Shadow Banking and Canada's Monetary Policy*

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Abstract

This paper provides the first empirical evidence in Canada on the link between monetary policy and the growth of shadow banks, and by extension, financial stability. Using monthly Canadian financial market data from 1976-2015 in a structural VAR approach, we find that contractionary monetary policy increases financial instability by shifting household mortgage loans and business loans from chartered banks to shadow banks. On the other hand, shadow bank deposits do not increase under tightened monetary policy as in the US, and do not, therefore, increase risk to the financial system. We also use a two-stage time-varying coefficient Bayesian vector autoregression to estimate whether long-run growth in shadow banking sectors has acted as a drag on monetary policy transmission. We find that as the importance of shadow bank deposits and business loans increases, there is a reduction in the effectiveness of monetary policy.

JEL: E52, G21, G23

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1 Introduction

Canada's financial services sector has been recognized by scholars and industry experts for surviving the 2007-08 global financial crisis relatively unscathed. This resilience, especially in contrast to the U.S. banking sector, is partly explained by Canada's smaller shadow banking sector. The role of shadow banks in exacerbating the 2007-08 global financial crisis is well known (Gorton and Metrick, 2012; Mian and Sufi, 2009). In contrast to traditional deposit-taking banks, shadow banks are not as closely regulated and their liabilities are not covered by deposit insurance. Shadow banks compete with deposit-taking institutions in many traditional banking businesses by extending credit to riskier borrowers and transforming loans into investor-held securities. In boom years, shadow banks provide additional liquidity to the financial system. When uncertainty rises, shadow banks are more likely to collapse.

Shadow banks are a narrow component of what the Financial Stability board defines as the monitoring universe of non-bank financial intermediation (see Financial Stability Board 2018 for definitions). Assets managed by shadow banks have continued to grow in Canada over the last decade. Bedard-Page (2019), for example, estimates a 30% increase between 2015 and 2017 alone, and a near doubling since 2006.[1] This growth has coincided with macroprudential regulation geared at slowing down household mortgage credit growth. In addition to a tightening of the loan-to-value ratio from 100% to 95% in 2008, and reducing the maximum amortization from 40 years to 25 years over the 2008-2012 period, in late 2017, the Office of the Superintendent of Financial Institutions (OSFI), Canada's federal deposit-taking institution regulator, put in place a stress test forcing potential homebuyers to qualify at an interest rate significantly higher than the rate commercial banks were offering. As a result, borrowers have been forced to look for alternative lenders. This phenomenon has been exacerbated by recent Bank of Canada increases to its overnight

[1] Bedard-Page refers to shadow banking as non-bank financial intermediation.

policy rate.

Despite their importance, relatively few research papers investigate the role of shadow banks on monetary policy transmission, and the implications for financial stability. Of those that do, none as far as we can tell focus on Canada. Nelson et al. (2015) finds that a contractionary monetary policy shock in the US has a persistent negative impact on the asset growth of commercial banks, but a positive impact on the asset growth of shadow banks and securitization activities. Xiao (2018) also analyzes monetary policy transmission through US shadow banks. The study shows that liquid deposits created by shadow banks increase despite monetary policy tightening. Since shadow banks have to compete on yield, they pass more of the increase in rates on to consumers, negating much of the typical contractionary monetary policy impact on deposits. Therefore, it concludes that tightening monetary policy might not cool the economy to the extent necessary, and might even drive deposits into the uninsured shadow banking sector, amplifying the risk of bank runs. Iacoviello and Minetti (2008) argue that the relevance of the credit channel of monetary policy depends on the structural features of the financial system in a specific country.

Our paper will fill this gap in the literature by providing the first empirical evidence on monetary policy's impact on the growth of Canadian shadow banks, and the shift of assets between both traditional and shadow banks. Understanding this shift is critical to grasping the impact of monetary policy on financial stability. We will also assess how growth in the importance of shadow banks relative to traditional banks impacts the effectiveness of monetary policy.

We begin by using monthly Canadian financial market data from 1976-2015 in a structural autoregression (SVAR) model to analyze how monetary policy is likely to impact the growth rate of shadow bank deposits and loans, and whether this leads to greater systemic risk to the Canadian financial sector. Different from Xiao (2018), who finds that deposits increase for non-banks following a contractionary monetary policy shock, thus muting the effectiveness of monetary policy, we find shadow bank deposits measured by both money market mutual fund (MMMF) and non-MMMF decrease, while chartered banks deposits increase. Deposits, on aggregate, fall. This finding indicates that monetary policy is effective in shrinking total deposits in the financial system and regulators need not be concerned over increased financial stability risk due to deposits shifting from banks to shadow banks.

In contrast, we find monetary policy tightening has more concerning impacts on household mortgage loans and business loans. Although a contractionary monetary policy shock generates the desired decrease in household loans for chartered banks, it has an ambiguous effect on shadow bank loans. The effect on total mortgage credit as a result is also ambiguous. This insignificant change in total residential mortgage credit is a concern for monetary policy effectiveness and financial stability. The contraction of bank mortgage loans being offset by an expansion of loans from non-banks is also a feature documented by Drechsler et al. (2019) during Fed tightening between 2003 to 2006. It concludes that the shift to securitization had the important effect of making the mortgage market more run-prone.

We find a similar concerning shift in business loans in the Bank of Canada's inflation-targeting era (since 1991). Bank business credit falls following a contractionary monetary policy shock, but increases in shadow banks. On aggregate, the results provide central bankers with the desired decrease in total business credit. However, this decrease in total credit comes at the expense of a riskier composition favouring shadow banks.

To further analyze the link between the monetary policy transmission and the changing structure of financial institutions, we also evaluate how bank and shadow bank deposits, mortgage loans, and business loans impact the effectiveness of monetary policy using a two-stage time-varying coefficient Bayesian vector autoregression (TVC-BVAR). We find that the more important shadow bank deposits are in the financial system, the more they act as a drag on monetary policy effectiveness. Similarly, as non-bank business loans increase in importance, we see a decrease in monetary policy effectiveness, though this result is constrained to the inflation-targeting period.

