined since 1998. In 1998, 60% of assets were risk-weighted while in 2015 this had declined to less than 40%. Have the Canadian banks become less risky? Or was this a function of switching from standardized risk-weights to internal models? Neither of these ratios seemed to move with the Dotcom bubble nor the financial crisis of 2007-'09. RWA might have given regulators and market analysts

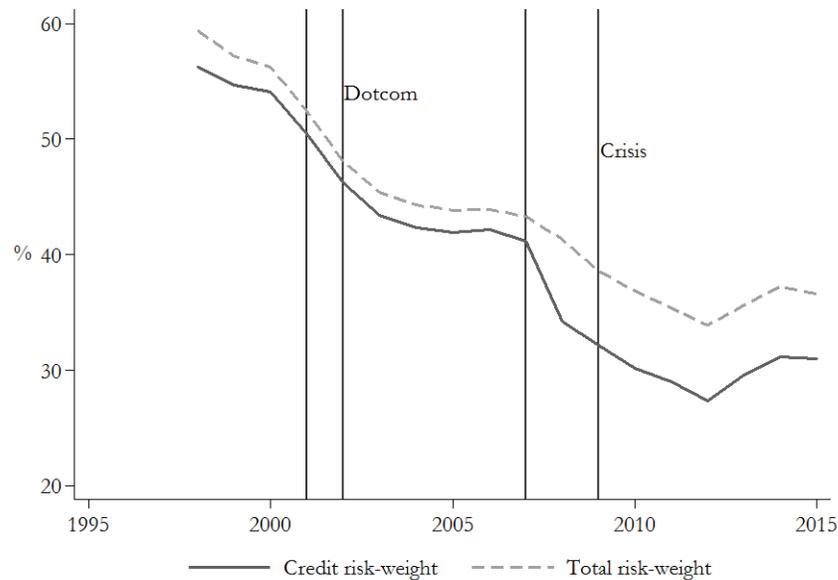


Figure 18: Credit and total risk-weighted assets

Note: Risk-weighted assets are presented as a percentage of total financial assets. The difference between credit risk-weights and the total is the sum of market and operational risk. Source: OSFI.

a more accurate view of risk exposure than total assets, yet it remained unclear whether it created any predictive capabilities; these risk-weighted ratios appeared to be uncorrelated with recent crises. Figure 19 shows market and operational risk relative to total assets. There is a modest increase in market risk exposure relative to total assets which began prior to the financial crisis of 2007-'09 but peaked in 2009. Comparing the measure of market risk to that of securities in 2006, the aggregate banking system had 8.64% of assets in equity securities and 11.7% in bonds³⁸, much more than in 2015 or 1997. So the build-up in market risk relative to total assets coincidence with a relative increase in assets exposed to market risk. Risk-weighted assets are difficult to interpret without knowledge of the calculations involved. And on the surface, they do not seem to predict upcoming crises in the

³⁸See section 2, table 1

Canadian banking system.

