

Efficiency and Competition in Canadian Banking

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- *A safe and efficient financial system is important for the development and longer-run growth of the economy. Recent research at the Bank of Canada has considered various aspects of efficiency in Canadian financial services, specifically in the banking industry.*
- *The research summarized in this article suggests that, overall, Canadian banks appear to be relatively efficient producers of financial services. As well, some efficiency gains from becoming larger appear to be possible.*
- *The research implies as well that Canadian banks do not exercise monopoly or collusive-oligopoly power, and that banking can be considered a monopolistically competitive industry.*
- *However, data limitations constrain the ability to examine these issues in great depth.*
- *The analysis reported here also indicates that past legislative and regulatory changes have benefited efficiency in Canadian financial services and might have improved contestability. This points to the importance of continuing to promote efficiency and competition in financial services in Canada.*

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A safe and efficient financial system is important for the development and longer-run growth of the economy. Indeed, a recent comprehensive survey of the research literature suggests that the quality of financial service provision is a key ingredient for economic growth (Dolar and Meh 2002). Recent research at the Bank of Canada has considered various aspects of efficiency in Canadian financial services, particularly in the banking industry. In this article, we summarize the main insights from this research.

To provide context, we begin in the next section with a brief review of the recent history of the Canadian banking industry, with a particular focus on the evolution of the governing legislation since 1980. Basic performance measures of banking efficiency are then considered, followed by a discussion of efficiency and economies of scale based on econometric methods. We also review a key influence on efficiency, the nature of competition in Canadian banking, and then present concluding remarks.

The Evolution of Canadian Banking

Historically, the structure of the Canadian banking industry has been relatively stable. From 1920 to 1980, for example, Canada consistently had 11 banks (Bordo 1995). As well, prior to 1980, the financial services industry had been segmented (by legislation, regulation, and practice) into distinct “pillars”: commercial banking, trust business, insurance underwriting and brokerage, and securities underwriting and dealing. There were also constraints on the entry of foreign banks into the Canadian market.

In the past 25 years, with changes in market practice and a series of revisions to the governing financial legislation, there has been a significant evolution of the Canadian banking industry. Key characteristics have

been the entry of foreign banks and the expansion of banks into the range of financial services, including the trust business, insurance underwriting and sales (although not through bank branches), and securities underwriting and dealing.¹

There has been a substantial evolution of the Canadian banking system over the past 25 years, including numerous changes that have affected the powers, organization, and competitive pressures in the industry.

A feature of all federal legislation concerning financial institutions, including the Bank Act, is a sunset provision that requires a periodic review of the policy framework and legislation that govern financial services. This formal review process led to important legislative amendments in 1980, 1987, 1992, 1997, and 2002 that have contributed to the development of more diversified and more market-oriented activities on the part of Canadian banks. In addition, important changes to the legislation regarding the entry of foreign banks into Canada were made in 1980 and 1999.

Specifically, the 1980 Bank Act revisions allowed banks to establish subsidiaries in various financial services markets, such as venture capital and mortgage lending. The mortgage-loan subsidiaries could raise deposits that were exempt from reserve requirements (which existed at the time). As a result, the banks could compete more effectively in the mortgage-lending market with trust companies, whose deposits were not subject to reserve requirements. As well, foreign banks were allowed to establish bank subsidiaries in Canada. Before this revision, the possibility of foreign bank entry had been curtailed by amendments to the Bank Act in 1967. Nevertheless, from 1967 to 1980, foreign banks operated in Canada on a limited scale through non-bank affiliates that issued commercial paper in Canada carrying their parent bank's guarantee, thereby

1. For discussions of these and related developments in Canada, see Daniel, Freedman, and Goodlet (1993); Freedman (1998); and Engert et al. (1999).

funding their activities in sales and business finance.² Following the 1980 Bank Act revision, all such affiliates were to be incorporated as subsidiaries, subject to the provisions of the Bank Act, and able to conduct the full range of banking activities. This legislative change led to many foreign bank subsidiaries opening in Canada, with the number peaking at around 50 in the mid-1980s.

In 1987, Canadian banks (both domestic and foreign) were permitted to invest in corporate securities dealers, as well as distribute government bonds. All major banks subsequently made substantial investments in the securities business and purchased control of most of the existing investment dealers. The 1987 amendments also allowed financial intermediaries to conduct brokerage activities. Following legislative revisions in 1992, Canadian banks were allowed to enter the trust business through the establishment or acquisition of trust companies. Most trust companies were subsequently purchased by Canada's largest banks. In this regard, the financial difficulties that many trust companies experienced following the collapse of the speculative real estate boom in the late 1980s contributed to the ability of the banks to acquire them. In 1997, new legislation included various changes to update and revise the amendments made in 1992.