We made two novel contributions to this line of literature. First, we provide comprehensive empirical evidence on how monetary policy impacts the deposits, mortgage loans, and business loans of shadow banks. We find that contractionary monetary policy did not cause an increase in shadow bank deposit growth, as in the US, and on aggregate generated the expected decline in deposits. However, contractionary monetary policy did cause a shift in mortgage and business loans from banks to shadow banks. This finding reinforces the difficulty in using monetary policy to simultaneously deal with inflation and financial stability. Second, while the diminished impacts of monetary policy post-crisis have been well documented in the literature[2], we provide the first evidence that part of the explanation is the growth in the importance of shadow bank deposits and business loans.

The remainder of the paper is structured as follows. Section 2 reviews the literature. Section 3 describes the methodology and data. Section 4 presents the empirical results. Section 5 concludes.

2 Related Literature

The monetary policy transmission mechanism has changed dramatically over the last thirty years. Perhaps most notably, interest rates have fallen, with a significant and sudden decrease during the financial crisis. Similarly, long-run neutral interest rates are now lower than they have been at any point over this period. The diminished impacts of monetary policy on real activities in recent decades are well documented (e.g. Boivin and Giannoni 2006; Boivin et al. 2010). This type of finding, as well as the slow recovery and

[2] See, for example, Borio and Hofmann

below-target inflation, has led to much work on the transmission of monetary policy in this new economic environment.

One transmission approach in the literature is the bank-lending channel, where the focus is on the creation of deposits and loans by financial intermediaries. The existing bank-lending channel-based monetary transmission research (Kashyap and Stein 1995; Kashyap and Stein 2000; Drechsler et al. 2017) narrows in on commercial banks as the key financial institutions for transmitting monetary policy. Specifically, contractionary monetary policy from a hike in the Fed Funds Rate, is accompanied by a slow increase in rates at commercial banks due to imperfect competition. Therefore, deposits flow out of the commercial banking system.

The growth of shadow banks makes it necessary to expand the bank-lending channel of monetary transmission to include shadow banks. Based on data from 29 countries, the Financial Stability Board (2018) reports that the broader measure of shadow banks that comprises all financial institutions that are not banks, insurance corporations, pension funds, or public financial institutions saw its assets grow by 8% to $99 trillion in 2016, faster than the assets of traditional banks, insurance corporations and pension funds.

Credit from shadow banks is more fragile than credit provided by traditional banks. Carey et al. (1998) find that finance companies tend to choose riskier borrowers than banks. Adrian and Shin (2010) documents that total assets and leverage for shadow banks increase during boom times. The increase in loan capacity results in higher risk-taking and increases the possibility of a crash. Gorton and Metrick (2012) provide empirical evidence that a combination of having no access to deposit insurance and increases in uncertainty on the collateral value for repo contracts results in shrinking liquidity and runs on the repo market. A theoretical model by Moreira and Savov (2017) demonstrates that the fragile liquidity created by shadow banks leads to higher crash risk. Although shadow banks lead to booms in investment and growth during quiet times, a rise in uncertainty in bad times results in shrinking liquidity, lower asset prices, investment and negative economic growth.

Relatively few research papers investigate the role of shadow banks on monetary policy transmission. Papers pre-dating the global financial crisis (Calomiris et al. 1995; Kashyap et al. 1993) document that tighter monetary policy leads to an increase in commercial paper issuance. More recently, Nelson et al. (2015) use quarterly U.S. data from 1966-2007 to analyze how tightening monetary policy impact banks and shadow banks. They find that an unexpected 100 basis point increase in the Fed Funds rate has a persistently negative impact on commercial bank asset growth and an immediate positive effect on the shadow bank asset growth rate. Using time series regression and US data, Xiao (2018) finds that the growth rate of shadow banking deposits, measured by MMMF shares, is positive and significantly correlated with the Fed Funds rates. At the same time, the growth rate of commercial bank deposits is negatively correlated to the Fed Funds rate. It, therefore, concludes that tightening monetary policy might have weaker impacts on cooling the economy, and even drive deposits into the uninsured shadow banking sector, amplifying the risk of bank runs.

None of the existing empirical literature, as far as we can tell, discusses Canada.

3 Methodology and Data

We begin by investigating the question of what is monetary policy's impact on the shadow banking sector. We are interested in both how it grows/shrinks as a result of a contractionary monetary policy shock, but also the resulting composition of deposits and loans in the sector given monetary policy's impact on both traditional and shadow banks.

To answer these questions, we use the exogenous monetary policy shock series from Champagne and Sekkel (2018) in a structural vector autoregression (SVAR). To create this exogenous series, these authors use the narrative approach, pioneered by Romer and Romer (2004), which involves estimating a central bank reaction function. This reaction function facilitates the creation of a set of estimated changes to the policy rate. The estimated policy rate series is then subtracted from the actual policy rate changes generating a series of unanticipated monetary policy shocks.

We then follow the set up employed in Kronick and Ambler (2019) where the SVAR is ordered as a Cholesky decomposition with a commodity price index, to account for the importance of energy prices, the US Federal Funds Rate, to account for the importance of US monetary policy on Canadian monetary policy, the Champagne and Sekkel shock series, inflation, unemployment, and a variable for the size of the shadow banking sector.[3] Champagne and Sekkel use only the lagged US Federal Funds Rate, however, we believe it is critical to account for the contemporaneous effects of this variable on Canadian monetary policy.

More formally, we define our vector of variables for the SVAR as:

$$y_t = \left[p_t, i_t^{US}, i_t, \pi_t, u_t, sb_t\right], \tag{1}$$

where p_t is the commodity price index, i_t^{US} is the Federal Funds Rate, i_t is the Champagne and Sekkel monetary policy shock series, π_t is inflation, u_t is the unemployment rate, and sb_t is the individual shadow banking variable.

Using optimal lag length of two, the equation for the SVAR is:

$$y_t = \mu_t + \delta_1 y_{t-1} + \delta_2 y_{t-2} + {\beta_1}^{-1} \epsilon_t, \tag{2}$$

where $\delta_i,\ i = 1, 2$, is a 6×6 matrix of coefficients (6 being the number of variables), and ϵ_t

[3] In addition to Champagne and Sekkel (2018), remaining variables come from Statistics Canada, Bank of Canada, and the Federal Reserve.

is a 6×1 vector of shocks with covariance matrix Ω.

