Financial structure change and banking income: A Canada–U.S. comparison

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Abstract

Data suggest that the Canadian financial structure, and particularly indirect finance (e.g., banking), have become more market-oriented. We associate this financial trend in part with the regulatory changes that have occurred in Canada since the 1980s. Financial intermediaries are increasingly involved with financial market activities—e.g. off-balance sheet (OBS) activities such as underwriting securities. In this article we analyze the noninterest income attributable to these financial market activities. We find that the variance of Canadian banks' aggregate operating-income growth is rising because of the increased contribution of noninterest income. Overall, our analysis corroborates the U.S. findings of Stiroh and Rumble (Stiroh, K., 2006. A portfolio view of banking with interest and noninterest assets. Jounal of Money, Credit, and Banking 38, 1351–1361; Stiroh, K., Rumble, A., 2006. The darkside of diversification: the case of U.S. financial holding companies. Journal of Banking and Finance 30, 2131–2161): by contributing to banking income volatility, market-oriented activities do not necessarily yield straightforward diversification benefits to Canadian banks.
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1. Introduction

Over the 1990s, Canadian businesses relied increasingly on financial markets as their primary source of external funding (Calmès, 2004). Data display a trend towards a more market-oriented

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financial structure. At the same time, Canadian banks have become increasingly involved with non-traditional activities, e.g. OBS activities. This trend is partly related to the regulatory changes that occurred in Canadian banking. In the U.S, Boyd and Gertler (1994) observe a similar shift in banking. Going a step further, Stiroh (2006) and Stiroh and Rumble (2006) investigate the consequence of the market-oriented trend on U.S. banking riskiness. Surprisingly, these authors find "little obvious diversification benefit" from this ongoing phenomenon.

To our knowledge, the approach proposed by Stiroh (2006) has not yet been used to assess the case of Canadian banking riskiness. Dionne and Harchaoui (2003) find a positive link between securitization and bank risk but, in their study, banking riskiness is not expressed in terms of income volatility. D'Souza and Lai (2004) focus on Canadian bank portfolio efficiency and find that more diversified business lines and industries would be somewhat detrimental to banks' efficiency. However, concentrating on on-balance sheet activities, the authors cannot fully account for financial market activities. This article contributes to the perspective held by Stiroh (2006) and Stiroh and Rumble (2006) regarding the current banking stance. We investigate whether Canadian bank managers, shareholders and regulators can benefit, each in their own respect, from the continued integration of noninterest income activities in the banking business.

In this empirical study, we argue that financial market activities do not necessarily provide diversification benefits to Canadian banks, in the sense that they contribute to banks' income volatility. We find that the contribution of noninterest income to the volatility of the aggregate net operating-revenue growth has increased since the early 1980s. This persistent increase partly coincides with changes in financial regulation. The next section describes this trend and explains it in relation to the consecutive changes in financial regulation. Section 3 studies the consequence of the financial structure change on banking. In Section 4, we report results suggesting that banking is procyclical with respect to both Gross Domestic Product (GDP) and the Toronto Stock Exchange (TSE), owing in part to the influence of noninterest income. The last section concludes with a discussion of some policy implications and possible extensions of this study.

2. The change in the Canadian financial structure

Our study suggests that banking is becoming more market based. We analyze this trend in the context of the Canadian legislative developments because regulatory changes help explain why and when financial intermediaries, especially banks, became more involved with financial markets. Indeed, it is reasonable to think that there is a direct relationship between the regulatory changes and the structure of the Canadian financial system (Calmès, 2004).[1] In the following section, we characterize the current Canadian banking trend in relation to the amendments to the Canada's *Bank Act*.

2.1. The regulatory changes

The "sunset" clause of the Canada's *Bank Act* requires a periodic reassessment of the legislation governing the national chartered banks. This clause led to significant revisions and contributed to change in the financial industry. The 1980 amendments was the first of a series that had a persistent effect on banks and other financial institutions. They allowed banks to have subsidiaries in

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[1] Along the same line, Houston and Stiroh (2006) note that the increased financial sector risk observed in the U.S. over the last three decades "likely reflects the deregulation and financial innovation that have enabled financial institutions to evolve towards a greater mix of riskier assets" (p. 3).

different areas such as venture capital and mortgage loans. In 1987 and 1992, banks entered into a range of new businesses such as new OBS activities. Canadian banks were permitted to invest in corporate securities, and to distribute government bonds. They made substantial investments in the securities business and gained control of most investment dealers. Financial intermediaries were also allowed to conduct brokerage activities. Consequently, the financial structure is more market-oriented, with a pronounced change associated with the 1987 amendments. The main transition took place between 1987 and 1989, as bank customers were allowed to invest in financial markets directly through their banks. The situation evolved further in 1992 when banks were allowed to offer a number of new services such as portfolio management and investment advice.