In 1999 (pursuant to provisions of the North American Free Trade Agreement), foreign banks were allowed to directly establish branches in Canada, without having to establish a subsidiary. However, foreign bank branches were restricted to wholesale activities; that is, deposits made at such branches must have a minimum value of \$150,000.³ By the end of 2006, in addition to 22 domestic banks there were 50 foreign banks operating in Canada, including 26 foreign bank subsidiaries and 24 foreign bank branches. Finally, legislative changes in 2002 provided for modest increases in the range of business powers available to Canadian banks; for example, they were allowed to own finance companies. As well, there was a moderate decrease of the

2. According to MacIntosh (1984), by the time of the 1980 Bank Act revisions, there were about 60 foreign banks represented in Canada, including some with several offices.

3. There were concerns among policy-makers that unrestricted entry of foreign bank branches at the retail level could create risks for the Canada Deposit Insurance Corporation and for the Office of the Superintendent of Financial Institutions that would be difficult for these agencies to manage, given the foreign control and supervision of such branches. As a result, foreign bank branches were allowed to take only deposits significantly above the deposit insurance coverage limit.

Box 1: Canadian and U.S. Banks

To investigate efficiency and economies of scale, Allen, Engert, and Liu (2006) considered a sample that includes the six major Canadian banks, which comprise over 90 per cent of the assets of the Canadian banking sector. The banks are Royal Bank Financial Group, Bank of Montreal, Canadian Imperial Bank of Commerce, TD Bank Financial Group, Bank of Nova Scotia, and National Bank. The efficiency comparisons reported consider total U.S. banks and a sample of 12 U.S. bank holding companies (BHCs).

The BHCs are selected from the top 20 U.S. banks in terms of assets as of 31 December 2004. They were selected because there are continuous data from 1986 to 2004, and because most of these banks have a business mix broadly similar to that of the Canadian banks, benchmarked in a specific manner. That is, most of these BHCs make a similar proportion of revenue from retail banking. The BHCs are JPMorgan Chase & Co., Bank of America Corp., Wachovia Corp., Wells Fargo & Co., U.S. Bancorp, SunTrust Banks Inc.,

National City Corp., Citizens Financial Group Inc., BB&T Corp., Fifth Third Bancorp, Keycorp, and The PNC Financial Services Group Inc.

With regard to the research on contestability in Allen and Liu (forthcoming), 10 domestic banks and 15 foreign banks operating in Canada were considered. The 10 domestic banks are Royal Bank Financial Group, Bank of Montreal, Canadian Imperial Bank of Commerce, TD Bank Financial Group, Bank of Nova Scotia, National Bank, Canadian Western Bank, Laurentian Bank, Citizens Bank of Canada and Manu-Life Bank. The 15 foreign banks operating in Canada that are included in the study are Bank of Tokyo-Mitsubishi, Mizuho Corporate Bank, Sumitomo Mitsui Banking Corporation, HSBC Bank of Canada, JP Morgan Chase Bank, ING Bank, Bank of China, Bank of East Asia, BCPBank Canada, BNP Paribas, CTC bank of Canada, International Commercial Bank of Cathay, MBNA Canada, National Bank of Greece, and ABN Amro Bank.

restrictions that preclude concentrated holdings of bank equity.

In addition to the various changes that have affected the powers, organization, and barriers to entry in banking, the regulatory regime was also fundamentally reformed during this period, through a series of changes to the incentives and powers of the regime (Engert 2005). The key measures were:

- the establishment of a clear mandate for the supervisor, focused on protecting the interests of depositors and other creditors, and which recognizes that financial institutions can fail;
- the creation of the authority and obligation for the supervisor to act promptly and preemptively with regard to troubled institutions; and
- the establishment of the authority and means for other safety-net agencies (notably the Canada Deposit Insurance Corporation) to influence the supervisory process.

In turn, these changes have influenced the environment in which financial institutions operate and have sharpened their incentives to manage risk appropri-

ately, in part to avoid becoming subject to supervisory intervention.

Performance Measures

Clearly, there has been a substantial evolution of the Canadian banking system over the past 25 years, including numerous changes that have affected the powers, organization, and competitive pressures in the industry. In this section, we begin our examination of efficiency in Canadian banking by considering some basic performance measures. As a frame of reference, the performance measures for Canadian banks are compared with samples of U.S. banks.