Our variables of interest are the shadow banking variables, which include deposits, household credit, and business credit, obtained from the Bank of Canada's Historical Banking Financial Statistics and Weekly Financial Statistics, supplemented by more granular Statistics Canada's data. Specifically, we evaluate both MMMF deposits, as in Xiao (2018), as well as non-MMMF deposits. The major difference between these two forms of deposits is the former invests almost exclusively in domestic and foreign short-term instruments, while the latter invests in a wider range of financial instruments. For both household and business credit, ideally we would follow either the definitions in the Financial Stability Board's Global Shadow Banking Monitoring Reports, or Bedard-Page (2019), which provide a comprehensive dataset for shadow banking. But as of writing, this dataset is annual and only goes back 10-15 years. In order to perform the type of empirical analysis we set out to, we must obtain higher-frequency data with a longer time series component. This type of data is available for a subset of the narrow definition of shadow banking. Specifically, we are able to use non-depository credit intermediary data for both household residential mortgage credit, and non-mortgage, business credit.[4]

For the sake of parsimony, and given the well-identified monetary policy shock, we evaluate each of these shadow banking variables one-by-one. We also complement the shadow banking analysis with an equivalent chartered bank analysis to tease out the necessary comparisons.

For shadow bank deposits, the sample period begins in January 1985 and ends in December 2015. For bank deposits we are able to begin earlier, namely March 1976. March 1976 is also the beginning date for residential mortgage and business credit.

[4] In the case of residential mortgage credit, we are not able to remove 'other' institutions, whereas we are with business credit. For business credit, it is imperative we do as it includes trusts, ATB Financial, and estimates for credit unions and caisses populaires. For residential mortgage credit it is less of an imperative, as 'other' does not include trusts and credit unions, though it does make estimates for ATB Financial.

To determine whether we run the SVAR in levels or in differences, we must determine what the level of integration is for our variables. We first take logs of each variable, with the exception of variables already in percent terms. We then test for unit root/stationarity, primarily using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test as we prefer the null of stationarity to the null of unit root, common in Dickey-Fuller tests.

Summary statistics are reported in Table 1, while stationarity results are presented in Table 2. We find that all variables, with the exception of our shadow banking variables, are I(1). The shadow banking variables are all I(2). However, the deposit and loan data are measures of stock, so analyzing their growth rate is more akin to a flow variable, which in our view is a more appropriate measure. We take year over year real growth rates to remove any seasonality or other noise arising from monthly growth rates.

We find cointegration amongst the levels of our variables (including the deposit and loan year over year growth rates). We, therefore, run the SVAR in levels.

	(1) count	(2) mean	(3) sd	(4) min	(5) max
Commodity Price Index	476	5.789	0.374	5.195	6.786
Federal Funds Rate	476	5.301	4.043	0.070	19.100
C&S Shock	476	-0.106	0.712	-1.857	2.228
Inflation	476	3.675	2.933	-1.000	12.100
Unemployment Rate	476	8.364	1.641	5.800	13.100
Bank Deposits - Flows	476	3.842	3.315	-8.042	11.214
Non-bank Mortgage Credit - Flows	476	0.560	6.655	-16.377	20.848
Non-bank Business Credit - Flows	476	2.178	10.809	-28.542	35.187
Bank Business Credit - Flows	476	2.129	8.245	-18.881	33.127
MM Mutual Funds Deposits - Flows	370	10.281	28.786	-46.778	93.183
Non-MM Mutual Funds Deposits - Flows	370	18.173	21.611	-4.176	107.118
Bank Mortgage Credit - Flows	464	7.273	5.941	-9.967	20.171

YoY Bank mortgage credit does not include the Nov 2011 to Oct 2012 period as a result of a one-off change to accounting standards that brought off-balance sheet securitization onto bank balance sheets.

Table 1: Summary Statistics

	(1) KPSS - levels	(2) KPSS - YoY growth
Commodity Price Index	1.93***	.112
Federal Funds Rate	.382***	.052
C&S Shock	.540***	.014
Inflation	1.96***	.060
Unemployment Rate	.773***	.113
MMMF Deposits - Flows	.181**	.057
NMMF Deposits - Flows	.803**	.047
Non-bank Mortgage Credit - Flows	.359***	.018
Non-bank Business Credit - Flows	.318***	.020
Bank Deposits - Flows	.353***	.028
Bank Mortgage Credit - Flows	.297***	.023
Bank Business Credit - Flows	.691***	.024

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Null is variable is stationary.

Table 2: Stationarity Tests

Standard monetary policy theory suggests that a contractionary (expansionary) monetary policy shock causes a decrease (increase) in the money supply, through, among other things, low (high) deposit creation (see, for example, Bernanke and Blinder(1988)). Contractionary (expansionary) monetary policy also leads to a decrease (increase) in lending, which should cause inflation to slow (rise), and increase (decrease) unemployment. In other words, we would expect both deposits and credit to fall (rise) following a contractionary (expansionary) monetary policy shock, slowing down (boosting) economic growth. However, if the opposite were to occur to either deposits or credit, as Xiao (2018) points out has occurred with respect to deposits in the US shadow banking sector, the question becomes whether this impacts the effective transmission of monetary policy. Therefore, the first part of our analysis, using the SVAR as just described, is to determine whether contractionary (expansionary) monetary policy has the expected effect on both shadow and traditional banks, as well as on aggregate. We note that, in theory, it is possible to see an aggregate fall in deposits and credit as expected, but see a shift in composition from traditional banks to shadow banks, thus increasing financial risk.

The second part of our analysis, which we explain the methodology for next, is to discuss whether the increased importance of shadow banking variables has acted as a drag on monetary policy transmission.

To investigate this latter question, we perform a two-stage time-varying coefficient Bayesian vector autoregression (TVC-BVAR) based off work in Kronick and Ambler (2019), which itself is based off of work by both Imam (2015) and Primiceri (2005). Using a similar SVAR setup as above, the TVC-BVAR gives us the flexibility to allow for monetary policy's impact on inflation and unemployment to change over time. We do not include the different shadow banking variables as they will be our independent variable in the second stage multivariate regression (described below).[5] More formally, rewrite (2), as:

$$y_t = \mu_t + \delta_{1,t} y_{t-1} + \delta_{2,t} y_{t-2} + {\beta_{0,t}}^{-1} \epsilon_t, \tag{3}$$

where $\delta_{i,t},\ i = 1, 2$ is now a 5×5 matrix of *time-varying* coefficients, ϵ_t is a 5×1 vector of heteroskedastic shocks with covariance matrix Ω_t. In vectorized form, we can re-write this equation as:

$$y_t = X_t^{'} \delta_t + \beta_{0,t}^{-1} \Sigma_t e_t, \tag{4}$$

with

$$X_t^{'} = \left[I_5 \otimes (1, , y_{t-1}^{'} y_{t-2}^{'} \right]$$

and

$$V \left[e_t \right] = I_5.$$

The structure for the covariance matrix is as follows:

$$\Omega_t = \beta_{0,t}^{-1} \Sigma_t \Sigma_t^{'} \beta_{0,t}^{-1}, \tag{5}$$

[5]We find cointegration amongst the variables, so again we run the vector autoregresion in levels.

