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An Overview of the Canadian Banking System: 1996 to 2015

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Abstract

From 1996 to 2015, total assets at Canadian 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, I describe how the Canadian banks earn revenue, fund business activities, and pay expenses. The success of the Canadian banking system can be attributed to: i) a focus on retail and branch-level banking, ii) a preference for deposit-financing, and iii) minimizing costs, particularly noninterest expenses. Furthermore, I provide a broad overview of the data, accounting rules, and trends in Canadian banking. Estimating a reduced form model similar to [DeBoskey and Jiang \(2012\)](#), I find no evidence that the Canadian banks manipulated the provision for credit losses to ‘smooth’ earnings.

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 these numbers give something of a false impression of market concentration in Canada. Just six large banks, known colloquially as the Big Six¹ controlled approximately 90 percent of total banking assets from 1996 to 2015. Although each of the Big Six banks enjoys its own comparative advantages, they share many common and quantifiable characteristics. These banks have had, at one point in time or another, large international exposures and investments, particularly in the United States. [Damar et al. \(2016\)](#) find that when foreign jurisdictions tighten local prudential measures the Canadian banks will increase lending, particularly when capital requirements are increased. Each of these banks controls a branch network that spans each Canadian province: they pool resources to pay for a common system of payments and offer a full range of financial services and lending that fits the definition of an universal bank. During the U.S. Financial Crisis of 2007-09', regulation from the Office of the Superintendent of Financial Institutions (OSFI) and strong risk management helped the Big Six survive the economic downturn and quickly return to profitability. In this paper, I seek to provide a broad overview of the data, accounting rules, and trends in Canadian banking. 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 elsewhere.

Figure 1 summarizes aggregate bank assets. Clearly, the Big Six Canadian banks 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 expanded their U.S. operations.² Figure 2 shows how the balance sheets of members

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 remaining banks are known as the 'big-five'.

²TD has been expanding retail branch network in the U.S. north-east. 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 U.S. base in Chicago.

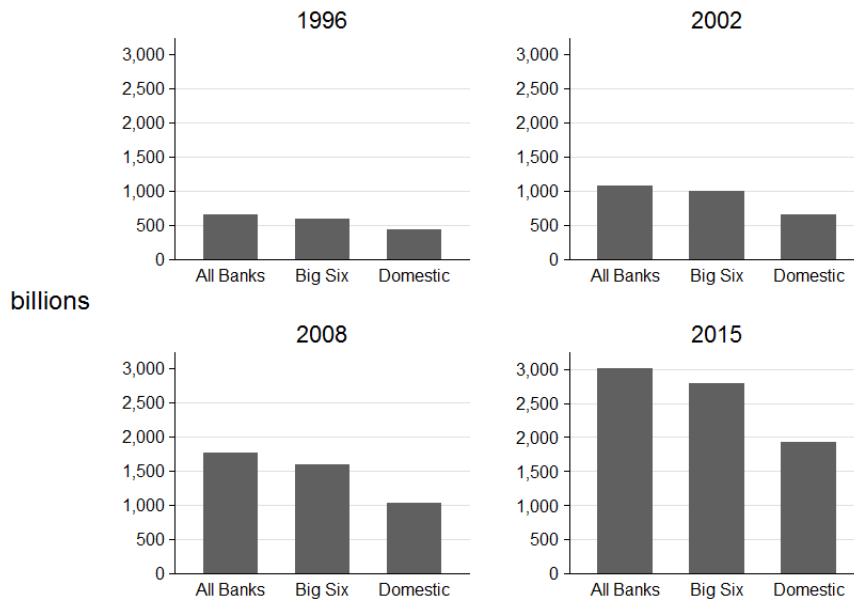


Figure 1: Financial assets

Note: Calculates financial assets as the sum of loans and securities. It is presented in billions of nominal Canadian dollars. Domestic assets are any security or loan associated with a Canadian address. Sources: OSFI, assets with a Canadian address came from CANSIM.

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. By 2015, CIBC was significantly smaller than four of the other banks and it had sold its US operations. This retreat from the U.S. market was in some part due to two bad experiences: large legal penalties associated with Enron and trading losses during the financial crisis of 2007-'09. Despite this, CIBC average real assets grew from \$200 billion in 1996 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, so that TD Canada Trust became one of the largest banks by total assets. As of March 2017, it continues to expand operations in the U.S. north-east.

Data available from OSFI does not differentiate between activities in Canada and in

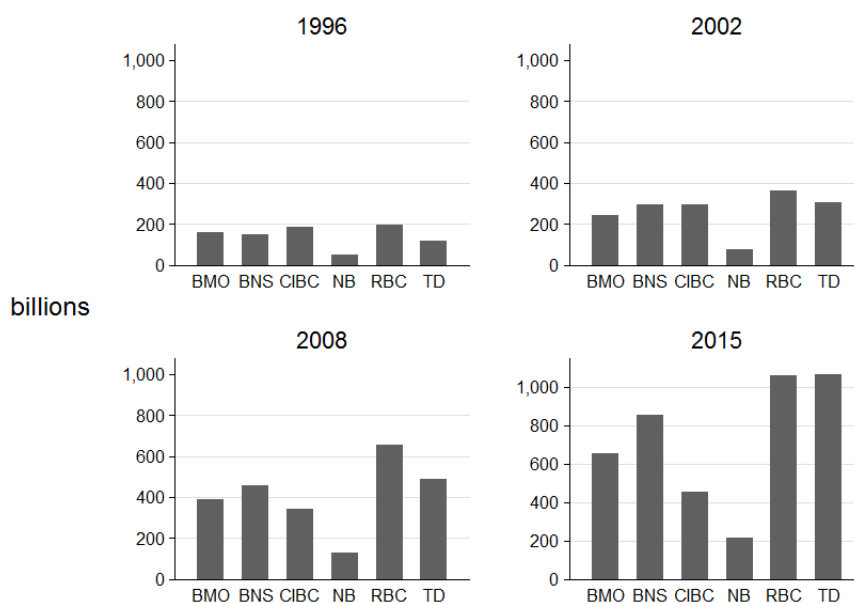


Figure 2: Total assets

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

other countries, at least not with the data that is publicly 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 but even this information typically relies on recipient addresses rather than the location where business activities actually occur. These factors make it difficult to separate activities that occurred in Canada from those in other countries. However since each Canadian bank must file regulatory reports in the United States detailing their American business activities, there is some publicly available information on Canadian bank foreign operations.⁴ OSFI publishes assets and liabilities in domestic and foreign currency. A researcher might assume that any asset in a foreign currency likely occurred in a foreign country, but

³There is a separate filing for assets that are recorded in either a Canadian branch, subsidiary or head office account.

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)

the accuracy of this assumption is difficult to measure. At times between 1996 and 2015, the foreign currency data appears to be missing observations and contains some inconsistencies, particularly during the financial crisis in 2009, that are not easily correctable.

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 or foreign bank's business activities (or assets) reporting to OSFI. Although it might omit some important financial institutions, it coincides with the data available under the OSFI 'Total All Banks' category. As figure 1 suggests, the high concentration of assets in the Big Six makes it probable that an alternative definition would generate a similar result. An advantage of this definition is that it includes HSBC Canada, which has grown significantly to become the seventh largest bank overall, and the largest foreign bank in Canada. Total assets at this 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. A disadvantage is that two large deposit-taking institutions are excluded: Caisse central Desjardins is a credit union, or *caisse populaire*, that operates mostly in Québec and had total assets of \$51.8 billion in 2016,⁵ and ATB Financial, a crown corporation that operates solely in the province of Alberta, had total assets of \$46.7 billion in the same year. Finding comparable data is difficult because of their unique ownership structure and they report to provincial regulators rather than OSFI. Consequently, a significant portion of the Alberta and Québec markets are unaccounted for.

While both OSFI and statistics Canada, with data from the Bank of Canada, make banking information available to the public⁶, compared to the United States, there is much less publicly available information on Canadian banks. Statistics Canada offers aggregate

⁵Caisse central Desjardins is owned by the Desjardins Group. The latter also operates a large insurance business across Canada. This financial entity had \$258 billion assets in December of 2016. Separating costs incurred at the *caisse populaire* from those at the larger financial group is problematic.

⁶Statistics 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.

banking information while OSFI has both individual bank and aggregate information but makes only some of this available to the public. A complete description of the data collected 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 offers no such assistance, and it presents something of a roadblock to researchers.⁷ Fortunately, some data has been made available. Since 1996, the OSFI website publishes information on each bank's income statement, balance sheet, impaired loans report, Basel Capital Adequacy Requirements, and derivative positions.

Using the information described above, I present a summary of the Canadian banking system from 1996 to 2015. The paper is organized to follow the monthly and quarterly accounting statements. These are published by the banks and most of the information has been confirmed by a major accounting firm. Regulatory filings submitted to OSFI can be found on the OSFI website.⁸ Section 2 highlights the asset-side of the balance sheet that can inform us about the different assets in the investment portfolio of a bank. 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 \$1,220 billion real 2012 Canadian dollars. By the end of 2015, this number increased to \$4,429 billion without any indication of slowing. The Canadian banking system contains a smaller proportion of loans to businesses and a greater proportion of loans to households – mortgages and consumer loans – than it did in 1996. Section 3 focuses on revenue, specifically net interest income and noninterest income. During the pre-crisis 2000's, noninterest income was increasing at a faster rate than net interest income on loans and securities. This reflects the possibility that banks were moving from a traditional, intermediary business model with loans held

⁷Unfortunately, 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, I spent consider effort downloading, sorting, and collating the data into usable time series and cross-sections.

⁸<http://www.osfi-bsif.gc.ca/Eng/wt-ow/Pages/FINDAT.aspx>

on the balance sheet, to an originate-and-distribute business model associated with securitization. However this trend reversed during, and subsequent to, the financial crisis of 2007-2009. Section 4 is divided into two subsections: the first, subsection 4.1, focuses on how banks funded their business activities and at what cost. The Canadian banks rely primarily on two sources of funding: deposits from individuals, whose levels remained steady during the financial crisis, and wholesale deposits. These declined by over \$50 billion in 2009.⁹ 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. From 2004 to 2009, average noninterest expense per asset declined 33 percent – a result that should likely be attributed to an improvement in technology. Section 5 explains the accounting behind bad loans and how these are measured on the balance sheet, income statement, and the impaired loans report. I test whether the Big Six Canadian banks used the provision for credit losses to ‘smoothes’ earnings over the business cycle – I find that there is no evidence that they did so. Section 6 discusses some of the issues around risk-weighted assets (RWA). Specifically, how RWA were calculated over the sample period and how effective RWA were as a measure of risk – both as it regarded aggregate risk in the system and identifying risk at individual banks. Section 7 summarizes the key findings.

2 Balance sheet assets

A traditional role of a bank is to act as an intermediary between savers and borrowers. Typically, depositors take on the role of savers and borrowers receive loans. Using double-entry accounting, deposits appear as liabilities and loans appear as assets on the balance sheet, so the balance sheet tells us about the sources of funding and who is borrowing. However not all activities, or even loans, appear on the balance sheet. The lend-and-distribute, or market-oriented business model, packages loans into securities that are then sold to third

⁹As explained in subsection 4.1, what might be called senior debt in other jurisdictions, GICs for instance, is often included in fixed-term deposits.

parties. Collateralized debt obligations (CDOs) and mortgage-backed securities (MBS) are classic examples and became infamous during the financial crisis of 2007-'09. These items were often held off balance-sheet despite any exposure to potential losses. Lines of credit were also frequently held off-balance sheet until funds were withdrawn by a client. These are benign when the client is financially sound however if she has a liquidity or solvency crisis, she will certainly borrow the maximum available amount – regardless of whether or not it can be repaid.