More specifically, based on work by Allen, Engert, and Liu (2006), we report simple performance measures for the six largest Canadian banks (which account for the great majority of Canadian banking assets), total U.S. commercial banks, and a subset of U.S. bank holding companies (BHCs). (See Box 1 for more on these banks.) The data used in this study are from the balance sheets and income statements reported by these institutions to the banking supervisors in Canada and the United States. To make the data comparable, all variables are deflated by the consumer price index

(CPI) excluding food and energy prices, in their respective countries. As well, the data are converted to a common currency using a Canada/U.S. dollar exchange rate that reflects the relative purchasing power of these currencies in the financial services sector of the two countries.⁴

Expense ratio

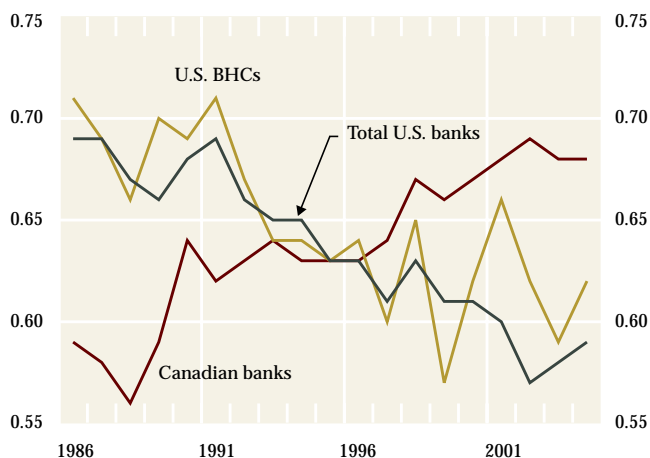
The expense ratio, which is defined as the ratio of non-interest expense to net operating revenue (net interest income plus non-interest income), is often used by analysts to evaluate bank performance.⁵ Chart 1 presents the expense ratio for Canadian banks, a sample of U.S. BHCs, and total U.S. banks. The expense ratio of Canadian banks was lower than that of U.S. banks in the late 1980s and early 1990s. This measure, however, has been trending up at the Canadian banks and down at the U.S. banks over the sample period, so that the expense ratio of Canadian banks currently exceeds that of U.S. banks.

Allen, Engert, and Liu's (2006) analysis indicates that the difference in the expense ratios between the Canadian and U.S. banks can currently be attributed to higher overall labour costs (wages and benefits) at the Canadian banks compared with the U.S. banks in their samples.

Labour productivity ratio

The authors also examine measures that consider the output produced by banks, relative to labour input. Bank output is difficult to measure, however, on both conceptual and pragmatic grounds. Indeed, it is widely believed that official (national accounts) statistics on output and productivity in financial services industries are subject to large errors. Maclean (1996, 1997), for example, concludes that productivity growth in financial services as measured in Canadian official statistics is probably significantly underestimated (see

Chart 1
Expense Ratio



also Triplett and Bosworth 2004 or Diewert 2005).⁶ As noted above, the analysis in Allen, Engert, and Liu (2006) does not rely on national accounts data; their data are from balance sheets and income statements reported to bank supervisors.

Another important consideration concerns the price index used to deflate nominal output to produce a measure of “real output.” To most accurately measure real output in banking, nominal variables should be deflated by a price index that specifically measures the prices of banking services, instead of a more general price index, like the GDP deflator or the CPI. Use of a more general price index could be misleading if there was a substantial difference between the evolution of prices in financial services and prices more generally. However, no bank-specific price measures exist for Canada, so Allen, Engert, and Liu (2006) use the CPI excluding food and energy prices to deflate nominal output measures (total assets and net operating income).⁷

4. Rao, Tang, and Wang (2004) suggest, after detailed calculations, a purchasing-power-parity (PPP) exchange rate of 1.09 for financial services (in 1999), which is used here.

5. The denominator of this ratio—particularly net interest income—depends on the risk differential between assets and liabilities. A change in the expense ratio can therefore be caused by changes in risk taking and not necessarily by changed efficiency. A change in the mix of a bank's services or products (say, towards non-traditional banking services) can also affect this ratio by altering the mix of inputs and expenses. Thus, we prefer the term “expense ratio” to “efficiency ratio,” as it is sometimes called.

6. The difficulty in measuring service industries (such as finance and health care) is a longstanding problem for the statistical systems in most countries. To address this problem, Statistics Canada is putting into place a program to improve the measurement of outputs and prices in service industries in Canada, including financial services.