where we define $\beta_{0,t}$ and Σ_t as:

$$\beta_{0,t} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_{1,t} & 1 & 0 & 0 & 0 \\ \beta_{2,t} & \beta_{3,t} & 1 & 0 & 0 \\ \beta_{4,t} & \beta_{5,t} & \beta_{6,t} & 1 & 0 \\ \beta_{7,t} & \beta_{8,t} & \beta_{9,t} & \beta_{10,t} & 1 \end{bmatrix},$$

and

$$\mathit{\Sigma}_t = \begin{bmatrix} \sigma_{1t} & 0 & 0 & 0 & 0 \\ 0 & \sigma_{2t} & 0 & 0 & 0 \\ 0 & 0 & \sigma_{3t} & 0 & 0 \\ 0 & 0 & 0 & \sigma_{4t} & 0 \\ 0 & 0 & 0 & 0 & \sigma_{5t} \end{bmatrix}. \tag{6}$$

Defining β and $\mathit{\Sigma}$ in this fashion allows for both time-varying coefficients and stochastic volatility (Koop and Korobilis 2009).

By assuming the parameters of interest δ_t, $\beta_t = [\beta_{1,r}, \beta_{2,t}, ...\beta_{10,t}]$ and $\log(\sigma_t) = \log[\sigma_{1t}, \sigma_{2t}, \sigma_{3t}, \sigma_{4t}, \sigma_{5t}]$ follow random walks, the implication is also that the covariance matrix follows a random walk:

$$\delta_t = \delta_{t-1} + e_t^{\delta}; \tag{7}$$

$$\beta_t = \beta_{t-1} + e_t^{\beta}; \tag{8}$$

$$\log(\sigma_t) = \log(\sigma_{t-1}) + e_t^{\sigma}. \tag{9}$$

As in Imam (2015), we assume all shocks are jointly normally distributed with a covariance matrix:

$$\boldsymbol{V} = V\left(\begin{bmatrix} e_t \\ e_t^{\delta} \\ e_t^{\beta} \\ e_t^{\sigma} \end{bmatrix}\right) = \begin{bmatrix} I_k & 0 & 0 & 0 \\ 0 & V^{\delta} & 0 & 0 \\ 0 & 0 & V^{\beta} & 0 \\ 0 & 0 & 0 & V^{\sigma} \end{bmatrix}. \tag{10}$$

We estimate (4) subject to (7) through (10) for the period from November 1977 to October 2015.[6] We use a Gibbs Sampler with 10,000 runs and a burn-in length of 2,000 in order to get closer to the desired ergodic distribution.

We extract the changing peak and cumulative impacts of the contractionary monetary policy shock on inflation and unemployment over time and use these variables as our dependent variables in the second stage simple multivariate OLS regression. We focus our attention on the inflation results given the Bank of Canada's inflation-targeting mandate.

For each of the dependent variables (cumulative and maximum inflation), we run the following multivariate regression:

$$y_t = \alpha_t + \gamma_1 sb_{D,t} + \gamma_2 sb_{L,t} + \gamma_3 b_{D,t} + \gamma_4 b_{L,t} + controls + \eta_t, \tag{11}$$

where subscripts D stands for year-over-year real growth in deposits and L stands for year-over-year growth in loans. One set of regressions is run with household mortgage credit as our loan variable and the other with non-mortgage business credit as our loan variable. In both cases, 'sb' refers to shadow banks, and 'b' refers to chartered banks. Our variables are monthly and the sample runs from January 1988 - October 2015.[7]

γ_1 and γ_2 are our coefficients of interest, given our focus on shadow banks. Since we choose

[6]The data starts in March 1976, but we impose a 20 month training sample on the estimation, bringing us to November 1977.

[7]The beginning point is moved from 1985 to 1988 due to stationarity of the regression residuals. The end date reflects the end of the publicly available Champagne and Sekkel monetary policy shock series.

to analyze contractionary monetary policy shocks, when inflation is the dependent variable, negative coefficients signal increased monetary policy effectiveness, while the opposite is, obviously, true as well.

In addition to our shadow banking variables as described above, this OLS regression includes a series of control variables including the term spread - the difference between 10-year government bond and 3-month prime corporate paper, which captures term risk in the economy. The larger the spread, the higher the perceived future risk; TSX stock market month-end close to control for the impact of the financial markets; home price index; and TED spread - the difference between the Bank rate and a 3-month T-bill , which captures credit risk in the economy. All these control variables are obtained from Statistics Canada. Both the deposit and loan flow variables of interest, and the controls, are I(1) variables with cointegration amongst the set, allowing us to run the OLS regression in levels.[8]

4 Results

4.1 Impact of MP on shadow bank and chartered bank deposits and loans

We first run the SVAR in equation (2), focusing on the impact of a contractionary monetary policy shock on both traditional and shadow bank deposits, as well as on aggregate. For shadow bank deposits we look at both MMMF and NMMF data. We produce a series of impulse response functions, as shown in Figure 1.[9]

[8]Stationarity and cointegration results available upon request.

[9]For each SVAR run, we also produce impulse response functions for inflation, unemployment, and the shock itself to ensure economic results are appropriate. See Appendix A.