The large Canadian banks all have an investment banking division now usually referred to as the capital markets segment of operations. Traditionally, they raise funds for corporate clients by 'placing' new and seasoned debt and equity offerings with third-party investors in exchange for a fee. 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. So long as a bank is able to find buyers for a new IPO, it creates little risk. Beginning in the late 1990's, capital market activities came to include trading gains and losses. This had an effect on asset allocation. For example, in the 2007 RBC annual report, net interest income declined by 5 bps. This was explained as follows:

'we experienced higher growth in lower yielding and non-interest-earning assets, including trading securities and assets purchased under reverse repurchase agreements and securities borrowed largely in support of our trading and other business activities, which generate non-interest income.'

Average total assets in the capital markets division at RBC was \$311 billion in 2007 – in 2005, it was \$229 billion. The remainder of this section explains and summarizes the OSFI balance sheet information that focuses on the bank as a whole rather than by parts.

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 is easy to observe all

the bank assets in a comparable value, but it is 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.¹⁰ There are 17 sub-categories of loan types in the regulatory filings, but generally 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 insured and uninsured residential mortgages and a smaller amount of reverse mortgages, non-residential mortgages, and New Home Act mortgage backed securities (NHA MBS) that are pooled and unsold. These are mortgages that have been sold to the Canadian Mortgage and Housing Corporation (CMHC), but the sale has not yet been recognized under the IFRS accounting standards fully introduced in 2012. Previously, these unsold, securitized mortgages were held off-balance sheet. This is preferable because they do not need to hold any off-setting, and costly, liabilities or equity. In 2015, they averaged \$178 billion, or 17 percent 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.

¹⁰Section 5 describes impaired loans in detail.

This portfolio is ‘ring-fenced’, meaning that the most senior claim on these assets belongs to the covered bond holder. 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 have sufficient value so that they are extremely low-risk. Covered bonds are extremely popular among European banks and investors.¹¹ Ahnert et al. (2016) provide a theoretical analysis on the implications of secured funding for a banking system. As 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. Ahnert et al. (2016) find that covered bonds allowed for less expensive financing that increased investment and financial stability. However they also find that as more covered bonds are issued, the burden of risk on unsecured depositors and creditors became greater. So in the event of a negative shock, depositors, 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 if covered bonds were not a major source of funds. Section 4 discusses other sources of bank funding and liabilities in detail.

Table 1 presents average annual assets among the Canadian banks for the years 1997, 2006, and 2015. The most prominent change was the increasing size of the balance sheet which, as illustrated in Figure 1, was driven by the Big Six. In nominal terms, the Canadian and foreign banks operating in Canada had assets four times the size in 2015 than they had in 1997. Mortgages as a percentage of total assets increased by only 1.33 percent from 1997 to 2006 but rose 6.59 percent from 2006 to 2015. New IFRS accounting rules increased this value by \$177 billion, but this does not explain the entirety of the increase. If this value is subtracted from both total assets and residential mortgages, residential mortgages

¹¹In 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 percent.

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: Values are denominated in billions of nominal Canadian dollars. All proportions are relative to total assets. Business loans include leases, and derivatives are recorded at fair value. Source: OSFI.

would have accounted for 23.3 percent of total assets in 2015. This remains a substantial relative increase over 2006 and could reflect increasing real estate prices – particularly in Toronto and Vancouver where prices have outpaced real wage and output growth. The relative size of equity, both direct-equity and securities, and bond securities relative to total assets was highest in 2006 at 20.4 percent, a year prior to the financial crisis. This was up substantially from the 9.84 percent in 1997 that included few equities. The relative increase in corporate and non-Canadian government securities and the relative decline in business loans could have represented a move towards more market-oriented activities, such as securitization. However this conclusion is not supported by the aggregate revenue illustrated in Table 2. The revenue entry that includes securitization had the same relative

size in 2015 as in 1997. Another possible explanation is that, beginning in the 1980's, the business cycle became less volatile, specifically in regards to inflation and output. [Stock and Watson \(2003\)](#) referred to this phenomenon as 'the Great Moderation' and was made popular in a speech by Ben Bernanke in 2004.¹² A sustained decline in volatility could have encouraged investors to acquire assets with higher yields, and consequently more risk, than otherwise. In part, this helps explain the declining share of cash equivalents and Canadian government debt over the sample. Additionally, some banks were purchasing assets in order to support trading activities and grow noninterest income rather than more traditional lending. Despite the increasing ratio of noninterest to net interest income leading up to the financial crisis, there remained a substantial amount of traditional intermediary activity over other, market-oriented, banking activities.

Figure 3 illustrates the composition of the loan portfolio in four, relatively usual, time periods. The loan portfolio of each of the Big Six are presented along with their aggregate total. 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 are 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 autumn of 2008,¹³ so banks were able to sell these assets during the stressful summer of 2007. At this time, problems in the U.S. subprime mortgage market became common knowledge and the Canadian asset-backed commercial paper market froze.¹⁴ It is certainly easier to sell assets if there is a pre-existing secondary market, and the secondary market for equity securities is much more

¹²The speech can be found here: <http://www.federalreserve.gov/BOARDDOCS/SPEECHES/2004/20040220/default.htm>

¹³This 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 was occurring, and that only a minority 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.

¹⁴For more on the asset-backed commercial paper market (ABCP), see [Chant \(2008\)](#) and [Halpern \(2016\)](#)

liquid than for loans, or even corporate bonds.¹⁵ Business loans contain many idiosyncratic and opaque features, and this makes them an unlikely candidate for securitization. Possibly, these loans remained on the balance sheet until they reached maturity, expired and the principal was repaid.

¹⁵For 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.

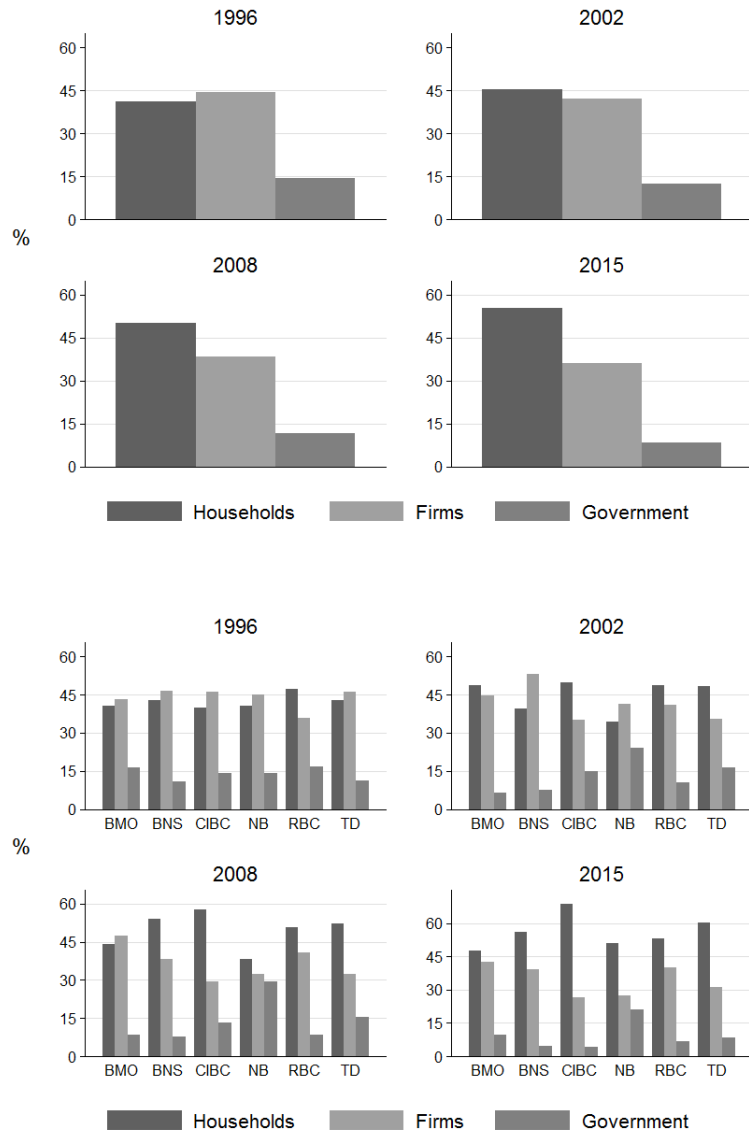


Figure 3: Aggregate loans

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.

Liquid assets include government securities, reverse repos, and cash equivalents. It represented 25.5 percent of all assets in 1997. Government securities were in high demand during the financial crisis of 2007-'09. In 2008, the banks held an average of \$194 billion in Canadian government securities, rising to \$315 billion the following year. This can be attributed to both an increase in Canadian governments debt issues and a likely 'flight-to-quality' episode. 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. After the crisis and commensurate with the transition to IFRS accounting standards, the banks either sold these securities or allowed them to mature without replacement.

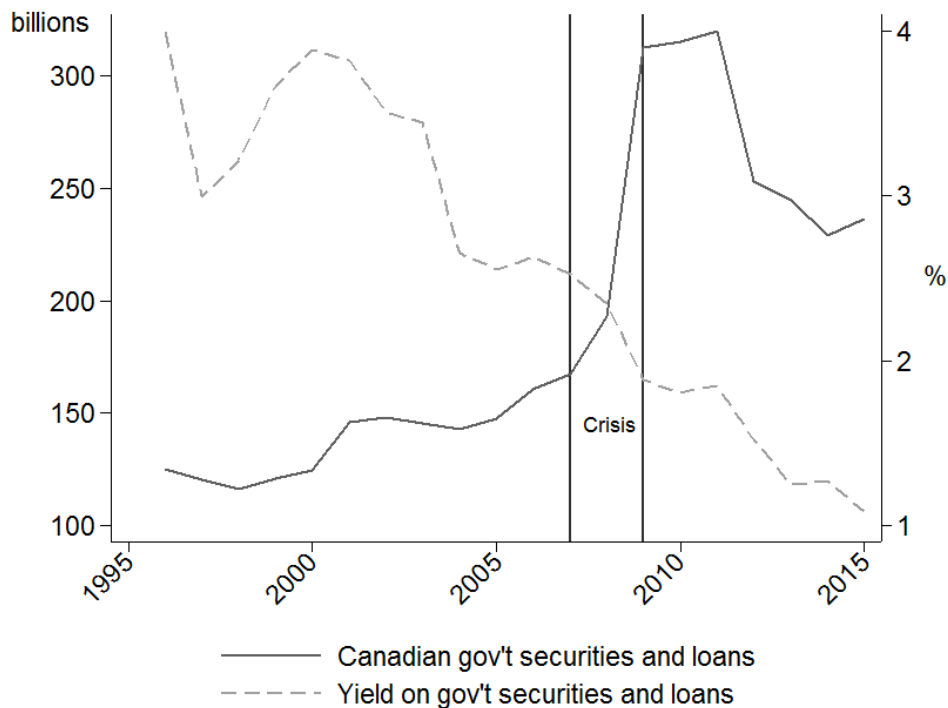


Figure 4: Canadian government securities and yield

Note: The average quarterly balance is shown in real 2012 Canadian dollars. Canadian government securities include 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

Derivative assets are held at fair value on the balance sheet while changes in value are recorded in other comprehensive income. There is a corresponding derivative liability that is also held at fair value. IFRS 9 accounting rules are set by the International Accounting Standards Board; they have strict conditions regarding when a hedge can be recognized which would allow both the asset and liability to be removed from the balance sheet. This partly explains why derivative assets and liabilities accounted for more than 7 percent of assets in 2015 while the net difference between the two was quite small. There is a negligible correlation between trading revenue and the average level of derivatives that makes it difficult to connect 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 while the method of depreciation for equipment varies. Some banks use the straight-line method while others used a combination of the straight-line and double-declining methods. Maturities on equipment are typically 2 to 5 years, or occasionally 8 years. The depreciation on buildings can be as long as 30 years, and net capital was often upwards of 70 percent of the initial cost. Consequently, net physical capital can be a misleading indicator of the actual quantity in use. In 2015, physical capital accounted for less than 0.3 percent of all bank assets and was declining over the entire sample. This could reflect either better technology such as more efficient use of physical branch space and a decreasing cost of computing power or a greater reliance on renting rather than owning property¹⁶. The other assets category is calculated by subtracting each of the categories listed in Table 1 from total assets. It includes those related to insurance, accrued interest, prepaid or deferred charges, goodwill, and intangibles. It also includes a sundry list such as foreclosed real estate, recoverable losses from hold-ups, and defined benefit pension assets.