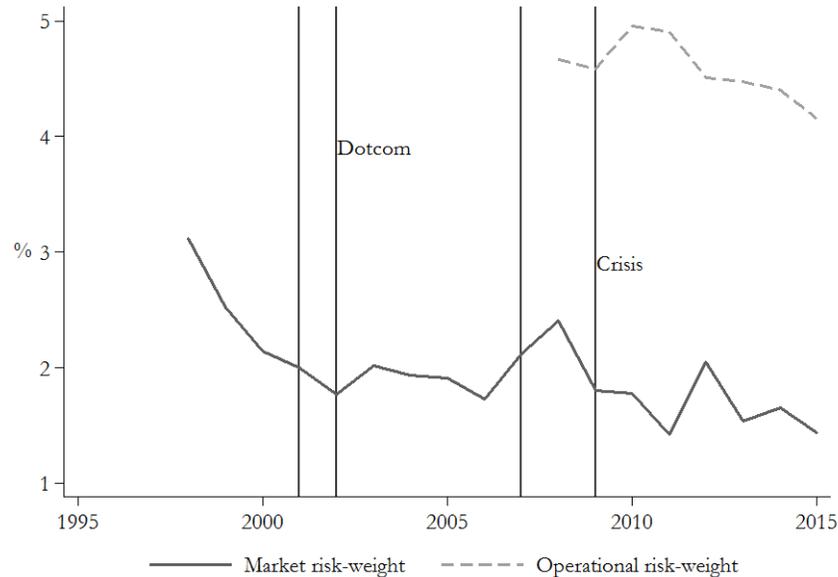


Figure 19: Market and operational risk-weighted assets

Note: Risk-weighted assets are presented as a percentage of total financial assets. The difference between credit risk-weights and the total is the sum of market and operational risk. Source: OSFI.

Using internal models for calculating risk-weighted assets is theoretically pleasing; it can account for both on and off-balance sheet items and proprietary trades without the inflexibility of a standardized approach. [Le Leslé and Avramova \(2012\)](#) discussed how RWA and how it is calculated could be improved. They stated that a good RWA regime should (i) provide a common measure for a bank's risks; (ii) ensure that capital allocated to assets is commensurate with the risks; and (iii) potentially highlight where destabilizing asset class bubbles are arising. Let us compare how RWA fared in these three objectives as it relates to the Canadian banking system from 1996 to 2015. As a predictor of bank stress, total RWA fails to predict either the Dotcom bubble or the financial crisis of 2007-'09, both of which pre-

sented banks with significant losses. So I question whether (iii) was successful, as RWA failed to highlight either crisis. To compound the issue, [Le Leslé and Avramova \(2012\)](#) stated that RWA is inconsistently calculated across national borders. So it would be unwise to compare the Canadian banking system with an European country, or even banks in the United States. Despite these drawbacks, it was possible that OSFI found the risk-weighted assets to be helpful during the financial crisis. As the regulator, they would have better information on how these models calculated RWA. So it is possible that RWA satisfied (ii), that it helped the regulator ensure the Canadian banks had adequate capital.

Did RWA provide a common measure for a bank's risks? Figure 20 shows RWA per financial asset for the Big-Six Canadian banks. Risk-weighted assets per financial asset have both declined and moved closer together. Are each of these banks equally risky? Over the entire sample, CIBC consistently maintained a lower RWA to total financial asset ratio than other members of the Big Six; yet CIBC accounted for more losses than any other bank. Using the metric of RWA per financial asset, it actually favoured the worst performer. BMO and BNS had the highest ratio but they performed quite well over the sample. Thus RWA failed to satisfy (ii), namely that it was a common measure of risk that could be used to compare the riskiness of one institution with another. RWA may provide insight to the regulator, and it may give a bank an incentive to better quantify risk, yet it is likely that going forward, traditional leverage ratios such as assets per equity capital will remain an important objective measure of adequate funding.

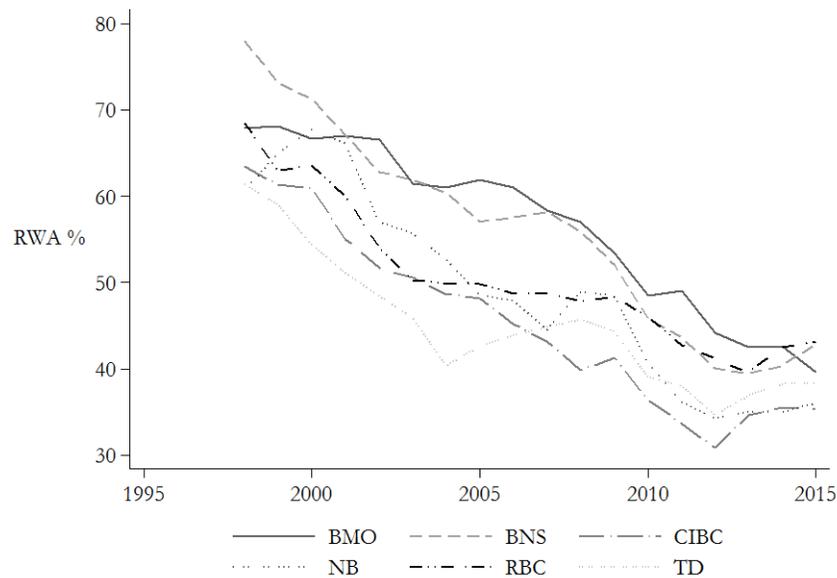


Figure 20: Big Six risk-weighted assets

Note: Risk-weighted assets are presented as a percentage of total financial assets. Source: OSFI.