2.2. The relative decline of the Canadian loan business

In relation to the amendments, financial institutions have been losing market share to the financial markets. In the 1990s, indirect financing sharply decreased. Canadian financial institutions have been experiencing a relative drop in loan business, from approximately 60% of external financing in the 1980s to just under 40% in recent years. The financial structure is currently characterized by a trend toward a market-oriented system, a trend which has been more pronounced since the implementation phase of the 1987 amendments. More precisely, the transition occurred between 1987 and 1989 (Calmès, 2004).

2.3. Stylized facts

Regulatory changes, by allowing banks to enter the brokerage business, have *de facto* initiated the growth of banks' non-traditional activities. This subsection discusses some basic stylized facts regarding these activities.

2.3.1. The increase in non-traditional activities

The growth in Canadian banks' total assets shares the same pattern as its U.S. counterpart (Boyd and Gertler, 1994). Of particular interest is the growth in non-traditional activities (e.g., OBS activities). In the last decades the noninterest income generated by these activities has grown much faster than net-interest income. This has been particularly true since the 1992 and 1997 *Bank Act* amendments. Surprisingly however, non-traditional activities are generally overlooked. One of the reasons might be that noninterest income activities, by definition, are not reported as traditional lending, so it is more difficult to get a somewhat compatible financial indicator of bank activities in these areas. To address this issue, Boyd and Gertler (1994) propose a transformation of the noninterest income series into an *assets*[2] equivalent. Applied to Canadian data, the transformation suggests that, after the 1992 and 1997 amendments, this financial indicator grew rapidly (Calmès, 2004). In recent years, much of the growth in total (adjusted) banks assets, on- and off-balance sheet, has actually come from noninterest income. It is a global phenomenon taking place in Canada, in the U.S. and Europe (Rajan and Zingales, 2003).

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[2] They implicitly assume a perfect mapping between OBS activities and noninterest income. Since noninterest income actually involves some on-balance sheet items, the method only provides an approximate indicator of OBS activities.

Table 1
Canadian and U.S banks net operating revenue by source andyear

	1980		1990		2000	
	Level	%	Level	%	Level	%
Canadian Banks						
Net operating revenue	**15.7**	100	22.97	100	**52.52**	100
Net-interest income	12.41	**79.0**	15.86	**69.0**	23.01	**43.8**
Noninterest income	3.29	**21.0**	7.11	**31.0**	29.351	**56.2**
U.S banks						
Net operating revenue	**123.4**	100	196.9	100	**333.7**	100
Net-interest income	98.2	**79.6**	132.9	**67.5**	188.9	**56.6**
Noninterest income	25.2	**20.4**	64.0	**32.5**	144.8	**43.4**

Note: In 1997 national currencies (US$b). The bottom panel is taken from Stiroh (2006).
Bold values are used to emphasize important numbers.

3. Analysis

While regulatory changes have allowed the system to become more market-oriented little attention has been paid to the consequence of this situation in terms of banking diversification. This section provides an analysis of this question with a focus on banking income.

3.1. Summary statistics

Two types of data are used in our analysis: the banks' consolidated monthly balance sheet data and the quaterly consolidated statement of income collected by the Office of the Superintendent of Financial Institutions of Canada. To facilitate a comparison with the U.S. experience, Table 1 shows the breakdown of net operating revenue for Canadian banks for 1980, 1990 and 2000. Net operating revenue, net-interest income and noninterest income are reported. Net operating revenue is the sum of net-interest income and noninterest income. As shown in Table 1, aggregate noninterest income of Canadian banks has increased as a share of net operating revenue, from 21% in 1980, to 31% in 1990, to 56.2% in 2000. The trend identified for the U.S is even more pronounced in Canada, where net operating revenue has more than tripled in the last couple of decades, from US$ 15.7b to US$ 52.52b. This result suggests that, in recent years, the increase in net operating revenue has been mainly driven by the increase in the noninterest component. In this context, it is particularly interesting to investigate whether the increased contribution of noninterest income to net operating revenue is a "neutral" substitution (in terms of risk) or not. What follows is an assessment of net operating revenue volatility.