¹⁶Looking at the Canadian bank annual reports, it appears that not all real estate leases were capitalized on the balance sheet. See [McKeown \(2017\)](#).

3 Revenue on the income statement

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 within 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 a ‘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 who include firms, households, governments, and government agencies. Loans to households fall into two 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 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, CIBC 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 \$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 percent simple interest.¹⁷

Figure 5 shows the net interest rate spread on different types of loans. It is calculated as revenue per asset type less the average interest expense of all interest-paying liabilities. Loans to businesses have the highest and most volatile spread. During the financial crisis,

¹⁷Data 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

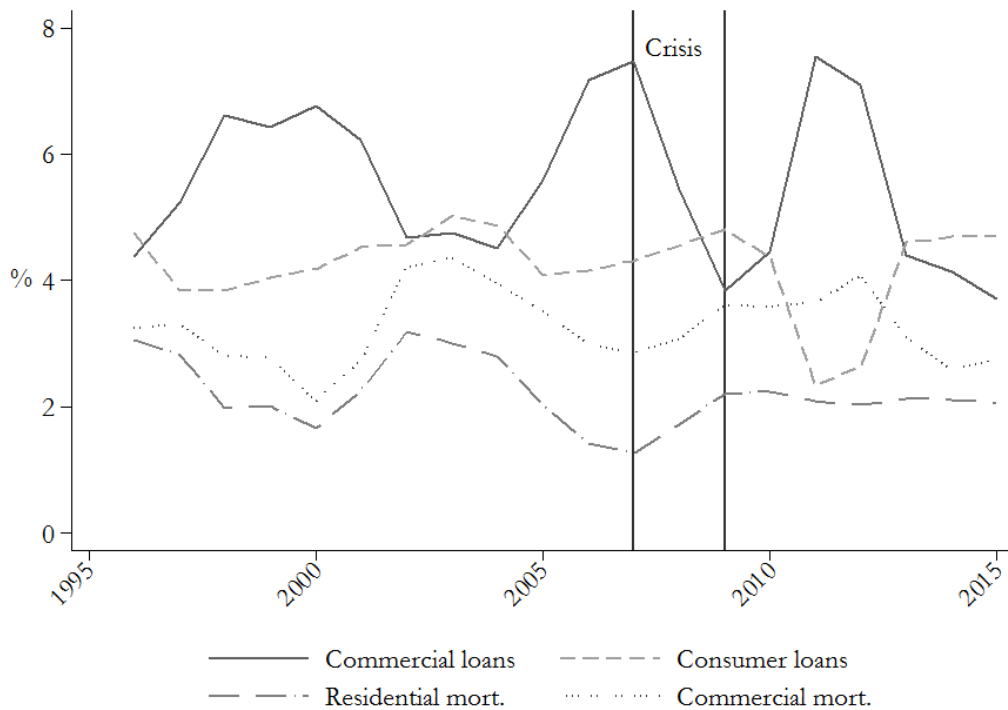


Figure 5: Average interest rate spreads

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

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. Why did the spread on business loans decline? There are two likely contributors. 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 demanded the principal be repaid at maturity. Second, many of these loans went into arrears – some of the interest was never collected. Alternatively, the banks may have renegotiated a lower rate of interest in order to maintain the solvency of the borrower and the value of its loan. On October 31, 2009, there were \$12.7 billion business loans that had failed to make a payment in the previous 90 days. This was just \$3.3

billion on the same day in 2007. By comparison, the value of impaired residential mortgage loans was \$1.1 billion on October 31, 2007 and \$3.1 billion on October 31, 2009. This is in spite of the details listed in Table 1. It shows that in 2006, 19.6 percent of total assets were residential mortgages while business loans accounted for just 11.7 percent.

With hindsight, a certain level of risk can be inferred from these spreads. It seems residential mortgages were, on average, the least risky followed by commercial mortgages. The highly collateralized nature of these loans can significantly reduce, though not eliminate, risk. In Canada, mortgages are full-recourse loans, meaning that borrowers must repay the mortgage in full, or lenders can make claims on the borrower's other assets.¹⁸ Naturally, the collateral is worth more if real estate prices are increasing. If the value of any collateral underlying these mortgages declined then losses would be more severe. However the quality of mortgage in Canada is mitigated by stronger macroprudential policy. New mortgage issues with a loan-to-value (LTV) ratio above 95 percent are forbidden. If the LTV is above 80 percent then mortgage insurance is required. Most mortgage insurance is purchased from the Canadian Housing and Mortgage Corporation (CMHC), a crown corporation. While CMHC is the largest insurer of mortgage insurance in Canada, there are also private providers; the two largest private insurers are Genworth Canada and Canada Guaranty (formerly AIG United Guaranty). Curiously, these two private firms were able to profitably compete against what might have been a government monopoly, so the presence of private firms suggests that CMHC pricing was imperfect¹⁹. Finally, CMHC mortgage insurance enjoyed an explicit 100 percent guarantee from the Federal Government. For private insurers, the government guarantee was 90 percent. Macroprudential policies such as these lead to a lower level of risk per dollar of mortgage and consequently lower rates on mortgages. For the most part, the Canadian banks avoided subprime lending in the U.S.

¹⁸In some U.S. jurisdictions, the law of the land was non-recourse mortgages which encouraged borrowers and exacerbated lending losses.

¹⁹For more on the differences between Canadian and U.S. mortgages, see https://www.cmhc-schl.gc.ca/en/corp/nero/jufa/jufa_018.cfm

and the severe price correction in certain geographic areas.²⁰ By contrast to the U.S. experience, the Canadian real estate market leveled off rather than declined during the financial crisis, and subsequent to 2010, prices continued to increase.

If a bank is able to observe cash deposits and withdrawals of a client, then it will have private information that its competitors lack – a natural way to understand the significance is through a model of asymmetric information. [Boot and Thakor \(2000\)](#), [Petersen and Rajan \(1994\)](#), and [Sharpe \(1990\)](#) argue that banks earn monopoly rents from the asymmetric information garnered through repeated interactions with the same clients. With more knowledge, a bank can more accurately estimate the creditworthiness of a would-be borrower. It can also sell products tailored to the observed preferences of the depositor; if the client also operates her own business, the benefits are even greater. Evidence suggests that successful banks skillfully manage their relationships with customers. A UK Competition and Markets Authority (CMA) report²¹ finds that only 3 percent of individuals and 4 percent of firms switched banks in any given year, and the average length of a bank-client relationship was 16 years. This ability offers insight into how more established banks, such as the Big Six, continue to dominate financial systems even with increased competition from new entrants and disruptive new technologies. For more on relationship banking and switching costs, see [Greenbaum et al. \(2015\)](#) chapter eight and [Berger et al. \(2014\)](#) chapter two. More recently, [Höwer \(2016\)](#) studies German banks from 2000 to 2013. He finds that German banks made more efficient liquidations of distressed firms if it had a close pre-existing relationship with the firm and surrounding geographic area.

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

²⁰Some of the worst hit areas included Nevada, Arizona, and California.

²¹"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

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 trading).²² Some of these activities, such as banker's acceptances, are traditional activities that can be traced back through history while credit and debit card fees are clearly more recent additions.²³

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 a large quantity of smaller, independent firms.²⁴ The Big Six banks leveraged their brick-and-mortar branches and online platforms to sell wealth management services to depositors through investment products such as mutual funds. Banks underwrote their own mutual (investment) funds and securities while collecting commissions and fees. Furthermore, they offered investment management and custodial services. Traditionally, bank regulators were not concerned about wealth management because the products are owned by the client and gains and losses accrue directly to the them rather than the bank. Consequently, assets-under-management do not appear on the balance sheet, and OSFI reports little aggregate data beyond the associated noninterest income. Banks do report assets-under-management in their financial reports however the reporting

²²This category is largely made-up of branch level foreign currency purchases. Larger orders go through capital markets and the trading desk. Quoted exchange rates per trade depend on client characteristics such as creditworthiness, simplicity of the transaction, and history with the client.

²³I 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 rather it is an example of adopting new technology to improve service.

²⁴"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 percent of all the assets in retail brokerage accounts might be controlled by the Big Six.

standards are not always consistent year-to-year or comparable across different banks.

Although there remains a strong, separate insurance industry in Canada, the Big Six also offer insurance services. Insurance companies in Canada make-up the largest non-bank financial industry. They recognized a threat from the banks and successfully petitioned the Canadian government to pass a law that prevented insurance from being sold in a bank branch.²⁵ This highlights how a strong bank branch network contributes to the comparative advantage and success of an universal bank. For example, 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 has a first-mover advantage to offer the client insurance on the new asset, and the client can accept the offer with a great deal of convenience. If search costs are substantial, they can be avoided completely. Allen (2011) observes that if search costs are high, then banks can maintain high rates even if the bank rate has fallen. In May 2010, this prohibition was extended to include bank websites. These rules prohibiting the sale of insurance products limited Big Six expansion, yet it still accounted for an aggregate net profit of \$4 billion in 2015.

The activities and associated revenues detailed above revolve around the bank branch and depositors. The branch-network originated as a means to collect deposits and to, primarily, issue loans to businesses in a local geographic area. Since then Canadian banks spread into many other business activities. According to the Canadian Bankers Association,²⁶ there were 6,348 bank branches in Canada and of these, 2,000 were rural and small-town branches. They operate 18,711 automated banking machines (ABMs) in Canada and these processed 741 million transactions in 2015, an increase from 698 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 ser-

²⁵For an overview of the tension between insurance providers and the Big Six, see <http://www.theglobeandmail.com/report-on-business/rob-magazine/top-1000/banks-last-frontier-insurance/article4323178/?page=all>.

²⁶This information was last updated on July 26, 2016

vices on offer can satisfy most customer needs, and it gives the banks a comparative advantage over monoline financial companies. However the internet is changing the way home buyers arrange mortgages. A CMHC mortgage consumer survey in 2016 found that most buyers arranged their first mortgage in a bank branch (39 percent) followed closely by online (31 percent). Previous studies, conducted annually by the Canadian Association of Accredited Mortgage Professionals, found that 45 percent of new home buyers visit only one lender. This illustrates the importance that a pre-existing client relationship can have in capturing rents. However there is a trade-off – banks want to maximize profits but to do so in a manner that maintains bank-client relationships.

Beyond banking activities at the branch-level, there are many sources of revenue that are associated with the head office and major financial centres. 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. \(2015\)](#) explains 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 much weaker compared to state governments. Following Confederation in 1867, the Canadian Federal Government was relatively much stronger compared to the provinces. The ability of the 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. These were sold across state-lines to avoid legal restrictions and the need to borrow directly from small local banks. By issuing securities, smaller deposit-taking institutions enjoyed more diversified portfolios than may have been otherwise possible. The preference for securities over lend-and-hold loans created a large secondary market. Even

after 1933, when the Glass-Steagall Act forced the separation of investment and commercial banking, the U.S. state laws and the greater demand for securities remained. This led to U.S. investment banks becoming larger and more important to the U.S. financial system than they were in Canada.