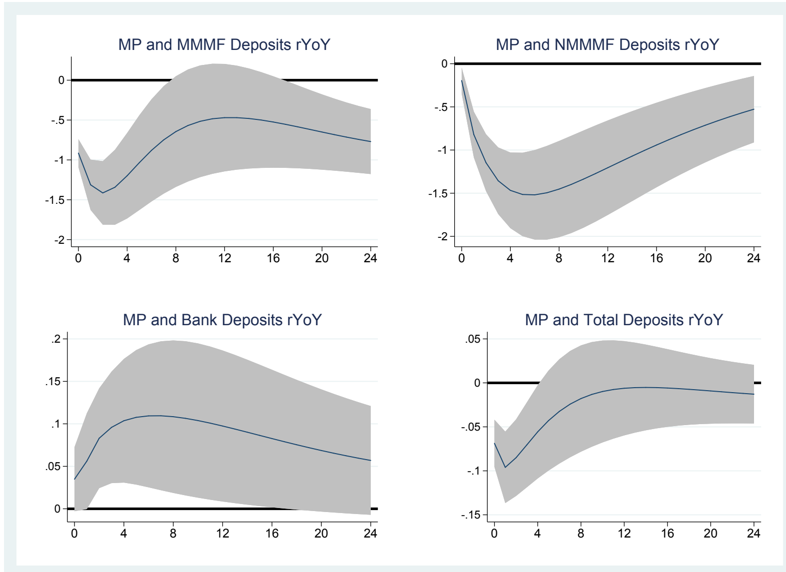

Figure 1: Contractionary MP Shock on Deposits (real YoY growth)

The results indicate that a contractionary monetary policy shock causes a decrease in both forms of shadow bank deposits, while causing an increase in chartered bank deposits. For shadow banks, this is a good thing from the perspective of monetary policy effectiveness, but is contrary to the US findings in Xiao (2018), who argues that because shadow banks are forced to compete on yield, deposits shift from chartered banks to shadow banks. This story does not appear to hold in Canada. Overall, monetary policy is effective in shrinking total deposits in the financial system.

Moreover, this is not simply a case of sample period. Even if we restrict ourselves to the inflation-targeting period, i.e. from Feb 1991 on, the results remain essentially the same (see Figure 2). Therefore, the conclusions with respect to deposits are that monetary policy is effective, and risks to the financial system remain the same or even improve. As shown in Appendix A, the results from the contractionary monetary policy shock on inflation and unemployment are consistent with *a priori* expectations, giving us confidence in the SVAR model.[10] The inflation and unemployment results shown are for the full

[10] Appendix A also shows these inflation/unemployment results for household and business credit, with similar conclusions.

sample, but hold for the inflation-targeting period as well.

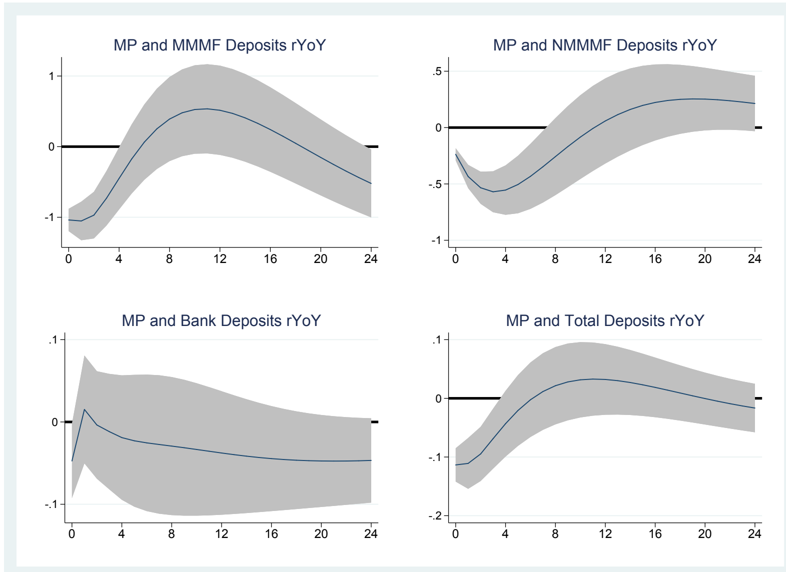

Figure 2: Contractionary MP Shock on Deposits (real YoY growth) - Inflation-Targeting Period

Turning to credit, we see that over the whole sample period a contractionary monetary policy shock generates the desired (from an effectiveness perspective) decrease in household loans for chartered banks, though is more ambiguous for shadow banks, as well as total credit (see Figure 3). In the inflation-targeting period the results are mostly similar. Shadow banks have a positive point estimate, though the results remain insignificant. Chartered banks, after an initial increase, decline as before. And, there is still an insignificant decrease for total residential mortgage credit (see Figure 4). The insignificant change in total residential mortgage credit is a concern for monetary policy effectiveness. However, the fact that the insignificance appears driven by ambiguity in the shadow bank results could be a concern from a financial stability perspective as well. This is true if the typical decline in shadow bank residential mortgage credit is being offset by borrowers coming over from banks, and this is a strong enough effect to generate ambiguity in total residential mortgage credit.

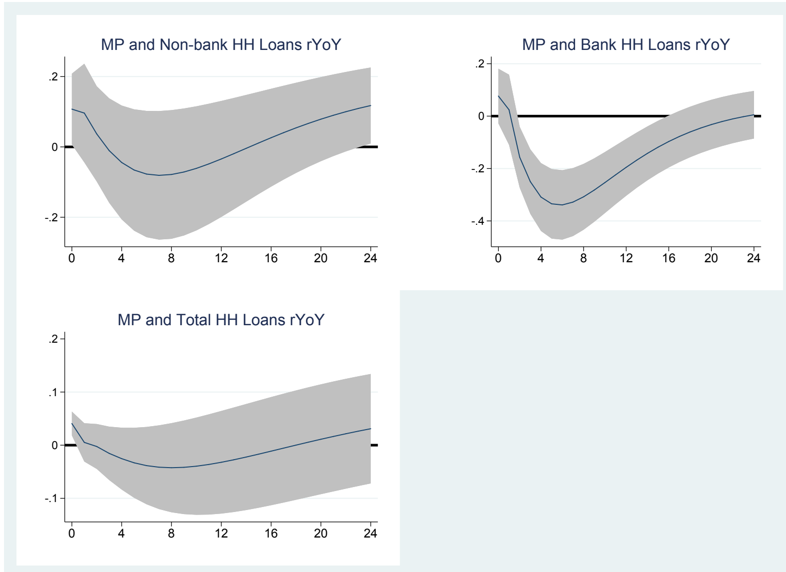

Figure 3: Contractionary MP Shock on HH Loans (real YoY growth)