3.2. Banks' income volatility: a Canada–U.S. comparison

We expect that an increased volatility coincides with a growing share of financial market activities. This should be the case since noninterest income tends to be more volatile than net-interest income. If noninterest income increasingly contributes to banks' revenue, it can be suspected that it increases fluctuations in net operating revenue as well. To analyze this, it helps to think of net operating revenue as a portfolio composed of two types of assets. First, a bank's regular assets generate net-interest income. Second, a bank's asset equivalent yields noninterest income. A standard examination of the volatility of aggregate return of this kind of portfolio would require some

asset equivalent indicator of noninterest income. Instead, following Stiroh (2006) and Stiroh and Rumble (2006), we consider a direct approach based on a modification of the standard portfolio analysis. Rather than computing a regular decomposition of return volatility and relying on some asset equivalent series, we directly compute a decomposition of *portfolio growth* volatility. In standard portfolio theory, the volatility of a portfolio aggregate return is a function of the volatilities of each of its components, and also a function of their covariance. Hence, adapting this idea to banks' revenue boils down to specifying the volatility of the growth rate of net operating revenue (NOR) as the weighted average of the variance of the growth rate of noninterest income (NONIN) and of the variance of the growth rate of net-interest income (NI), plus the covariance between these two components. More precisely, since NOR = NONIN + NI we have:

$$\sigma^2_{d\ln(\text{NOR})} = \alpha^2 \sigma^2_{d\ln(\text{NONIN})} + (1-\alpha)^2 \sigma^2_{d\ln(\text{NI})} + 2\alpha(1-\alpha)\,\text{cov}\,(d\ln(\text{NONIN}), d\ln(\text{NI}))$$

(1)

where $\alpha = \text{NONIN}/(\text{NI} + \text{NONIN})$ is the share of noninterest income in banks' net operating revenue, $(1-\alpha)$ is the share of net-interest income, and the growth rate of each variable is simply its log total differential. The contribution of noninterest income is then captured by the term $\alpha^2 \sigma^2_{d\ln(\text{NONIN})}$. The intuition behind this equation is straightforward. The overall variance of the endogenous variable will increase with the growth of noninterest income share and volatility if noninterest income is more volatile than net-interest income. Furthermore, if the covariance between the two explanatory variables (the growth rate volatilities of noninterest income and net-interest income) is positive, then this further directly increases the variance of bank revenue growth. However, as long as the covariance is not equal to one, the trade-off between net operating-revenue growth and volatility can improve because the standard deviation of the volatility of net operating-revenue growth rate is less than the weighted average of the two exogenous variables.

Table 2 shows results for the components of Eq. (1) for the periods 1984:1–1989:4 and 1990:1–2001:3. We use the same periods as do Stiroh and Rumble (2006) so as to make a direct comparison with the U.S. experience. For each period, the first subcolumns display α, the average

Table 2

Decomposition of the variance of net operating revenue, Canada versus U.S.

	1984:Q1–1989:Q4			1990:Q1–2001:Q3		
	Average share	Variance	Contribution to variance	Average share	Variance	Contribution to variance
Canadian banks						
Net operating revenue		**16.6**			**27.4**	
Net-interest income	74	19.5	10.7	60	10.0	3.6
Noninterest income	**26**	**28.9**	2.0	**40**	**101.7**	16.3
Covariance		9.3	3.6		2.8	1.3
Correlation		0.39			0.09	
U.S banks						
Net operating revenue		**50.4**			**46.2**	
Net-interest income	72	100.2	51.9	63	14.2	5.7
Noninterest income	**28**	**228.9**	18.2	**37**	**259.1**	35.8
Covariance		−29.0	−11.7		5.6	2.6
Correlation		−0.19			0.09	

Note: The bottom panel is taken from Stiroh (2006).