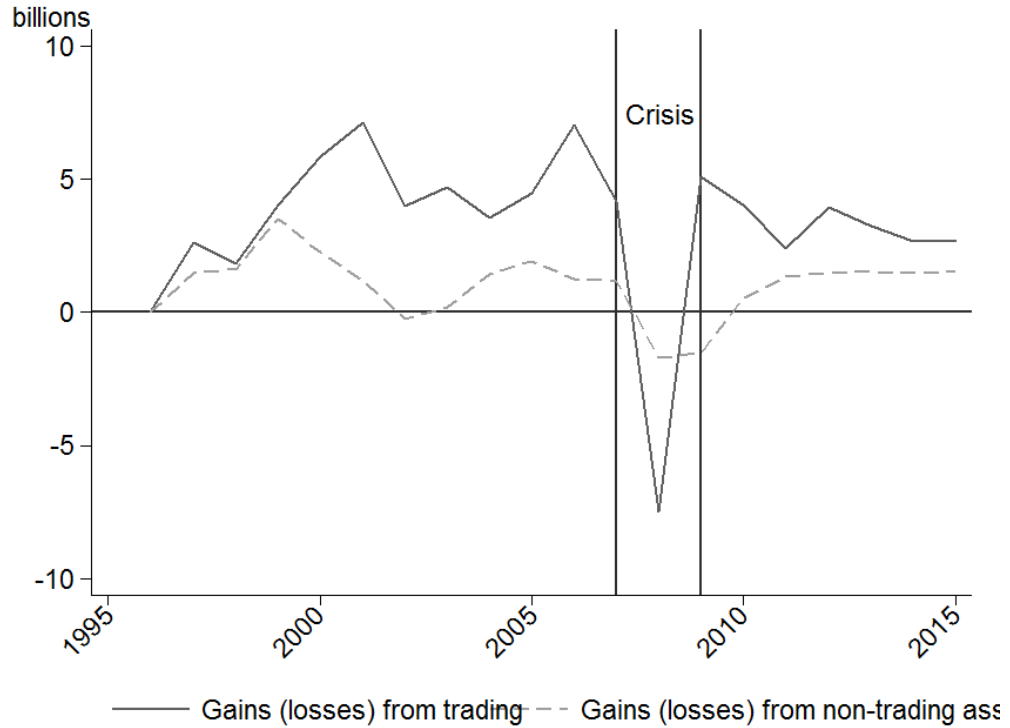


Figure 6: Aggregate trading revenue

Note: Realized and unrealized gains and losses are in real 2012 Canadian dollars. Trading revenue makes up less than 10 percent 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 pur-

poses) and engage in proprietary trading (Trading Income).²⁷ Trading revenues are 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 percent of operating revenue, which is quite small and it can create large losses. For example, in 2008, most trading losses were attributable to just one bank, CIBC, which suffered more than \$8 billion in trading losses during 2008 and 2009. Prior to these losses, the U.S. capital markets division of CIBC was exposed to monoline lenders and the Sub-Prime Crisis. Consequently, management decided to exit the U.S. market and agreed to sell all U.S. operations to Openheimer Holdings Inc. in November of 2007. Unfortunately for CIBC, the agreement did not prevent the trading losses in figure 6. Bank managers may have a preference for trading income because it is associated with few fixed costs, or overhead. The trading assets earn interest revenue that is mostly larger than the interest expense. Any additional noninterest income from trading is close to pure profit, minus a share to employees which can in the form of performance bonuses – no trading income equates to little pay.

Similar to the large U.S. commercial and investment banks, the Canadian banks also securitize assets and sell them to third parties. In 2015, the Big Six held over \$150 billion in mortgages that had been securitized and not yet recognized as sold to CMHC under the National Housing Act (NHA)^{28,29} Lastly, the banks earn fees on underwriting new and seasoned security issues and on instigating mergers and acquisitions between firms. These last three activities are aggregated in the OSFI data as ‘other’ revenue under noninterest income and have a high amount of volatility in earnings. As OSFI chose to aggregate these capital market activities into one entry, the available information on the size and profitability of securitization is limited.

²⁷Prior 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.

²⁸The Canadian Federal Government passed the National Housing Act in 1944 with the purpose of providing a housing program for returning World War II veterans.

²⁹The IFRS accounting standards introduced new rules about accounting for securitized assets, specifically about when a security can be recognized as sold.

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%
noninterest 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: Values are denominated 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 exclude forex trading revenue. Source: OSFI.

Table 2 summarizes revenue for the years 1997, 2006, and 2015. These years are chosen in the belief that they are somewhat uneventful and thus better illustrate trends in revenue. 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 percent of aggregate bank income came from these activities, but in most years this was approximately 5 percent. The year 2006 is something of a high water mark for noninterest income in the Canadian banking system. More than 50 percent of all net revenue came from noninterest activities. [Calmès et al. \(2004\)](#) posit that this trend indicates a shift towards market-oriented banking activities such as proprietary trading and securitization. However subsequent to the financial crisis of 2007-2009, the trend towards noninterest income appears to reverse. In 2015, noninterest income was 44.3 percent 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 it makes up more than 20 percent of all net revenues.

The bottom of Table 2 shows revenue information for different loans, and the three month average T-bill rate is included for comparison. Lending to businesses is the most traditional Canadian banking activity; prior to 1967, the 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 holding them on the balance sheet matched with deposits. In 1997, business loans accounted for almost 39 percent of all interest revenue. But in 2015, this fell to 24.5 percent of gross interest revenue. During the financial crisis of 2007-2009, 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 lending 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, the one-time financing arm of General Motors. This partly explains the increasing importance of consumer loans as

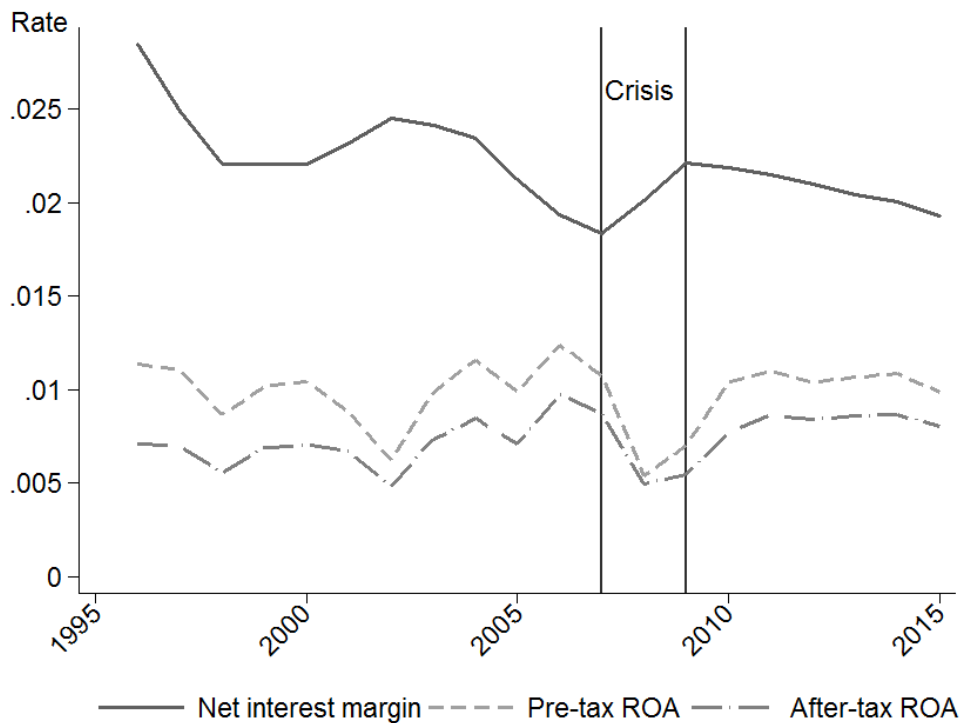


Figure 7: Return on assets and net interest margin

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

a source of revenue although the trend had been building for some time. The introduction of Home Equity lines of credit (HELOCs) combined with increasing real estate prices led to a surge in new consumer lending. Lastly, residential mortgages remain an important component of Canadian banking activities. In 2015, relative revenues suggest that the Canadian banks were focusing more on retail banking than in earlier years.

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 increasing benefits should be mitigated by higher interest expenses. [Calmès and Théoret \(2015\)](#) find that there is a negative relationship between the net interest rate of return and the bank rate. Figure 7 illustrates the return

on assets and the net interest rate margin. Net interest rate margin appears to be quite consistent. The margin hits a nadir in 2007, the year associated with the beginning of the financial crisis, it is also a time when bank managers may have been selecting assets to increase trading revenue. 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 a worthy object of research.

4 Liabilities and expenses

4.1 Liabilities and funding

This section discusses bank liabilities, interest, and noninterest expenses. Banks have a diverse set of options when it comes to funding business activities. Recently they began to experiment with covered bonds and contingent capital (cocos). 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. Each depositor is insured by the Canadian Deposit Insurance Corporation (CDIC) for up to \$100,000 at each bank. Unfortunately, OSFI does not release information on the amount of insured and uninsured deposits outstanding. Similarly frustrating, there is no breakdown on deposits regarding 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 the remainder are placed in a residual category. Separate notice and demand deposit expenses are not available to the public.

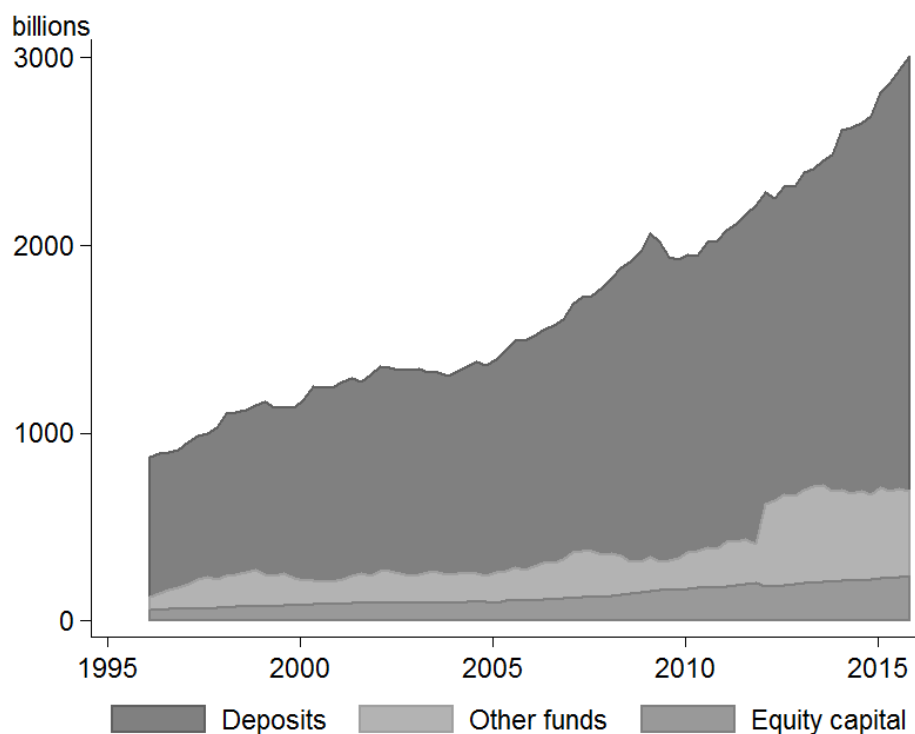


Figure 8: Aggregate funding

Note: Demand, notice and fixed-term deposits account for over 70 percent 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 available immediately upon request unlike notice deposits that can only be withdrawn after a certain number of days without penalty. This is true even if they are in a chequing account. 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 the residual category 'others'. This final category obviously includes every legal entity not previously listed, but generally it includes what are sometimes called wholesale deposits.³⁰ These 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 follows the bank rate. However there is 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. Each type has a different risk profile and average maturity; the category can be interpreted as a portfolio of miscellaneous debt-instruments.

As previously stated, deposit accounts with less than \$100,000 are insured by CDIC, and these funds are held mostly by individuals and small businesses. For this reason, some individuals keep accounts at multiple banks to ensure that their deposits are insured. Individual deposit funding was the least disrupted source of funding during the financial crisis of 2007-2009, so it can be regarded as the most reliable source of funds. [Demirguc-Kunt et al. \(2013\)](#) find that during the financial crisis, banks with more deposits were rewarded with higher stock market returns. However attracting new deposits remains competitive and time-consuming.³¹ Figure 10 illustrates how the level of individual deposits evolved

³⁰It 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.