7. Consequently, the resulting measures could arguably be considered measures of real income rather than real output.

Chart 2
Assets per Employee

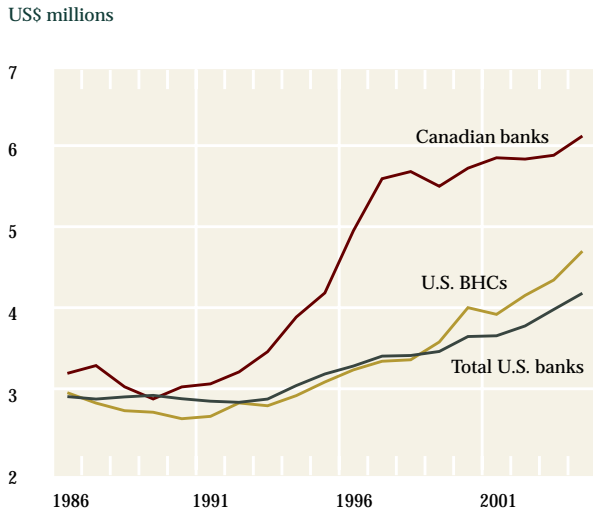
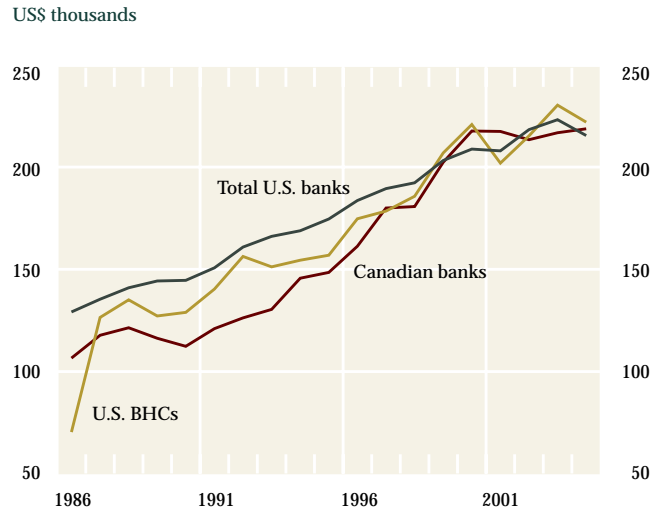


Chart 2 compares total assets per full-time equivalent employee of Canadian banks, the U.S. BHCs, and total U.S. banks. By this measure, the productivity of Canadian banks has been considerably higher than that of U.S. banks in the past decade.⁸ As is the case when using the expense ratio as a measure of efficiency, there are challenges inherent in using assets per employee as a measure of productivity. The decision of banks to have loans, for example, on-balance sheet or off-balance sheet (via securitization), is a response to historical, institutional, and regulatory differences across countries. (Freedman and Engert 2003 discuss different patterns of securitization in Canadian and U.S. banking, and reasons for these differences.) It is therefore possible that banks use different approaches to generate similar profits.

Given these factors, the authors consider a measure that internalizes differences in asset generation, disposition, and management, and focuses on overall results. Specifically, Chart 3 shows net operating revenue per full-time equivalent employee of Canadian banks, the U.S. BHCs, and total U.S. banks. According to this measure, Canadian bank employees were less productive than their U.S. counterparts in the late 1980s, but started to catch up in the early 1990s. In fact, according to this measure, the three groups of banks have converged since the late 1990s.

8. Including in total assets an approximation of non-traditional activities (discussed below), such as those related to off-balance-sheet assets, does not change this conclusion.

Chart 3
Net Operating Revenue per Employee



Cost Inefficiency and Economies of Scale

In this section, we discuss results from recent Bank of Canada research that considers another means of gauging bank efficiency, based on econometric methods, using disaggregated bank data (Allen and Liu 2005; Allen, Engert, and Liu 2006). Specifically, we examine how efficiently banks transform inputs into outputs and consider returns to scale in Canadian banking. The analytical framework uses a standard tool in the research literature on such questions (the translog cost function).

Methodology

In this framework, researchers study how efficiently inputs are transformed into the financial services that a bank sells to consumers. To do so, a model that relates costs to measures of bank output and input prices is estimated. The analysis also takes account of technological progress and the effects of regulatory changes. In addition, the model incorporates variables to measure unique influences on cost structures specific to each bank in the sample. Essentially, the idea is to estimate the empirical relationship between costs and the financial services that a bank produces, while recognizing the impact of technological change and the influence of the regulatory environment.

Inferences regarding economies of scale are drawn from observing how the banks' estimated cost structures vary with the scale of output. The efficiency with which inputs are transformed into outputs is measured through terms in the model that capture residual, unexplained influences on the cost structures of the banks. Since the model accounts for identifiable influences on the cost structure of a bank, any unexplained influences on costs are considered to be the result of inefficiency or waste, and so form the basis for the measure of "cost inefficiency"—which is our focus here.

In this framework, the most efficient bank is considered to be the bank with the lowest inefficiency measure, and is also taken to represent the best-practice or benchmark institution, that is, the efficient frontier in that banking system. Then each bank's distance from that efficient frontier is measured. An efficient banking system overall, according to this measure, is represented by relatively small inefficiency measures.