Bold values are used to emphasize important numbers.

of the shares of noninterest income over the periods, and $1 - \alpha$ (for net-interest income). The second subcolumns show the variances, covariances and correlations, while the third subcolumns give the share-weighted variances, that is, the contribution to the overall variance of net operating revenue. In the U.S., bank revenue has become less volatile as the variance of net operating-revenue growth fell from 50.4 to 46.2, but the difference is not significant. Contrary to the finding in the U.S., the variance of net operating revenue actually *increased* in Canada, from 16.6 for 1984:1–1989:4 to 27.4 for 1990:1–2001:3. This increase comes essentially from an increase in the variance of noninterest income, an increase substantially larger than the one observed in the U.S. Indeed, for Canada, the volatility of the noninterest income growth rate went from 28.9 in the first period to 101.7 in the second period, whereas in the U.S. it increased only from 228.9 to 259.1. Another dimension along which the Canadian experience is different comes from the growth in α. In Canada, the noninterest income component is more volatile than its U.S. counterpart and growing more in relative size. The difference however is not very large on average. In Canada, the share increased from 26% to 40%, whereas it increased from 28% to 37% in the U.S. Hence, the fact that net operating revenue is more volatile in Canada results mainly from the fact that the noninterest income component is more volatile than in the U.S. Regardless of the country considered, the increased volatility in noninterest income leads to a greater contribution of this component to the overall variance of net operating income growth (from 18.2 to 35.8, and 2.0 to 16.3 in the U.S. and Canada, respectively). Furthermore, in the U.S., the volatility of net-interest income plummetted from 100.2 to 14.2, but in Canada, it decreased only from 19.5 to 10.0. In other words, if Canada has experienced a relative increase in bank revenue volatility, it is not only because noninterest income has contributed more to this volatility, but also because the decrease in net-interest income volatility has been far less pronounced than in the U.S.

Finally, it should be noted that because the covariance between net-interest income and non-interest income actually increased from -29.0 to 5.6, Stiroh (2006) argues that there has been no clear diversification benefits in the U.S. across the two periods. The case of Canada is different as the covariance between the two components of net operating revenue has decreased between the periods 1984:1–1989:4 and 1990:1–2001:3. Since this is the opposite of what happened in the U.S., we examine this question further below.

3.3. Robustness check and additional results

To check the robustness of the results discussed above, we look at the possible influence of the choice of the time periods. We also report additional results on the source of noninterest income volatility.

Table 3 reports the variance decomposition over shorter sub-periods. Time intervals correspond to different legislative periods. In most sub-periods, noninterest income seems to help reduce net operating revenue variance below what it would be if the banks relied solely on interest income. For example, in the 1983–1987 episode, net operating revenue variance was 13.6, lower than the 15.5 variance of net-interest income. It can even be argued that from 1993 to 1997 there were clearly diversification benefits. In this period, the volatility of Canadian bank revenue was lower and the covariance between its two components was slightly negative. However, the period 1998–2002 is different. The variance of noninterest income increased substantially and the covariance actually increased. Consequently, in this sub-period, net operating revenue variance was almost six times higher than net-interest income variance, as the variance of noninterest income reached 212.6.

The increase in net operating revenue variance over the 1990–2001 period mainly took place in the last sub-period. The peculiarity of this situation is also emphasized by Houston and Stiroh

Table 3
Decomposition of the variance of net operating revenue, before provision (Canadian banks)

	1983–1987			1988–1992		
	Average share	Variance	Contribution to variance	Average share	Variance	Contribution to variance
Net operating revenue		13.6			14.2	
Net-interest income	0.74	15.5	9.0	0.6	16.9	8.3
Noninterest income	0.26	25.3	1.5	0.4	30.2	2.7
Covariance		7.9	2.9		7.5	3.2
Correlation		0.4			0.33	
	1993–1997			1998–2002		
	Average share	Variance	Contribution to variance	Average share	Variance	Contribution to variance
Net operating revenue		9.4			57.1	
Net-interest income	0.66	9.8	3.9	0.55	10.2	2.4
Noninterest income	0.34	40.4	5.5	0.45	212.6	55.3
Covariance		−0.9	−0.4		5.1	2.5
Correlation		−0.04			0.11	

(2006). They note that, in the U.S., "financial sector volatility has increased over the past thirty years, particularly between 1998 and 2002" (p. 1).[3]

In this period, consistent with the results obtained for the U.S., income from trading and investment activities is one of the major contributors to noninterest income volatility. Even though trading and investment income only account for 6.5% and 2.6% of total revenue, respectively, their volatilities are quite substantial (1311 and 12625 over the period). In fact, the income from these two types of activities was negative in some quarters. Furthermore, trading income is slightly negatively correlated (−0.02) with net-interest income while investment income is positively correlated (0.12) with net-interest income.