³¹See the UK CMA report and the discussion in section 3

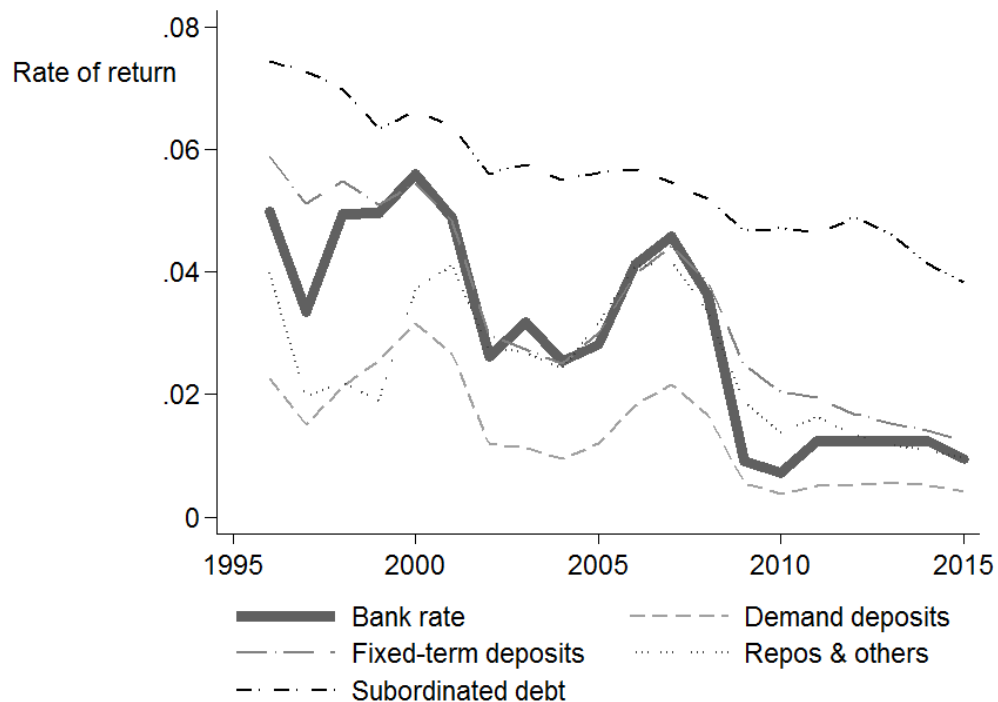


Figure 9: Average interest expense rates

Note: All rates are presented as an 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 yield is higher. Source: OSFI.

over the sample. Households, sometimes referred to as retail depositors,³² 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 held \$143 billion nominal Canadian dollars worth of demand deposits from individuals and \$232 billion worth of notice deposits: chequeable and non-chequeable.

Wholesale deposits are those from businesses, pension funds, and other sophisticated

³²OSFI separately identifies deposits from individuals. Sometimes I may refer to this category as retail deposits.

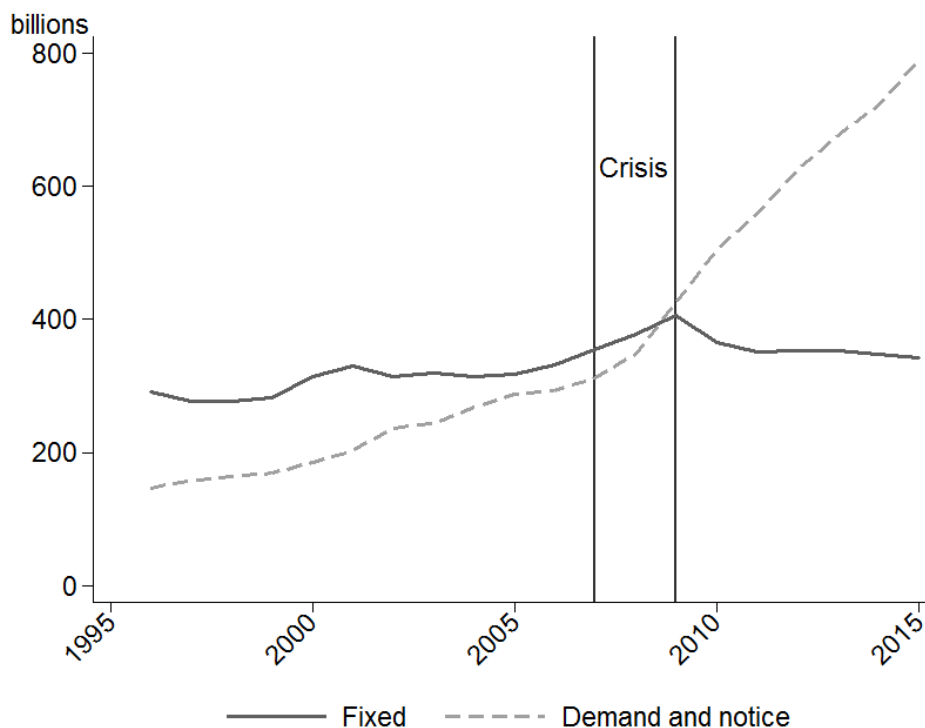


Figure 10: Deposits of individuals

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

investors. These deposits are beyond the insurance maximum of \$100,000 and 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 \(2011\)](#) find that, with costless but noisy signals from monitoring, wholesale fund depositors are more likely to withdraw funds and force inefficient liquidations than insured depositors. Figure 11 illustrates the amount of wholesale deposits split into categories that cover deposit-taking institutions, fixed-term wholesale deposits, and demand and notice wholesale deposits. In the beginning of 2009, there was a noticeable decrease in the amount of fixed-term wholesale deposits

concurrent with a more modest increase in wholesale demand and notice deposits. This is commensurate with a decline in deposits from deposit-taking institutions. The total amount peaked during the first fiscal quarter of 2009 and did not return to that level until the first quarter of 2011.

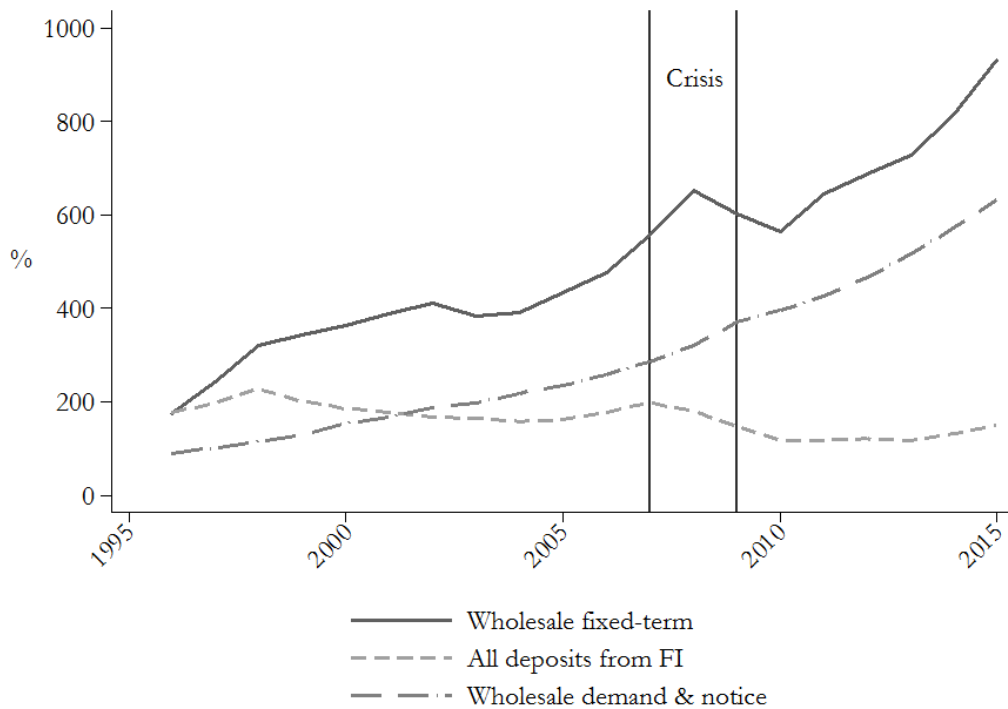


Figure 11: Selected deposits

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 include notice deposits with fewer than 90 days to maturity. The average fixed term deposit rate closely follows the bank rate. 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 in-

terest 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 because reporting of these positions was not consistent over the entire time period. In order to maintain comparability, I report only the main components of equity: preferred shares, common shares, contributed surplus, and retained earnings. I exclude accumulated other comprehensive income and non-controlling interests because they are not consistently reported. Fortunately, they are often relatively small. Figure 12 illustrates two different sources of equity financing: those raised from new equity offerings and those retained from after-tax earnings. Beginning in 1996, new equity offerings were quite flat while retained earnings were accumulating until the financial crisis. At this point, retained earnings levelled off but failed to decline. This illustrates how there were no aggregate losses in the Canadian banking system although the same can not be said for individual banks. CIBC lost \$3.8 billion in the first two quarters of 2008. In response, management issued additional equity, and by 2011, it had issued approximately \$5.0 billion dollars worth³³. Beginning in 2012, retained earnings began rapidly increasing while new equity issues were halted. It should be noted that much of this activity was made in preparation for the transfer to IFRS accounting which required more equity per asset than Canadian GAAP.

Canadian regulation requires that each bank maintain a leverage ratio no less than 3 percent at all times. OSFI is also able to prescribe authorized leverage ratio requirements for individual institutions; they carry the ability to both reward and punish individual banks with capital requirements. If OSFI perceives a bank to be low-risk, they may be allowed to take on additional leverage while a bank perceived to be high risk may be forced to add

³³As a result, CIBC became a smaller, more domestic, and retail-oriented – they also returned to profitability. 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.

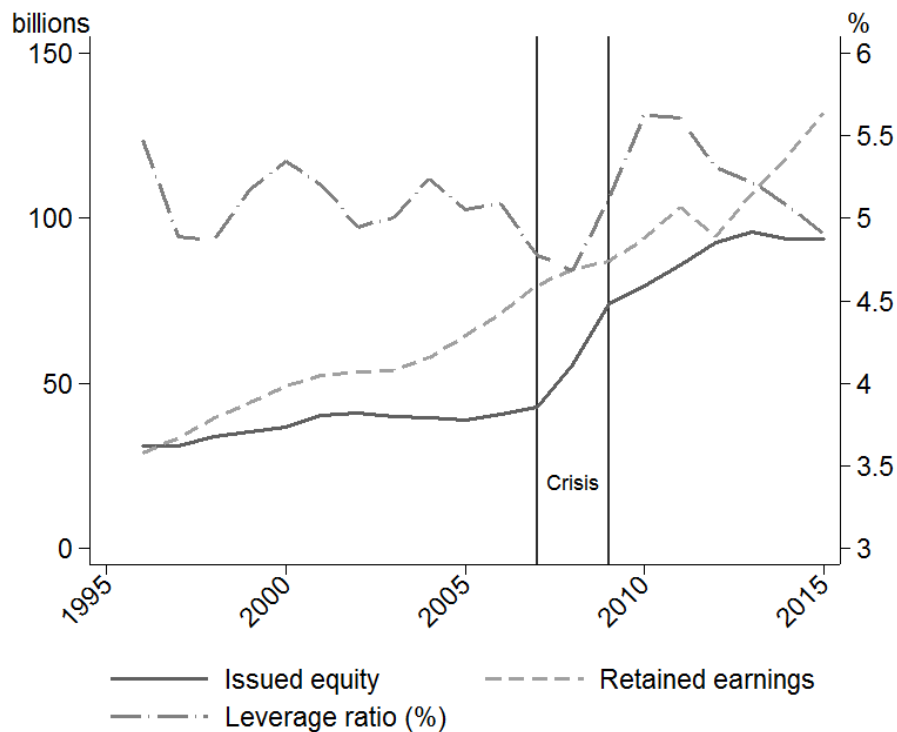


Figure 12: Aggregate equity and leverage

Note: Equity is stated 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 and impaired assets less nonfinancial assets such as goodwill and net physical capital. Source: OSFI.

equity. Figure 12 calculates a leverage ratio using adjusted net tier 1 capital divided by the sum of total assets and impaired assets less the book value of all non-financial assets such as goodwill and physical capital.³⁴ 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 by decreasing the ratio from a peak of 5.5 to 5 percent in 2015. The banks are accumulating retained earnings to increase their total equity and maintain a satisfactory

³⁴It 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>

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 suffers a severe loss, and breaks through the floor of 3 percent, then the regulator would, presumably³⁵, 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 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. To some degree, there exists a core-periphery relationship between the large Canadian banks and smaller, more regional banks, trusts, and cooperatives. If the regional institutions are short of funds, they can borrow from the larger banks that have access to the Bank of Canada's standing liquidity facilities. If the regional institutions have excess funds, they can deposit these with the larger institutions. As of August 2016,

³⁵OSFI has the power to use its judgment and not enforce the floor, but this raises the following question: why have the floor if it will not be applied during a stressful event?