Data

The model includes the costs of labour, capital, and deposits, measured respectively as: the average hourly wage of bank employees; expenses on real estate and fixtures as well as information and communication technology plus related costs; and the effective interest rate paid on deposits.

Bank output is divided into five categories: consumer loans, mortgage loans, non-mortgage loans, other financial assets on the balance sheet, and an asset-equivalent measure of non-traditional activities. The latter is aimed at capturing the growing importance of activities such as wealth management and securities trading.

To measure these activities, the authors use the asset-equivalent approach introduced by Boyd and Gertler (1994). This adjustment assumes that non-traditional activities yield the same rate of return on assets (ROA) as traditional activities, and so the assets that are required to produce non-interest income can be calculated by dividing non-interest income by the ROA of traditional activities. Allen, Engert, and Liu (2006) also consider the effects of increasing the assumed return on off-balance-sheet activities by 5 to 10 percentage points; the impact on the results reported below is marginal.

The model is estimated using quarterly data from 1983 through 2004 for the Canadian banks, and from 1986 through 2004 for the U.S. BHCs (discussed in

Box 1). Separate models are estimated for the Canadian and U.S. banking industries, given the differences in the development of the institutional and regulatory environments in Canada and the United States.

Results

For the Canadian banks, the analysis suggests that there are increasing returns to scale of about 6 per cent, suggesting that the Canadian banks could gain (modestly) from being larger. As regards the measure of cost inefficiency for Canadian banks, this research finds that the gap between the efficient frontier (the best-practice bank) and other banks averages less than 10 per cent, depending on the model specification considered. More refined measures of technological change in the model (capturing investment in employee training and automated banking machines, for example) lead to estimates of cost inefficiency among Canadian banks averaging about 6.5 per cent. As well, the results indicate that Canadian banks have tended to move closer to the efficient frontier over time.

For the U.S. case, increasing returns to scale are also found, but, at about 2 per cent, these are considerably smaller than in the Canadian sample. Estimates of cost inefficiency for the sample of U.S. banks indicate that the average gap between the efficient frontier and other banks is greater than 10 per cent, which is a typical result in the research literature on U.S. bank efficiency (for example, Berger and Mester 1997). In the model that best fits the data in Allen, Engert, and Liu (2006), the average measure of cost inefficiency for U.S. BHCs is about 14 per cent. As well, cost inefficiency among the U.S. BHCs has not narrowed appreciably over the sample period.

A striking feature of the results is that the measure of cost inefficiency for Canadian banks is comparatively low, suggesting that Canadian banks are relatively efficient according to this measure.

In various studies of bank efficiency in different countries, inefficiency measures similar to those found by Allen, Engert, and Liu for the U.S. case are not

unusual (see Berger and Humphrey 1997, for example.) That is, cost-inefficiency measures in excess of 10 per cent, as found for the U.S. case, seem to be typical of other countries as well. However, a striking feature of Allen, Engert, and Liu's results is that the measure of cost inefficiency for Canadian banks is comparatively low, suggesting that Canadian banks are relatively efficient according to this measure.

Notably, the authors also find that technological progress and legislative changes have reduced the cost structures of banks in both Canada and the United States. For example, in Canada, the revisions to the financial legislation in 1987 and 1997 appear to have been particularly beneficial in reducing the cost structures of Canadian banks.

Competition in Canadian Banking

An important dimension to consider when evaluating efficiency is competition. In this regard, other things being equal, a more competitive environment is generally expected to lead to more efficient outcomes. In this section, we report recent research by Bank of Canada staff (Allen and Liu forthcoming) that considers the state of competition in Canadian banking.

Concentration, competition, and contestability

Canada has a highly concentrated banking market; for example, the largest six banks account for more than 90 per cent of the assets in the banking system. Formal measures of concentration in banking (such as the Herfindahl-Hirschman Index) are typically in a range that points to what economists would interpret as a medium or high degree of market concentration.

It is important to keep in mind, however, that such assessments neglect the competition (especially in retail and small-business banking) provided by credit unions and caisses populaires, of which there are about 1,000 in Canada, and which are particularly prominent in certain regions of the country, such as British Columbia, Saskatchewan, Quebec, and parts of the Atlantic provinces. Insurance companies are another source of competition in financial services; indeed, the major life insurance companies rank among the very largest financial services firms in Canada.

Traditionally, it has been believed that a more concentrated industry is less competitive, and liable to compromise economic efficiency. However, empirical research on this idea provides mixed results. For exam-

ple, a study by Bikker and Haaf (2002) on 23 European countries found support for the traditional view that concentration impairs competition. In contrast, a more recent study by Claessens and Laeven (2005), using a data set of almost 4,000 banks from 50 countries, concludes that competition is not negatively related to concentration. These authors find that greater competition in financial services is most clearly related to an absence of barriers to entry (including with regard to foreign bank entry), and a policy framework that places few restrictions on the activities of financial services firms.