4. Is noninterest income a buffer against business cycles?

The analysis carried out in the previous section raises some doubts regarding the ability of non-traditional activities to systematically result in diversification benefits. Yet, a plausible explanation of the banks' increased involvement in noninterest income activities might come from the dampening impact these activities could have on the sensitivity of banks to the economy or to financial market fluctuations. For example, the current trend could be related to the belief that noninterest income may be less procyclical. It is possible that economic cycles lead to more fluctuations in loan demand than in the demand for a bank's other business lines.

4.1. Dynamic correlations

As a first step, we analyse the dynamic correlations between each type of bank revenue and GDP growth. We also examine the correlation between bank revenue and the TSE to investigate

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[3] They relate this to an important change in the nature of financial sector risk volatility. Common financial sector risk has risen.

which type of bank revenue is more affected by fluctuations in the financial markets. The contemporaneous correlations between all types of bank revenue and GDP growth are found to be positive, indicating that both interest income and noninterest income are to a certain extent, procyclical. Although the absolute value of the correlation is quite small, it is much stronger between noninterest income and output than between net-interest income and output. This casts doubt on the assumption that noninterest income is less affected by economic cycles. While the positive relationship also holds between the leads of GDP growth and the banks' revenue, the sign of the correlation between the lags of GDP growth and bank revenue is less clear. In other respects, the contemporaneous correlations are, on average, four times stronger when the TSE is considered. This suggests that bank revenues are more in tandem with the stock market than with business cycles because of noninterest income, which shows the highest same-period correlation (0.232) with stock market growth. The correlation between the first lag of TSE growth and noninterest income is also positive and quite high (0.337) compared to other correlations. These results tend to suggest that noninterest income does not constitute a buffer against either business cycles or financial markets fluctuations. To assess the significance of the correlations we run time series tests to investigate whether GDP and TSE contribute to the volatility of bank revenue. We use Stiroh (2006) methodology to complete the analysis, the findings of which are presented in the following subsections.

4.1.1. Time series analysis

In order to further study the relationship between the nature of bank revenue and exogenous shocks, we use the following model:

$$d \ln Y_t = \alpha + \sum_{i=1}^{4} \beta_i d \ln Y_{t-i} + \sum_{j=0}^{4} \theta_j d \ln X_{t-j} + \epsilon_t,$$

Where Y_t is one of the three measures of bank revenue (total revenue, net-interest income, and noninterest income), and X_t is the GDP or TSE. Thus, a total of six regressions are considered. Unit root tests suggest that all variables used are nonstationary, so they are modeled in first difference. In a lag selection process, we start with six lags and include lagged values of each variable up to the last significant lag. The experiment is based on aggregate bank data from 1983:1 to 2002:4, with all variables expressed in logged difference (*, **, and *** denoting significance at the 1%, 5% and 10% levels, respectively). The individual coefficients and their joint significance levels are reported in Table 4. As expected, noninterest income growth is positively related to TSE and GDP growth, confirming that this type of revenue tends to be procyclical and significantly affected by financial market fluctuations. While the lags of X_t have a negative coefficient for the net-interest income variable, they often display positive coefficients for noninterest income. This leads to a positive relation between total revenue and the stock market. In this respect, note that TSE growth is more significant in explaining the three types of bank revenue growth than GDP growth. Overall, net-interest income growth is negatively correlated with TSE growth, while total revenue and noninterest income growth are positively correlated with TSE growth. In particular, the sum of the coefficients of the lagged TSE growth in the noninterest income equation is much higher (1.474) than that in the total revenue equation (0.357).

4.2. VAR analysis

To complement the analysis we also study the impact of business cycles and financial market fluctuations using a vector autoregression (VAR) model. Our objective is to further