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, a clearing and settlements public-purpose organization created by the Canadian government in 1980. Retail deposits and repo financing were fairly consistent over the time period. The Canadian banks avoided the temptation to replace deposit-financing with repos. Superficially, deposits and repos share the common characteristic that both can be withdrawn on short notice. However in practice, insured, and perhaps uninsured, depositors are less likely to withdraw funds than uninsured, sophisticated, and short-term investors. This was the U.S. banking system experience during the financial crisis of 2007–2009.

4.2 Noninterest expenses

Clearly, if interest rates are low then noninterest expenses will become a larger share of total cost. This is illustrated in Figure 14. [Dietrich and Wanzenried \(2011\)](#) find that bank profitability is largely driven by cost efficiency. Banks that spend a larger proportion of operating revenue on labour costs, branches, computers, head offices, or legal expenses will find it difficult to compete with more cost-effective firms. Figure 14 shows a distinct downward trend in interest expense per asset over the sample period that would be expected given the low interest rate environment that predominated. Noninterest expense per asset was highest from 2000 to 2005, declined from 2005 to 2009, and then stabilized following the financial crisis. The remainder of this section looks in more detail at noninterest expenses.

What are the components of noninterest income? OSFI collects and reports information on labour costs that includes: salaries, pensions, and other staff benefits such as stock options and performance bonuses. Premises and equipment fall into two categories. The first is rent, depreciation of premises, furniture, and leasehold improvements. The second is computers and equipment. Other expenses include advertising, public relations, business development, capital and business tax, and office and general expenses. Professional

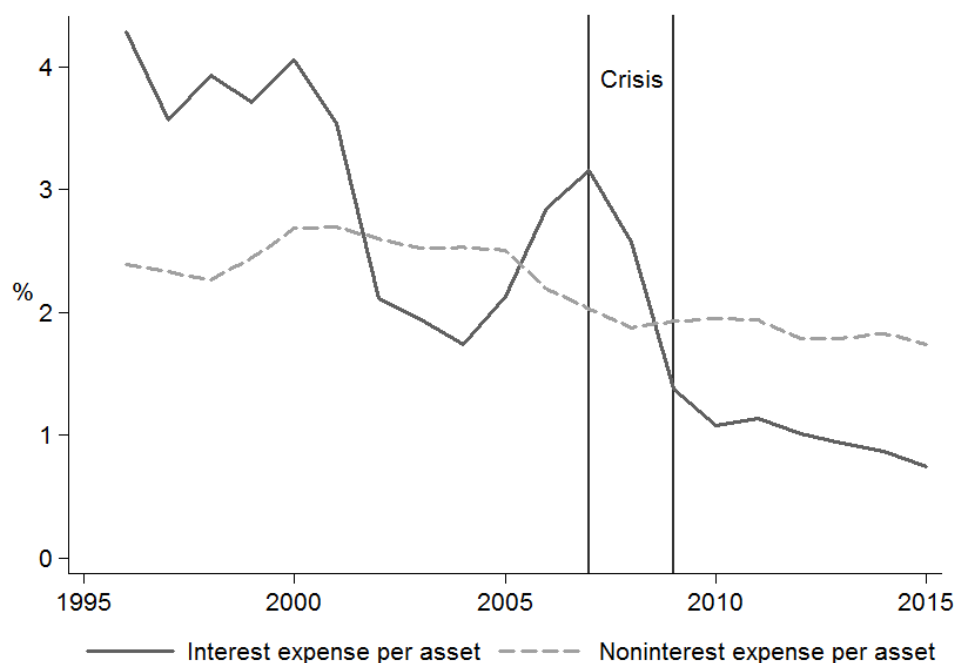


Figure 13: Aggregate expenses per asset

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

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 U.S. Enron scandal.³⁶

Table 4 summarizes noninterest expenses in the years 1997, 2006, and 2015. A striking feature is the consistency with which labour expense is a proportion of noninterest expenses; it varies only slightly from 54.4 to 56.3 percent. [Anderson and Joeveer \(2012\)](#)

³⁶As 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 Canadian Broadcasting Corporation (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.

consider large bank operations in the context of a principal-agent model where rents are earned but bank managers (agents) are able to capture a share of these rents from shareholders (principals). 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 when bank size increased, this ratio changed little. Similarly, [Minton et al. \(2017\)](#) find that smaller banks enjoyed a higher Tobin-q than their larger rivals while [Gandhi and Lustig \(2015\)](#) find that smaller banks enjoyed a higher risk-adjusted return. Neither of these studies suggest large advantages to shareholders from banks becoming larger.

Table 4 shows a modest decline in the cost of premises, equipment, and computers, from 18.6 percent in 1997 to 16.4 percent in 2015. Studying 457 German banks from

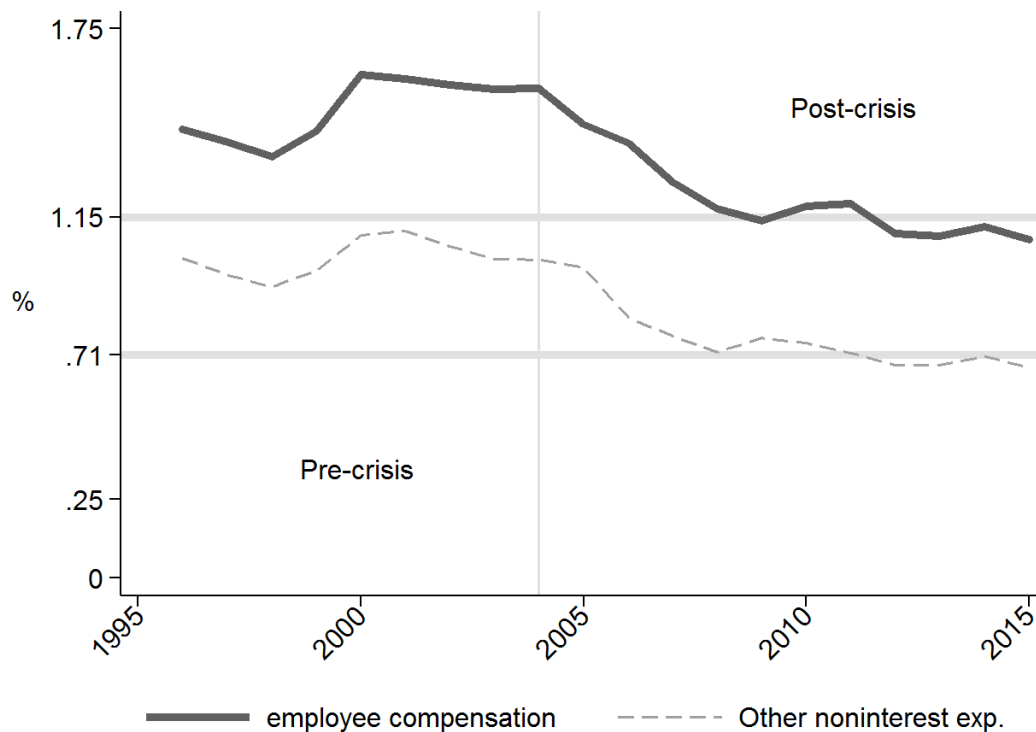


Figure 14: Expenses per asset

Note: Expenses per asset of each Big Six bank is equally weighted. Source: OSFI.

1996 to 2006, [Koetter and Noth \(2013\)](#) find that increasing IT expenses did not lead to improved profitability but rather that the efficient use of IT determined cost. In the late 1990's and early 2000's, the Canadian banks invested in technology and infrastructure while concurrently many analysts believed they were decreasing the number of branches. From 1996 to 2014, RBC, CIBC, and NB decreased their total number of branches from 3,681 to 2,824. On the other side of the Big Six, BNS, TD, and BMO increased their branches from 3,854 to 7,324 – a surprising increase. Each bank grew real total assets from between 1.5 (CIBC) and 6.0 times (TD). BMO, TD, and BNS are three of the four most international and fastest growing. 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 according to the Canadian Banker's Association, the total number in Canada had increased to 18,711 ABMs on July 26, 2016.

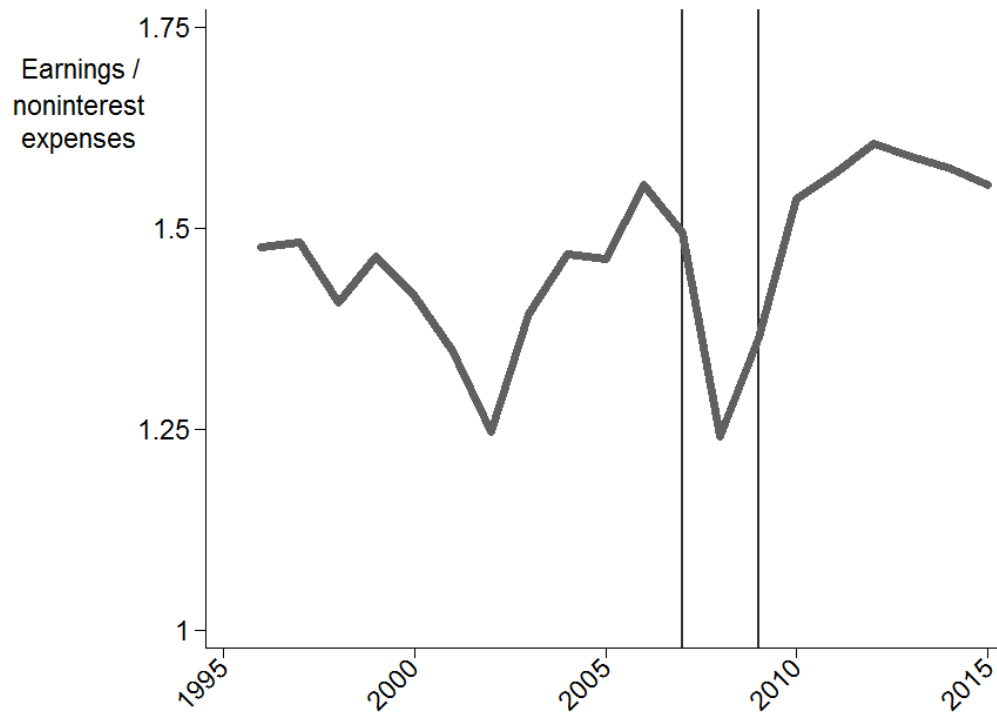


Figure 15: Income-cost efficiency

Note: Efficiency is calculated as the sum of net interest income and noninterest income less impairments divided by the sum of all noninterest expenses except corporate taxes. Expenses per asset of each Big Six bank is equally weighted. Source: OSFI.