The latter paper points to the notion of "contestability," which refers to the ability of firms to enter a market and compete with incumbents. Specifically, a market is considered to be contestable if barriers to entry are not prohibitive and if firms can exit from the industry without enduring punitive costs, so that firms are not discouraged from entering in the first place. The key idea is that a firm may be compelled to be more competitive and efficient by the prospect of new entrants. As a result, instead of considering only simple concentration measures to assess the degree of competition in an industry, economists tend to focus more on measures of market conduct to gauge the degree of contestability in an industry.⁹

Recent research by Bank staff (Allen and Liu forthcoming) measures contestability in the Canadian banking industry. This line of research, following the seminal work of Rosse and Panzar (1977) and Panzar and Rosse (1982, 1987), focuses on testing statistically for three forms of market structure: monopoly or collusive oligopoly on the one hand; perfect competition on the other; and an intermediate market structure, called monopolistic competition.

The specific test relies on basic propositions of economic theory and involves measuring the effect on firm revenue of an increase in input costs.¹⁰ For instance, if the costs of a monopolist or collusive-oligopolist firm increase, it will raise its price and, given market conditions that exist in a monopoly setting, the revenue of the firm will fall. On the other

9. For a comprehensive discussion of the measurement of firm conduct in different market structures, see Bresnahan (1989). Northcott (2004) provides a recent review of the research literature on competition in banking.

10. This test relies on the fact that a profit-maximizing monopolist always operates at an elastic point on its market demand curve, whereas a competitive group of firms need not (Shaffer 1982).

Box 2: What Is Monopolistic Competition?

Monopolistic competition describes an industry structure combining elements of both monopoly and perfect competition. Similar to perfect competition, there are a number of sellers, and conditions of entry and exit are not prohibitive. In a monopolistically competitive industry, however, products are somewhat differentiated, and firms invest heavily in establishing intangibles such as brand recognition and loyalty, for example.

Each firm in a monopolistically competitive industry has some degree of market power over the prices of the goods and services that it sells. The degree of market power is related to certain factors, including, for example, the extent of barriers to entry into the industry and the extent of successful product differentiation (and brand loyalty) created by the firm. However, although the products of a monopolistically competitive firm are differentiated somehow from those of its competitors, there are substitutes for those products so that the demand for the firm's products will depend on the prices charged by rivals producing similar (but also somewhat differentiated) products.

Monopolistic competition is probably the most prevalent market structure in modern economies. Consider

the markets for many consumer goods, for example, such as breakfast cereals, beer, fast food, toothpaste, or sports shoes, among others. Each is characterized by a handful of dominant firms offering differentiated (but similar) products aiming to establish a brand, and there is considerable investment by the firms in those industries to create brand recognition and loyalty (through advertising, for instance). As well, arguably the most prominent class of macroeconomic models used by economists today (so-called New Keynesian models) features monopolistic competition to characterize firm behaviour. Indeed, firm behaviour in the Bank of Canada's primary monetary policy model is monopolistic competition.

From a theoretical perspective, it can be shown that monopolistic competition is less efficient than the ideal of perfect competition. This inefficiency is essentially the result of producing and promoting a (possibly excessive) variety of products. However, because a number of firms are competing and both entry and exit are possible in this form of market structure (contestability), monopolistic competition is not generally considered to be a problem from the perspective of competition policy.

hand, if the costs of firms operating in perfect competition rise, there will be an equivalent proportional increase in its prices, and given relevant market conditions, its revenue will increase in a one-for-one fashion. If the firm was operating in an environment of monopolistic competition, its price response to an industry-wide cost increase would lie between these preceding cases, as would the effect on its revenues. Specifically, the effect of a cost increase on firm revenues would be positive, but less than a one-for-one increase.

Measuring contestability: The H-statistic

The method developed by Panzar and Rosse (1987) allows researchers to estimate the nature of the competitive behaviour of firms based on the properties of (reduced-form) revenue equations. Specifically, this methodology allows one to estimate a statistic, called the H-statistic, that measures the extent to which the revenues of a firm change in response to a change in

input prices. Put differently, the H-statistic is the sum of the elasticities of the revenue of a firm with respect to changes in input prices.¹¹

Consistent with the preceding discussion, the H-statistic equals 1 if the market can be characterized by perfect competition; that is, in this case, revenues respond in a one-for-one manner to input-price changes. Most importantly, the H-statistic is less than 0 if the underlying market structure is a monopoly or a collusive oligopoly; that is, revenues respond negatively to cost changes. Notably, an H-statistic in this

11. Given that there is incomplete information on prices and quantities of inputs and outputs in banking, one of the main advantages of the Panzar-Rosse methodology is its relatively modest data requirement. At the same time, this implies a partial-equilibrium analysis, where the industry demand curve, in effect, is fixed. The empirical significance of this simplification does not appear to have been explored in the research literature. The scarcity of data also means that it is very difficult to conduct a general-equilibrium analysis of competition.

range would suggest firm behaviour injurious to consumer welfare. Finally, the H-statistic ranges between 0 and 1 for other intermediate forms of market structure, which are broadly characterized as monopolistic competition. (See Box 2 for more on monopolistic competition.)