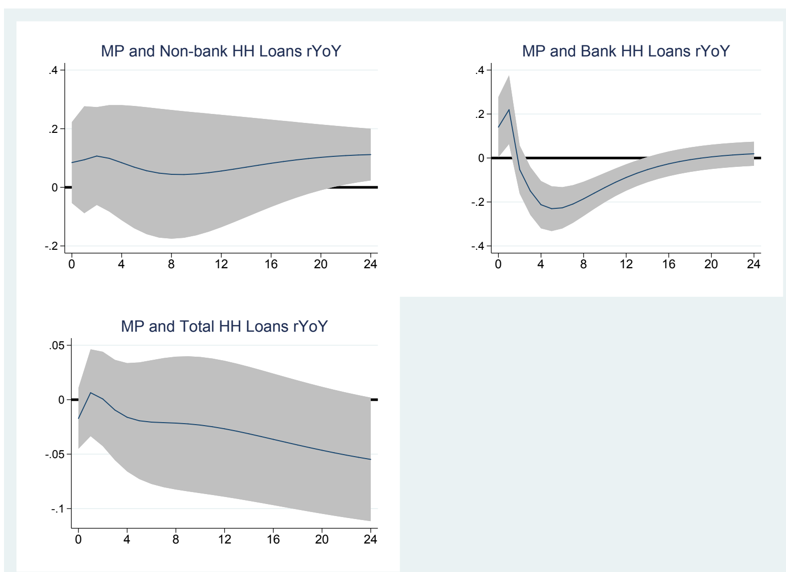

Figure 4: Contractionary MP Shock on HH Loans (real YoY growth) - Inflation-Targeting Period

For business credit, we find the effects of contractionary monetary policy change depending on the sample period. Over the full sample, shadow bank business credit falls following a contractionary monetary policy shock (though the results are insignificant). For chartered banks, it increases, indicating some shift from shadow banks to chartered banks (Figure 5).

And, business credit, on aggregate, increases, contrary to expectations following a contractionary monetary policy shock.

Interestingly, the results appear to flip in the inflation-targeting period (Figure 6). There is a longer lasting increase in business credit for shadow banks, and at least some of that increase comes from a fall in chartered bank business loans. On aggregate, the results provide central bankers with the desired decrease in total business credit. However, this decrease in total credit comes at the expense of a riskier composition favouring shadow banks.

One potential explanation for the inflation-targeting period results comes from Kronick (2018) who shows that, since the crisis, the spread between the interest rate banks charge large companies versus SMEs is among the highest of any OECD country. In other words, SMEs are charged relatively more to borrow from banks in Canada compared to other advanced economies. The effect of this spread may be greater following a contractionary monetary policy shock, shifting more business loans from traditional banks to shadow banks. However, bank business loans are still dominant so on aggregate, business loans fall.

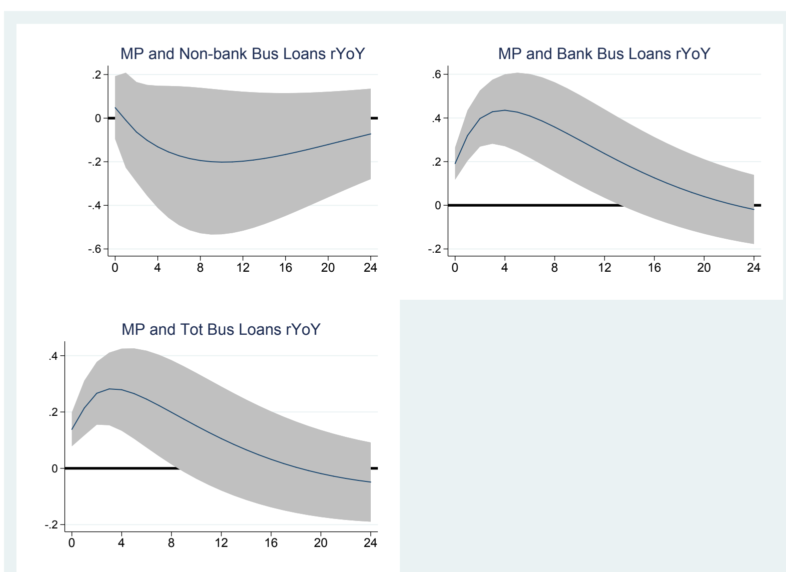

Figure 5: Contractionary MP Shock on Bus Loans (real YoY growth)

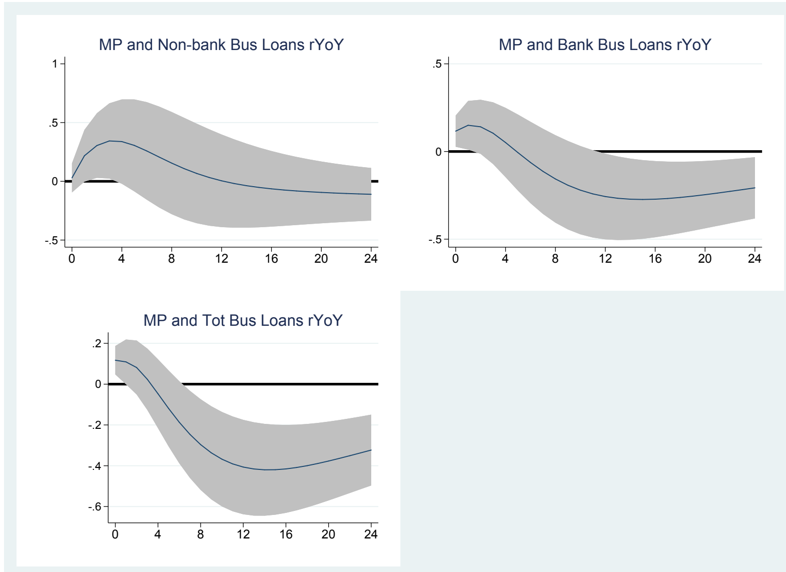

Figure 6: Contractionary MP Shock on Bus Loans (real YoY growth) - Inflation-Targeting Teriod

Table 3 summarizes - for both the full sample and inflation-targeting period - the results for total deposits, household credit, and business credit, along two dimensions: whether a contractionary monetary policy shock leads to the expected decline, and whether risk to the financial system increases due to a shift from the more heavily regulated banking sector to the non-bank regulated sector.