What is responsible for the decrease in noninterest expense per asset? General expenses and capital taxes declined relative to assets and other expenses. The improvement affected both labour and the other noninterest expense category from 2005 to 2009. Afterward, it appeared stable. Computing power increased significantly during this period. If the banks implemented more powerful computer system for risk-management, data collection, and back office operations, this could explain the efficiency improvement as a one-time gain. It would be in-line with how [Gordon \(2012\)](#) imagines technological progress in an era of

computers and the internet: technology creates one-time improvements in productivity. An alternative definition of efficiency, one that the banks themselves target, is defined as the sum of net interest income and noninterest income less impairments divided by the sum of all noninterest expenses except corporate taxes, or the amount of revenue generated from one dollar of noninterest expenses. Figure 15 presents this measure of efficiency over time. Observing a trend is something of a challenge, but for the most part, the banks appeared to earn more revenue per dollar of noninterest expense following the financial crisis in 2010. Interestingly, the efficiency gain did not result in an overall increase in ROA – see Figure 7 in section 3.

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 have considered. In 2015, TD, the second largest bank with large U.S. operations, had 20.2 percent of noninterest expense in this category while NB, a smaller bank with modest international operations, had 4.4 percent. 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.’ U.S. and other international jurisdictions may impose severe legal penalties, banks would be wise to manage their legal risk carefully.

5 Loan losses

What accounts are affected when a borrower fails to make a payment? Or perhaps 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 PCL appears on the income statement, and it reflects the opinion of management on current and future losses. Managers choose an

appropriate PCL in each quarter, and while it is a noninterest expense, it is not usually included in the total noninterest expense entry. Banks are fairly adept at predicting losses, and consequently PCL tends to be a strong predictor of net write-offs; this can be seen in Figure 16. Net write-offs is the value of bad loans less the value of any recoverables, such as collateral or legal settlement. It is reported in the annual reports but can also be inferred using the PCL and ACL available from OSFI. It is easy to think of the PCL as a ‘flow’ that fills the ACL ‘stock’ which is also known as the loan-loss reserves. Consequently, an increase in the PCL leads to an increase in the ACL³⁷. If the bank decides that a loan is never going to be repaid and the collateral is insufficient to make up the entire value of the loan, then it is a write-off which is sometimes known as a charge-off. This decreases the ACL and impaired loans. Profitability remains unaffected 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 insolvency risk and future profitability of a bank. This suggests that commercial banks have an incentive to develop strong risk management skills to reassure regulators and market participants.

In Canada, if a borrower fails to make a timely payment then the loan is considered to be an impaired. However at first, nothing is publicly reported and the dilatory client is placed on a non-public watchlist without further consequence. Depending on the situation, the lender(s) and borrower(s) could renegotiate the terms of a loan. In this situation, the loan would no longer be considered impaired. Otherwise, if the borrower fails to make a payment within 90 days, 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 more than 90 days. The OSFI website posts a quarterly report with information on impaired assets in a

³⁷Sometimes 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.

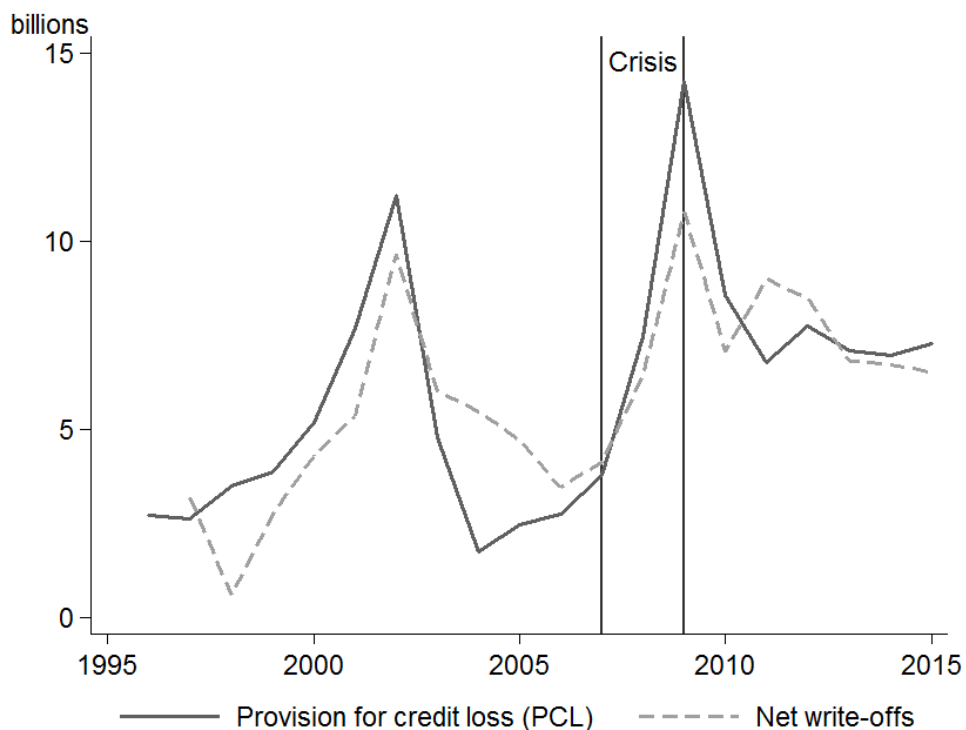


Figure 16: Provision for credit losses and net write-offs

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

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 PCL.

After 90 days of delinquency, asset categories on the balance sheet are reported net of impaired loans. Going forward, one of four things can happen: first, the borrower makes the delinquent payments, and the value of the impaired loan is returned to the balance sheet – it is no longer impaired. Second, the terms of the loan are renegotiated, and the loan is no longer considered impaired; loan value is returned to the balance sheet, net of any negotiated haircut which would decrease ACL. Third, the bank believes the loan will never be repaid and makes a legal claim on the underlying collateral. It becomes a

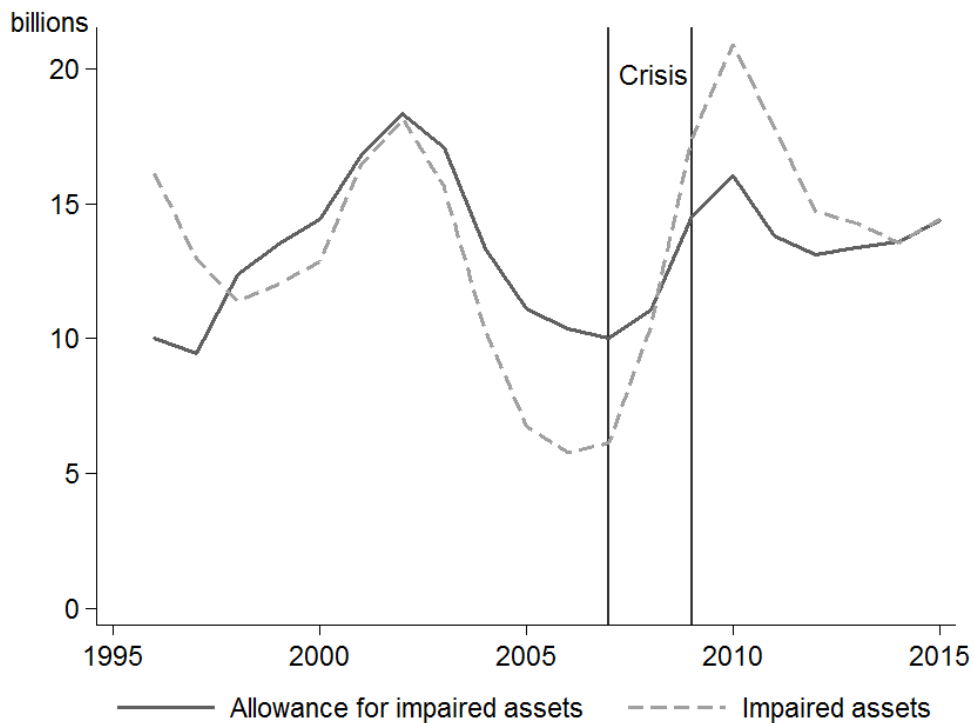


Figure 17: Allowance and impaired loans

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

write-off, or charge-off, net of any recoverables, yet the asset-side of the balance sheet remains unchanged because it is already reported net of impaired assets. Fourth, the bank decides that there is a decent chance that the borrower will repay her debt in full, so the asset remains impaired. The bank retains a large degree of subjectivity when deciding if a loan might be repaid. This allows for the possibility of misleading financial reports however banks must also convince the regulator and chartered accountants who oversee their financial statements that these decisions are reasonable.

If 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 discretion in the values they assign to PCL. This raises the question as to whether the PCL

is being used to manage, or ‘smooth’, earnings over time. One possible motivation is that banks can make earnings appear to be less volatile than they may actually be. For example, [Calmès and Théoret \(2014\)](#) find that banks with lower earnings volatility tended to have higher profits. A second motivation is to avoid corporate taxes by minimizing pre-tax income. Conversely, in order to achieve a profit target, they may wish to inflate earnings. [DeBoskey and Jiang \(2012\)](#) find that, using U.S. bank data from 2002-2006, pre-tax earnings net of PCL and PCL were positively correlated. They conclude that banks were using the PCL to minimize pre-tax income. However when experienced bank industry auditors, such as the Big Four accounting firms, validated the reports of a bank, the correlation disappeared. They conclude that skilled auditors may create value by producing more accurate information on financial institutions. Using quarterly data on 18 banks that operated in Canada from 1996 to 2015, I regress PCL per asset on Pre-PCL net earnings per asset in a fixed-effect model. I find no evidence that the Canadian banks managed their earnings using the PCL.³⁸ Given that the Big Six are audited by major accounting firms, the result is similar to [DeBoskey and Jiang \(2012\)](#). The sample size contained only a limited number of independent, ‘brick-and-mortar’ bank branch, deposit-taking institutions. If a wider-range of firms were included, the results could differ.

Table 5 shows impaired assets by borrower or asset. In 1997, business loans had the highest impairment rate. The increased value of impaired residential mortgage loans is commensurate with balance sheet growth over the sample period and the increasing value of Canadian real estate. Impaired assets are a useful objective measure of portfolio risk, but they do not account for the value of any underlying collateral. On the other hand, there is a strong correlation between the PCL and impaired assets. Using quarterly aggregate data from 1996 to 2015, the correlation between impaired assets and the PCL was 0.65,

³⁸I find a coefficient of .0023 with a robust standard error of 0.0026. Results are similar when the estimation includes levels and total assets as an independent variable to control for bank size. The coefficient on pre-PCL earnings is 0.0141 with a standard error of 0.0144. Using the levels, restricting the sample size to the Big Six, and including total assets to control for bank size, the coefficient is 0.0114 with a standard error of 0.023.

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.

so an unexpected increase in impaired assets was a good indicator of future losses. Finally, impaired relative to total assets declined from 1.7 percent in 1997 to 0.7 percent in 2015. There are a number of possible explanations including improved risk management and information technology, but it is likely that the aggregate bank portfolio became less risky. If this trend continues, the banking cycle could be moderated.

For a commercial bank, bad loans are both a cost of doing business and an existential threat. When a bank issues a credit card, it expects a significant amount of non-payment. Consequently, they charge a high rate of interest to compensate for the risk and the business can be quite profitable.³⁹ As figure 18 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 and 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 quarter. This happened to TD following the

³⁹In 2001, CIBC bought a 51 percent stake in Juniper Financial Corp., a U.S. credit card issuer, for \$285 million. They sold it three years later in 2004 for \$383 million.