Table 4
Bank income growth versus growth in GDP and stock market price

	Explanatory variable X = GDP			Explanatory variable X = TSE		
	Total revenue	Net-interest income	Noninterest income	Total revenue	Net-interest income	Noninterest income
Y_{t-1}	**−0.404*****	−0.168	−0.325***	**−0.487*****	−0.216**	**−0.557*****
Y_{t-2}	**−0.187**	−0.001*	–	**−0.229****	−0.121	**−0.340*****
Y_{t-3}	**−0.001*****	–	–	–	−0.075	**−0.208**
Y_{t-4}	–	–	–	–	0.074**	**−0.155****
X_t	–	0.945**	1.462	**0.146****	0.032	**0.356*****
X_{t-1}	–	−1.666***	0.211	**0.221****	−0.065	**0.570****
X_{t-2}	–	–	−0.003**	**−0.007***	−0.079	**0.167***
X_{t-3}	–	–	–	**−0.003****	−0.008	**0.119**
X_{t-4}	–	–	–	–	−0.138**	**0.261****
Constant	**0.026**	0.019***	0.022	**0.026*****	0.018***	**0.042*****
Sum of coef. of lagged X	–	−0.720	1.670	**0.357**	−0.257	**1.474**
Jt. sig. of lagged X	–	0.246	0.042	**0.002**	0.058	**0.000**
Adjusted R^2	0.11	0.07	0.063	0.243	0.033	0.330

Note: Dependent variable: Y_t; Explanatory variables: X_t (GDP and TSE); dashes represent removed variables.
Bold values are used to emphasize important numbers. Asterisks indicate the confidence intervals, *20%; **10%; ***5%.

investigate whether noninterest income can be considered as a buffer against business cycles and financial market fluctuations. We include three variables in the model; TSE (or GDP), net-interest income and noninterest income. Since TSE and GDP are most likely to be exogenous to bank revenue, they are placed first in the ordering. The VAR is estimated in logged differences using data from 1983:1 to 2002:4. The lag lengths of two and four for the models with GDP and with TSE, respectively, were determined by a joint maximum likelihood. The lag length of two, for example, is tested against alternative lengths of 3, 4, 6 and 8.

The analysis suggests that the response of noninterest income growth to the shock is much more pronounced than that of the net-interest income growth. In the first two quarters after the 1% shock to TSE growth, noninterest income increases by two to 3%. The following response is generally positive. In contrast, a shock to the TSE growth leads to an overall negative response in net-interest income. The response is also quite close to zero. In other respects, while both net-interest income and noninterest income respond positively to a shock to GDP growth in the first quarter, the response of noninterest income is more pronounced. The positive response of noninterest income is also more persistent than that of net-interet income. In fact, the latter becomes negative in the second quarter, while the former remains positive throughout. This supports the view that noninterest income is more procyclical than net-interest income. Even if the impulse response functions (IRF) are only significant in the two first quarters, these findings reinforce the results obtained with the single-equation analysis: noninterest income is positively correlated with stock market activities, while net-interest income is slightly negatively correlated with the growth in TSE. Consistent with the results from the dynamic correlation exercise and the single-equation regressions, the responses to a shock to TSE growth are more pronounced than those to a shock to GDP growth. This is true even in the case of net-interest income. This seems to support the view that market activities play an important role in determining both sources of bank revenue.

4.3. Noninterest income share and bank profitability

Even if noninterest income activities do not result in clear diversification benefits, nor dampen the sensitivity of banks to the economy and to the financial market fluctuations, they can still still lead to a higher average return to the bank's capital or asset. Therefore, it is natural to ask whether engaging in such non-traditional activities can at least yield a higher risk-adjusted profit. This section investigates this efficiency issue. We consider four measures of bank profitability: return on equity (ROE), risk-adjusted ROE, return on assets (ROA), and risk-adjusted ROA, where

$$\text{risk-adjusted}_{\text{ROE}} = \frac{\text{ROE}}{\sigma_{\text{ROE}}}$$

and

$$\text{risk-adjusted}_{\text{ROA}} = \frac{\text{ROA}}{\sigma_{\text{ROA}}}$$

σ_{ROE} (σ_{ROA}, respectively) represent the four quarter moving standard deviation of ROE (ROA) and is used as a measure of risk. We regress one of these four measures on its own lags, contemporaneous and lagged values of the share of noninterest income in total revenue, and a set of control variables as follows:

$$Y_t = \alpha + \sum_{i=1}^{m} \beta_i Y_{t-i} + \sum_{j=1}^{n} \theta_j \, \text{snonin}_{t-j} + \sum_{k=1}^{p} \gamma_k Z_{kt} + \epsilon_t,$$

where Y is one of the four measures of bank profitability; snonin is the share of noninterest income in a bank's net operating revenue, and $\mathbf{Z}$ is a vector of control variables including the log of assets