7 Conclusion

This paper summarizes the data available on the Canadian banking system, most of which is available on the OSFI website or through CANSIM. The Canadian banking industry grew significantly from 1996 to 2015, and during this period it survived, and prospered, through the worst financial crisis since the Great Depression. The ability of the Canadian banks to attract and maintain deposits, and thus avoid the turbulent short-term funding markets, was an essential component of success. The focus on retail banking paid-off after the financial crisis with a quick rebound to pre-crisis rates of return on total assets. This placed a number of the large Canadian banks in a strong financial position which allowed them the opportunity to expand into the United States. Furthermore, I found little evidence that the Canadian banks

were using the provision for credit losses to manage taxable income. Lastly, I found that risk-weighted assets were not an useful measure for comparing the riskiness of different Canadian banks or as a predictor of aggregate losses in the Dotcom bubble or financial crisis of 2007-'09.

References

- Ahnert, Toni, Kartik Anand, Prasanna Gai, and James Chapman (2016), “Asset encumbrance, bank funding, and covered bonds.” *Bank of Canada Staff Working Paper*, 2016-16.
- Anderson, Ronald W and Karin Joeveer (2012), “Bankers and bank investors: Reconsidering the economies of scale in banking.”
- Berger, Allen N, Philip Molyneux, and John OS Wilson (2014), *The Oxford handbook of banking*. OUP Oxford.
- Bordo, Michael D, Angela Redish, and Hugh Rockoff (2015), “Why didn’t Canada have a banking crisis in 2008 (or in 1930, or 1907, or . . .)?” *The Economic History Review*, 68, 218–243.
- Calmès, Christian and Raymond Théoret (2014), “Bank systemic risk and macroeconomic shocks: Canadian and us evidence.” *Journal of Banking & Finance*, 40, 388–402.
- Calmès, Christian et al. (2004), *Regulatory changes and financial structure: the case of Canada*. Citeseer.
- Chant, John (2008), *The ABCP crisis in Canada: the implications for the regulation of financial markets*. Expert Panel on Securities Regulation.
- Damar, H Evren, Adi Mordel, et al. (2016), “International banking and cross-border effects of regulation: Lessons from canada.” Technical report, Bank of Canada.

- DeBoskey, David Gregory and Wei Jiang (2012), “Earnings management and auditor specialization in the post-sox era: An examination of the banking industry.” *Journal of Banking & Finance*, 36, 613–623.
- Demirguc-Kunt, Asli, Enrica Detragiache, and Ouarda Merrouche (2013), “Bank capital: Lessons from the financial crisis.” *Journal of Money, Credit and Banking*, 45, 1147–1164.
- Dietrich, Andreas and Gabrielle Wanzenried (2011), “Determinants of bank profitability before and during the crisis: Evidence from Switzerland.” *Journal of International Financial Markets, Institutions and Money*, 21, 307–327.
- Greenbaum, Stuart I, Anjan V Thakor, and Arnoud Boot (2015), *Contemporary financial intermediation*. Academic Press.
- Huang, Rocco and Lev Ratnovski (2011), “The dark side of bank wholesale funding.” *Journal of Financial Intermediation*, 20, 248–263.
- Le Leslé, Vanessa and Sofiya Yurievna Avramova (2012), “Revisiting risk-weighted assets.”
- Stock, James H and Mark W Watson (2003), “Has the business cycle changed and why?” In *NBER Macroeconomics Annual 2002, Volume 17*, 159–230, MIT press.