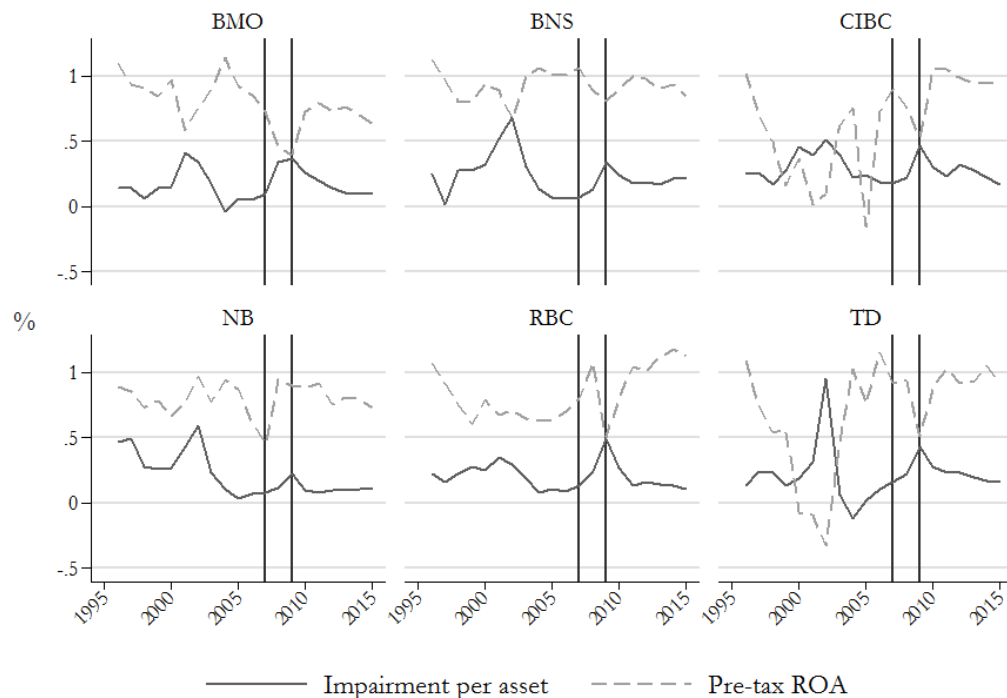


Figure 18: PCL and pre-tax income

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

Dotcom bubble and after 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 2007-09⁴⁰. For the most part, there appears to be 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 from 2004 to 2007. BMO, BNS, NB and RBC were always able to maintain a pre-tax ROA of between 0.5 and 1 percent.

⁴⁰National Bank suffered a large loss in 2007 related to the asset-backed commercial paper market in Canada. See [Chant \(2008\)](#) and [Halpern \(2016\)](#).

6 Risk-weighting

In the previous section, impaired assets and the PCL could tell us something about future loan performance. However many bank losses occur through off-balance sheet items, such as lines of credit, marked-to-market securities, and proprietary trading. There are few satisfactory instruments that predict future losses in the trading portfolio, and there is no 'silver bullet' to remedy this problem. However a summary of the Canadian banking system would be incomplete without a discussing risk-weighted assets (RWA). Beginning with Basel I, banks were required to calculate total risk-weighted assets and report it 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 standardized approach, and how it assigned some of the risk-weights were, in hindsight, 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, Argentina or the U.S. Mortgages were given a risk-weight of 50 percent of the value, regardless of the underlying collateral or the loan-to-value ratio. This failed to account for macroprudential policies that encouraged greater lending discipline. For example, some jurisdictions, such as Canada, 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 replaced it with a dual system. Smaller banks were still allowed to file risk-weighted assets according to the standardized values which were less costly to implement, but larger 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. 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. These internal models were then vetted by OSFI. An advantage of this system was that OSFI could compare and contrast the risk management models at each of the banks. They could also offer

advice on banks that were failing to meet best practices. 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.



Figure 19: 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.

In 2008, OSFI replaced the Capital Adequacy Component of Capital report with the Basel Committee Capital and Leverage filing (BCAR). More detailed information was provided with risk-weighted assets being broken down into types of risk. In 1998, credit risk and market risk were reported in separate categories, and in 2008, operational risk was also reported separately. Figure 19 shows that the relative proportion of total risk-weighted assets to total assets, and credit risk-weighted assets to total assets has declined since 1998. In 1998, 60 percent of assets were risk-weighted while in 2015 this had declined to less than 40 percent. Have the Canadian banks become less risky? In section 5, impaired as-

sets per total had declined which suggests yes. 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 2007-2009. RWA might have given regulators and market analysts a more accurate view of risk exposure than reported assets, yet it is uncertain what predictive capabilities it might possess. For example, RWAs appear to be uncorrelated with recent crises. [Acharya et al. \(2013\)](#) find that U.S. banks were able to reduce binding capital constraints by keep assets off-balance sheet. [Le Leslé and Avramova \(2012\)](#) describe how market confidence in the accuracy and reliability of RWAs has been in decline. There is a suspicion that banks are using RWA to ‘game’ the regulatory regime. [Berg and Koziol \(2017\)](#) study whether banks are able to accurately measure risk, namely model risk. They collect data on the probability of default (PD) that is calculated using internal models at 40 different German banks and 17,000 corporate borrowers from 2008 to 2012. They find that the PD for each corporate borrower varied widely among different banks and that only 5 percent of this variation could be attributed to fixed effects.

Figure 20 shows market and operational risk relative to total assets. There is a modest increase in market risk relative to total assets which began prior to the financial crisis and peaked in 2009. Comparing the measure of market risk to that of securities in 2006, the aggregate banking system had 8.64 percent of assets in equity securities and 11.7 percent in bonds⁴¹, much more than in 2015 or 1997. Correspondingly, the build-up in market risk coincides with a relative increase in assets exposed to market risk. Risk-weighted assets are difficult to interpret without knowledge of the calculations involved.

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 while avoiding the inflexibility of a standardized approach. [Le Leslé and Avramova \(2012\)](#) discuss how RWA is calculated and might be improved. They state that a good RWA regime should (i) provide a common measure for a bank’s risks; (ii) ensure that capital allocated to assets is

⁴¹See section 2, Table 1

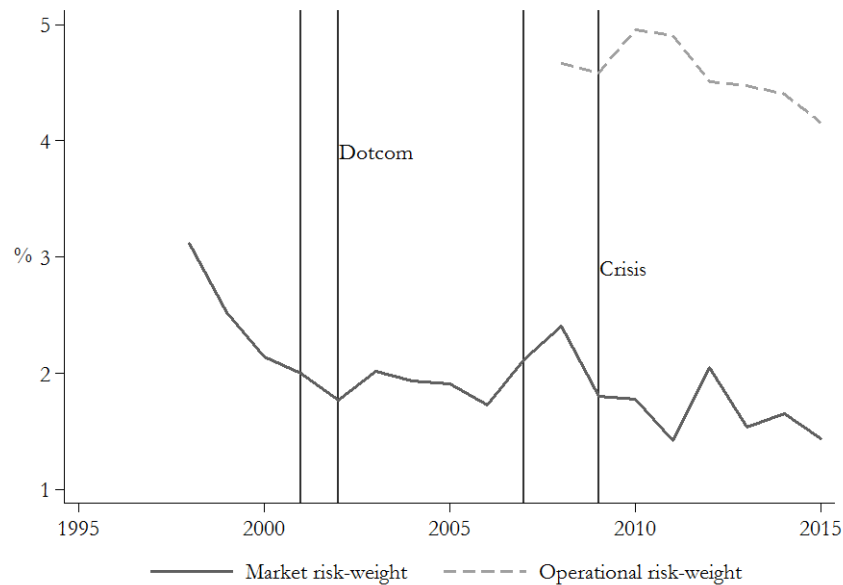


Figure 20: Market and operational risk-weighted assets

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.

commensurate with the risks; and (iii) potentially highlight where destabilizing asset class bubbles are arising. The following discussion compares how RWA fares in these three objectives as it relates to the Canadian banking system from 1996 to 2015. As a predictor of bank stress, total RWA failed to predict either the dotcom bubble or the financial crisis of 2007-'09, both of which presented significant losses to some Canadian banks. This questions whether RWAs can identify potential destabilization. To compound the issue, [Le Leslé and Avramova \(2012\)](#) state that RWA is inconsistently calculated across national borders. So a direct comparison of the Canadian banking system with another jurisdiction is not possible. Despite these drawbacks, OSFI may find RWA to be helpful. First, there is a certain learning-by-doing argument to be made. By modelling risk, the ability of bank manager to understand and appreciate potential risk is improved. Second, the regulator observes both the models and raw data used to measure RWA, so it may satisfy (ii), that the Canadian

banks have adequate capital, even if it is not publicly available.

Regarding (i), does RWA provide a common measure for a bank's risks? Figure 21 shows RWA per financial asset for the Big-Six Canadian banks. Over the sample, RWA relative to total financial assets had a declining trend while the bank cross-sections moved closer together. Were each of these banks equally risky? Over the entire sample, CIBC consistently maintained a lower ratio than other members of the Big Six; yet CIBC accounted for more losses than any other bank. Using this RWA as a metric of risk, it actually favoured the worst performer. BMO and BNS had the highest ratio, but they performed quite well over the sample. Thus RWA appears not to satisfy the condition that it provides a common measure of a bank's risk. RWA may provide insight to the regulator, and it may give a bank an incentive to better quantify risk which may improve risk management performance. However traditional ratios such as assets per equity capital will remain an important measure of risk.

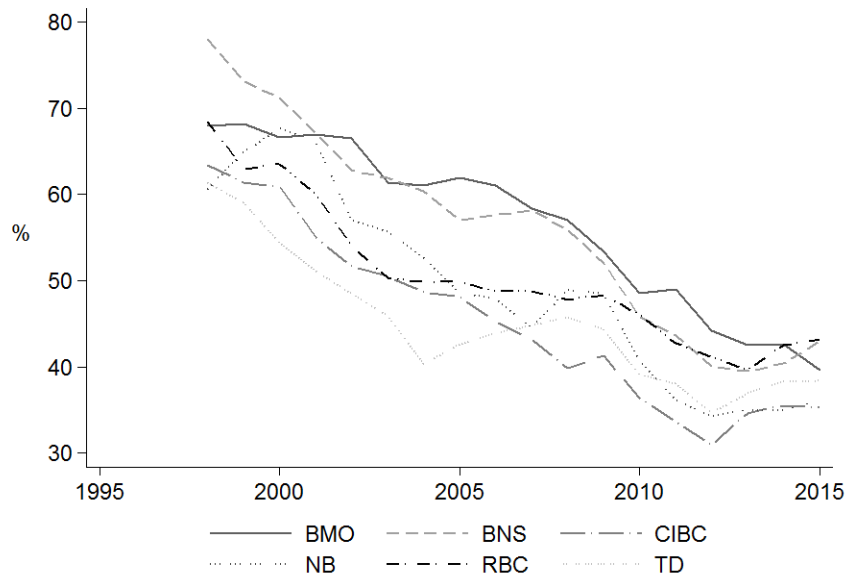


Figure 21: Big Six risk-weighted assets

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

7 Conclusion

From 1996 to 2015, total assets at 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. Consumer loans and residential mortgages make-up a greater share of the balance sheet than business lending. Noninterest relative to net interest income increased until 2006, then declined and stabilized. According to comments in annual reports, bank managers sometimes choose assets to support trading gains and losses at the expense of net interest income. In 2006, as much as 20 percent of operating income came from trading, securitization, and investment banking however this appears to be a one-time event rather than a continuing trend. There is a considerable improvement in cost efficiency from 2004 to 2009 which is likely attributable to improved technology. Most income is earned from traditional intermediary lending, retail bank fees, and wealth management. With data from a little used dataset, I explain how the Canadian banks earn revenue, fund business activities, and pay expenses. The success of the Canadian banking system can be partially attributed to: i) a focus on retail and branch-level banking, ii) a preference for deposit-financing, and iii) minimizing costs, particularly noninterest expenses. Estimating a reduced form model similar to [DeBoskey and Jiang \(2012\)](#), I find no evidence that the Canadian banks manipulated the provision for credit losses to ‘smooth’ earnings.

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