Many researchers have applied this methodology to study competition in the financial sector, specifically banking, in numerous countries. The main idea is to test statistically for evidence of monopoly or collusive-oligopoly behaviour (an H-statistic less than 0). An early application of the methodology to the Canadian financial system is Nathan and Neave (1989), which studies competition in banking in the early 1980s. Shaffer (1993) uses a variation of the H-statistic to study competition among Canadian banks from 1965 to 1989. The H-statistic methodology has also been applied widely to other countries. For example, Molyneux, Altunbas and Gardener (1996) find evidence of collusive-oligopoly behaviour in the Japanese banking sector in 1986–88. Using a sample from 1987 to 1994, Rime (1999) concludes that monopolistic competition characterized the Swiss banking system. Examples of large cross-country studies are Bikker and Groeneveld (2002) and Claessens and Laeven (2004, 2005).

Empirical studies of banking generally do not find perfect competition nor monopoly or collusive-oligopoly behaviour, and instead find evidence of monopolistic competition in the banking systems of most countries. The research literature generally concludes that the Canadian banking system can be reliably considered to be a case of monopolistic competition and suggests that it ranks among the most contestable in the world.

While these cross-country studies yield interesting results, they should be interpreted with caution, for a few reasons. First, the H-statistic relies on the assumption that markets are in equilibrium (which can be tested, and often is in empirical work, including that by Bank of Canada staff reported here). By comparing the H-statistic across countries, these studies implicitly assume that the banking systems in these countries are consistently in equilibrium during the sample period. Second, it might be the case that environmental conditions (such as regulatory treatment) vary significantly across countries, which can complicate cross-country comparisons. Third, the research literature has not agreed on a robust way of mapping the H-statistic into specific inferences about competitive

conduct for all ranges of the statistic, particularly when H is between 0 and 1. As a result, linear interpretations of the H-statistic may be problematic. Simply put, it may not be meaningful to rank-order similar H-statistics across countries or different sample periods to compare degrees of contestability when H lies between 0 and 1 (which is often done).

Finally, a recent working paper, Bikker, Spierdijk, and Finnie (2006), has raised doubts regarding some previous estimates of contestability. These authors suggest that many empirical studies using the H-statistic to measure contestability in banking over-estimate the level of banking competition because of a systematic misapplication of the method.¹² In the work conducted by Bank of Canada staff reported here, both the traditional application of the method and the approach recently recommended by Bikker, Spierdijk, and Finnie (2006) are considered.

Methodology

To calculate the H-statistic for Canadian banks, Allen and Liu (forthcoming) estimate a model that relates the revenues from banking outputs to the costs of banking inputs. Banks are considered to produce one composite output, which consists of loans and other investments, as well as non-traditional sources of revenue. As noted by Allen and Liu (2005), in the past decade, banks have been generating a larger share of their income from non-traditional sources (such as depositor services, wealth management, underwriting, and foreign exchange trading). Indeed, in the past five years, income from such sources has typically surpassed that from traditional banking activities. Accordingly, these authors take account of such non-traditional revenue sources in their calculations, following the asset-equivalent approach described above.

The model includes expenses on salaries, pensions, and employee benefits, as well as expenses on premises, computers, and equipment; the cost of deposits; and a series of bank-specific factors that reflect various behavioural and risk considerations (for details, see Allen and Liu forthcoming).

12. This has to do with how variables are represented in the estimated equations; for a discussion, see Allen and Liu (forthcoming). Briefly put, the standard approach followed in many econometric studies to control for bank size using total assets transforms the revenue equation into a price equation, and therefore, the elasticities are with reference to price, and not revenue, as they should be.

Data

The data are quarterly observations for 10 domestic and 15 foreign banks operating in Canada from 2000 to 2006. The number of banks in this study is constrained by data availability. (See Box 1 for more on the banks considered in this study.) The data set is from the banks' consolidated monthly balance sheet and quarterly consolidated statement of income, collected by the Office of the Superintendent of Financial Institutions. Because the research focuses on the domestic market, the authors limit inclusion of variables to those booked in Canada. (All data are deflated by the GDP deflator.) The assets of the banks in this sample account for 98 per cent of the total Canadian-dollar assets of the banking sector.