	(1) Desired MP Effect	(2) Inc Fin Stability Risk	(3) MP - IT Period	(4) FS - IT Period
Deposits	Yes	No	Yes	No
HH Mortgage Credit	No	Yes	No	Yes
Bus Non-Mort Credit	No	No	Yes	Yes

Table 3: Summary Stage One

4.2 Do shadow banks slow down MP transmission?

The previous set of results indicate that, while monetary policy has the desired impacts on inflation and unemployment, the reactions of deposits and credit do not always move in the expected direction. From a financial risk perspective, two results standout. First, the insignificance of any change to total residential mortgage credit following a monetary policy shock, which is driven by the insignificance of any change to shadow bank residential mortgage credit. Second, the case of business credit in the inflation-targeting period where, even though on aggregate business credit falls, it appears to shift from traditional banks to shadow banks.

From a monetary policy perspective, an increase in deposits or credit at either non-banks and/or chartered banks following a contractionary monetary policy shock would act as some kind of drag on monetary policy effectiveness. To estimate whether the growth in the importance of shadow banks hurts the overall effectiveness of monetary policy, we first calculate monetary policy effectiveness over time with the TVC-BVAR described above. We then estimate regression (11) twice for the sake of parsimony: once with household loans, and once with business loans.

As Figures 7 and 8 indicate, peak and cumulative impacts on inflation arising from a contractionary monetary policy shock improve for much of the inflation-targeting period. Since 2010, however, there has been a mild reversal, consistent with the work in Borio and Hoffman (2017). This is, of course, also consistent with actual inflation in Canada, which has struggled to hit its 2% target for much of the period since the crisis recovery (see Friedrich and Gosselin 2015, Ambler and Kronick 2018, for more). The results are less clear for unemployment, consistent with the breakdown in the relationship between inflation and unemployment - the typical Phillips curve relationship (see, for example, Ng, Wessel, and Sheiner (2018) for more). In addition to the Bank of Canada being an inflation-targeting central bank, these results support our use of only the peak and cumulative inflation as our dependent variables for the monetary policy effectiveness analysis.

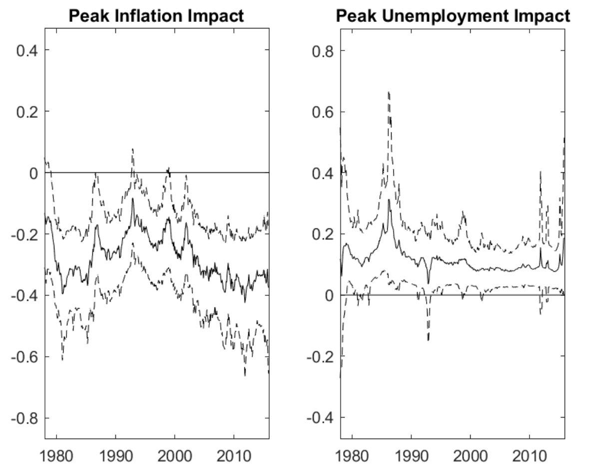

Figure 7: Evolution of Peak Impact of Contractionary Monetary Policy

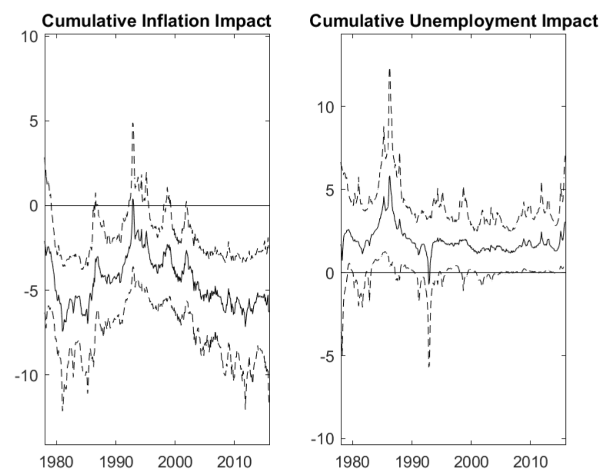

Figure 8: Evolution of Cumulative Impact of Contractionary Monetary Policy

This recent period of declining effectiveness is correlated with strong increases in year over year real growth in non-money market mutual fund deposits (see the second panel of Figure 9). The results are more mixed for shadow bank household mortgage credit, and business credit. From a share of the total perspective, shadow bank deposits are clearly increasing, and household credit has increased on average. Shadow bank shares of business credit have fallen since the beginning of the recovery, though have stabilized in the last five years, and, at over 10% of the market, need to be taken under consideration (Figure 10).