Table 5
Bank profitability versus noninterest income share

	Dependent variables (Y_t)			
	ROE	Risk-adjusted ROE	ROA	Risk-adjusted ROA
Y_{t-1}	**0.037**	0.604***	**0.057**	0.475***
Y_{t-2}	**0.091*****	–	**0.113****	–
Y_{t-3}	**0.055**	–	**0.075**	–
Y_{t-4}	**0.081****	–	**0.087****	–
snonin$_t$	**0.432*****	−30.87**	**0.017**	−27.008*
snonin$_{t-1}$	**−0.301****	–	**−0.019****	–
snonin$_{t-2}$	**−0.337*****	–	**−0.010**	–
snonin$_{t-3}$	–	–	**−0.010**	–
snonin$_{t-4}$	–	–	**−0.011****	–
Prov$_t$	**−0.779*****	−46.393	**−0.037*****	**−21.335****
Prov$_{t-1}$	–	−7.745	–	−10.519***
Prov$_{t-2}$	–	−18.350***	–	−19.622**
Constant	**0.308*****	25.201***	**0.014*****	21.617***
Lagged snonin sum	−0.206	−30.87	−0.010	−27.008
snonin jt. sig.	0.001	0.0456	0.014	0.069
Adjusted R^2	0.83	0.36	0.76	0.34

Note: Explanatory variables: snonin, share of noninterest income. Prov: ratio of loan loss provision over total asset. Bold values are used to emphasize important numbers. Asterisks indicate the confidence intervals – *stands for 20%, **stands for 10%, ***stands for 5%.

(to control for size effects), and the equity over asset ratio, the growth of asset and the ratio of loan loss provisions to total asset (three variables controlling for other factors impacting bank performance, such as bank risk preferences for example). A constant is also included to capture scaling effect in the dependent variable. The lag length of each variable is chosen using a selection criterion in which lags up to the last significant one are kept. The model is run using data from 1983:1 to 2002:4 for the aggregate of the eight publicly traded Canadian banks. All data are stationary, so they are modeled in levels. The results of the regressions are presented in Table 5. Control variables are eliminated whenever they are found to be insignificant. Not surprisingly, the only one left is the ratio of loan loss provisions to total asset. Consistent with expectations that loan loss provisions lower profits, the ratio of loan loss provisions to total asset coefficient is negative in all equations. As reported in the table, the sum of coefficients of noninterest income share in all four specifications is negative. This suggests that an increase in noninterest income share tends to decrease the profitability of a bank. Even though the control variable is not perfectly orthogonal to snonin, these additional findings, again, cast doubt on the notion that noninterest income activities can lead to better bank performance through diversification benefits (reduction in risk and/or higher returns). Instead, they suggest that Canadian banks might have underpriced their noninterest income activities.

5. Conclusion

This article presents some stylized facts regarding the Canadian financial structure. In particular, we establish that the regulatory changes that allowed banks to operate non-traditional activities, in particular, OBS activities, have consequently changed bank income volatility. The volatility of Canadian aggregate bank revenue growth seems to be increasingly impacted by noninterest income, both because of the increased reliance on noninterest income and because of the increased volatility of this component. The empirical evidence that we gather also suggests that market-oriented activities do not bring any clear diversification benefits to Canadian banks, and that noninterest income seems to comove with both the business cycle and financial markets. Hence, we cannot conclude that noninterest income activities constitute a buffer against economic or financial fluctuations, as they tend to be significantly and positively influenced by these shocks. Nor does noninterest income seem to bring any extra profitability. Overall, this Canadian study corroborates the U.S. findings of Stiroh (2006) and Stiroh and Rumble (2006). As in the U.S., it is possible that banks are beginning to realize that, some potential sources of noninterest income activities are not necessarily beneficial after all. The reasons why banks would engage in such activities could also include the existence of competitive pressures driving bank management to expand in areas where the benefits are uncertain.

While we investigate the diversification that financial market activities constitute, the question of optimality is still somewhat open to debate. To further research the question of efficiency, it would probably be appropriate to use the asset equivalent series we built. Indeed, the Boyd and Gertler (1994) transformation we use as a financial indicator can help assess *x*-efficiency. This would allow us, for example, to use a methodology similar to Clark and Siems (2002). Note however that our preliminary results suggest that Canadian banks have adopted a suboptimal behaviour. The potential impact of the current financial trend on the Canadian economy may also be another avenue of research. For example, following Houston and Stiroh (2006), we could investigate how financial sector risk and its impact on the business cycles have evolved over the last decades. These questions are left for future work.

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