Results

When Allen and Liu (forthcoming) estimate the H-statistic measure of contestability in the conventional manner, they obtain results very similar to those for Canada in previous studies, such as Claessens and Laeven (2004) for 1994–2001, Claessens and Laeven (2005) for 1987–96, and Nathan and Neave (1989) for 1983 and 1984. All of these studies conclude that Canada's banking system is characterized by monopolistic competition. Similarly, Shaffer (1993) concludes that there was no monopoly or collusive-oligopoly market power in Canadian banking from 1965–89. Results from various studies relevant to Canada are summarized in Table 1.

The overall conclusion is that Canadian banks do not exercise monopoly or collusive-oligopoly power.

When the H-statistic methodology is adjusted as suggested by Bikker, Spierdijk, and Finnie (2006), Allen and Liu find quantitatively smaller estimates of contestability, as expected. However, the overall conclusion remains that Canadian banks do not exercise monopoly or collusive-oligopoly power. (For complete results for various hypothesis tests, see Allen and Liu forthcoming.)

Table 1

Measures of Contestability in Canadian Banking

Study	H-statistic	Period	Sample	Conclusion
Nathan and Neave (1989)	1.06	1982	all banks	perfect competition
	0.68	1983	all banks	monopolistic competition
	0.73	1984	all banks	monopolistic competition
Shaffer (1993)	not reported	1965–89	all banks	no monopoly power
Bikker and Haaf (2002)	0.60	1991	all banks	monopolistic competition
	0.62	1997	all banks	monopolistic competition
	0.74	1991	small banks	monopolistic competition
	0.63	1991	medium-sized banks	monopolistic competition
	0.56	1991	large banks	monopolistic competition
Claessens and Laeven (2004)	0.60	1997	large banks	monopolistic competition
	0.67	1994–2001	all banks	monopolistic competition
	0.67	1987–2001	all banks	monopolistic competition
Bikker, Spierdijk, and Finnie (2006)	0.67	1992–96	all banks	monopolistic competition
	-0.001 ^a	1987–2004	all banks	not applicable ^a
	0.35 ^b	2000–2006	25 major banks	monopolistic competition
Allen and Liu (forthcoming)		2000–2006	25 major banks	monopolistic competition

a. The authors dismiss their results for Canada as meaningless, because their tests indicate that the banking system was not in equilibrium during their sample period.

b. This estimate is based on the methodology proposed by Bikker, Spierdijk, and Finnie (2006); see text for a brief elaboration.

It is interesting that the Allen and Liu study, which focuses on the latest time period, and uses more detailed data as well as more-refined model specifications than previous work, produces H-statistics that lead to the same conclusions as earlier studies. Also, the Canadian financial sector has experienced significant legislative and regulatory change, as well as substantial consolidation, including the acquisition by banks of mortgage and loan companies, trust companies, and other financial service providers. At the same time, there has been substantial new entry by foreign

banks. The empirical results suggest that regardless of the substantial structural changes that took place in the past 25 years, Canadian banks have behaved consistently in a monopolistically competitive fashion over this period.

There seem to be a couple of possible explanations for this consistency. Considering that the H-statistic appears to be robust to measurement errors (Genesove and Mullin 1998), and given the wide range of estimates that imply monopolistic competition (between 0 and 1), rejecting this conclusion might be difficult from a statistical perspective. At the same time, the reductions of barriers to entry and activity restrictions that accompanied the legislative reforms of the past 25 years might have increased contestability of the market, and thereby countered possible anti-competitive effects associated with the consolidation across financial services over the same period.

Finally, while Allen and Liu (forthcoming) consider alternative definitions of banking output and prices to take into account the diversified business mix of Canadian banks, the framework used allows for only a single composite output. It is possible that cost structures and pricing strategies (as well as market power) differ between the various business lines of a diversified bank. As a result, it would be better to estimate an H-statistic for each business line. However, this requires detailed data for each business line, which, unfortunately, does not exist.

Conclusions

The research summarized here suggests that, overall, Canadian banks appear to be relatively efficient pro-

ducers of financial services. As well, some efficiency gains from becoming larger appear to be possible. The research also indicates that Canadian banks do not exercise monopoly or collusive-oligopoly power, and that banking can be considered to be a monopolistically competitive industry.

However in the course of conducting the work reported in this article, it has become clear that a constraint on more precise study of the issues considered is a shortage of relevant, detailed data.

This experience indicates the importance of continuing to promote efficiency and competition in financial services in Canada.

As noted above, past legislative and regulatory changes have benefited efficiency in Canadian financial services, and might have improved contestability as well. Looking forward, this experience (as well as economic reasoning) indicates the importance of continuing to promote efficiency and competition in financial services in Canada.

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