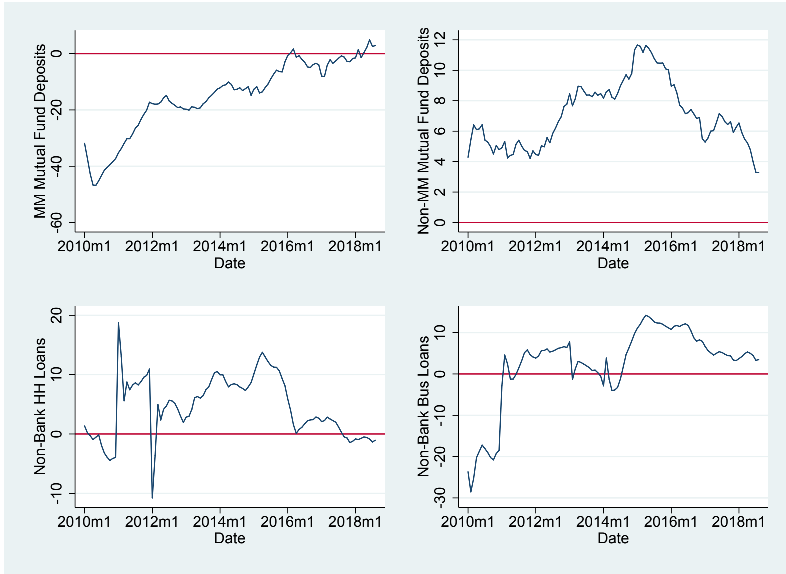

Figure 9: YoY Growth in Shadow Bank Deposits/Credit

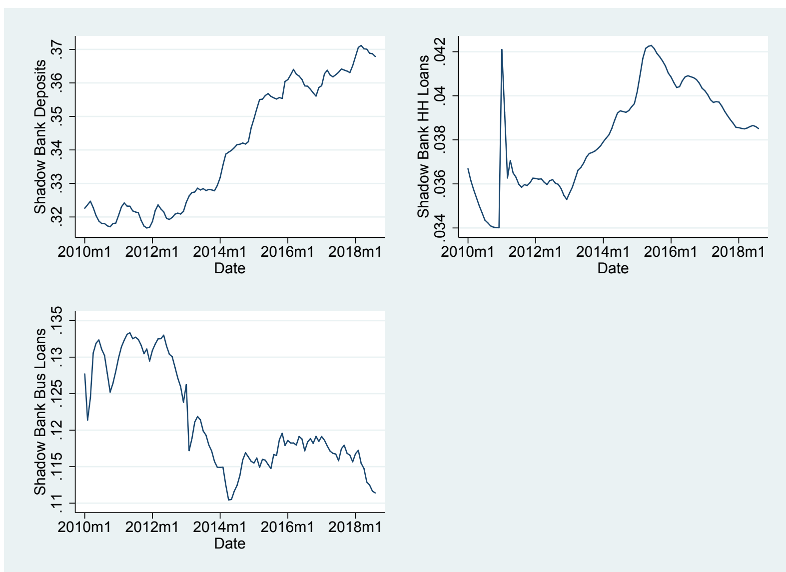

Figure 10: Shares of Shadow Bank Deposits/Credit Since 2010

These correlations suggest it is worth investigating whether growth in the importance of shadow banking variables has contributed to any decline in monetary policy effectiveness.

Table 4 contains the full-sample results from regression (11) both in the case where household loans is the credit variable (columns 1 and 2) and in the case where business loans is the credit variable (columns 3 and 4). Table 5 focuses on the inflation-targeting period.

The coefficient on shadow bank deposits, γ_1, is mostly positive and significant, indicating that the more important shadow bank deposits are, the more they act as a drag on monetary policy effectiveness. Bank deposits have a negative significant coefficient, indicating the more important they become, the more effective is monetary policy. This is consistent with what we saw in stage one, as a shift in deposits from non-bank to banks - implying banks have become more important - led to a decline in overall deposits, i.e. effective monetary policy. These results are consistent in both the full sample and post-inflation targeting period.

Looking at household credit, the coefficients are negative significant for shadow bank household mortgage loans, meaning that as this variable increases in importance, it leads to increased monetary policy effectiveness. With banks, though the point estimate would indicate a drag on monetary policy effectiveness, the results are insignificant over the full sample. Stage one indicated that while contractionary monetary policy led to a decrease in bank household credit, there was no change to non-bank household credit, and this latter result was responsible for the insignificant change in overall credit. The results here support the fact that non-banks have an outsized importance on the effectiveness of monetary policy on residential mortgage credit. These results remain true in the post-inflation targeting period, though now an increase in the importance of bank mortgage credit clearly works as a drag.

For business credit, we find that over the full sample an increase in the importance of shadow bank loans has no significant effect on monetary policy, though the point estimates indicate increased effectiveness. An increase in the importance of bank business credit causes a decline in monetary policy effectiveness. These results are consistent with the stage one full sample results where there appeared to be a shift from non-bank to bank business credit due to a contractionary monetary policy shock, with this offset leading to increased total business credit, reducing monetary policy effectiveness. So, as banks become important they dominate the aggregate impact of monetary policy on business credit. As in stage one, the results flip in the post-inflation targeting period. Now non-bank business credit acts as a drag, while bank business credit acts as an accelerant. Overall, as in stage one, monetary policy is more effective given the outsized importance of bank business credit[11], but perhaps at the expense of increased financial system risk as credit shifts to shadow banks.

[11] If we sum the non-bank and bank coefficients the result is negative indicating increased monetary policy effectiveness

	(1)	(2)	(3)	(4)
	Cum_Inf	Max_Inf	Cum_Inf	Max_Inf
Non-bank Deposits - Flows	0.0129*	0.000640**	0.00601	0.000173
	(1.89)	(2.34)	(1.02)	(0.71)
Non-bank Mortgage Credit - Flows	-0.0378***	-0.00185***		
	(-3.39)	(-4.27)		
Bank Deposits - Flows	-0.128***	-0.00705***	-0.122***	-0.00688***
	(-8.04)	(-8.97)	(-8.00)	(-8.92)
Bank Mortgage Credit - Flows	0.0140	0.0000724		
	(1.04)	(0.11)		
Term Spread	0.0470*	-0.000246	0.122***	0.00353**
	(1.71)	(-0.18)	(3.81)	(2.36)
TSX	-0.537***	-0.0193***	-0.748***	-0.0281***
	(-3.29)	(-2.61)	(-4.32)	(-3.71)
House Prices	-2.915***	-0.187***	-3.641***	-0.223***
	(-8.62)	(-11.17)	(-11.79)	(-13.51)
TED Spread	0.215	0.0110	0.258	0.0141
	(0.68)	(0.88)	(0.66)	(0.85)
Dummy	-1.077*	-0.0310		
	(-1.94)	(-1.18)		
Non-bank Business Credit - Flows			-0.00391	-0.000163
			(-1.03)	(-0.94)
Bank Business Credit - Flows			0.0255***	0.00118***
			(3.56)	(3.45)
Constant	12.98***	0.709***	17.87***	0.933***
	(10.21)	(13.96)	(15.02)	(18.49)
Observations	334	334	334	334
Adjusted R^2	0.746	0.799	0.729	0.782

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dummy spans the Nov 2011 - Oct 2012 period, and reflects the outsized change in year over year growth rates as a result of the switch to International Financial Reporting Standards, which, in part, moved off-balance sheet securitization and mortgage-backed securities onto bank balance sheets

Table 4: Primary Regression Results

	(1)	(2)	(3)	(4)
	Cum_Inf	Max_Inf	Cum_Inf	Max_Inf
Non-bank Deposits - Flows	0.0237***	0.00117***	0.0365***	0.00150***
	(4.89)	(5.65)	(9.01)	(8.86)
Non-bank Mortgage Credit - Flows	-0.0174**	-0.00102***		
	(-2.45)	(-3.38)		
Bank Deposits - Flows	-0.0598***	-0.00439***	-0.0142	-0.00253***
	(-4.44)	(-5.84)	(-0.92)	(-3.11)
Bank Mortgage Credit - Flows	0.0387***	0.00101**		
	(3.94)	(2.00)		
Term Spread	-0.184***	-0.00885***	-0.236***	-0.0102***
	(-4.81)	(-4.73)	(-4.94)	(-4.62)
TSX	-1.418***	-0.0514***	-1.627***	-0.0612***
	(-6.75)	(-6.17)	(-8.20)	(-7.61)
House Prices	-1.969***	-0.153***	-1.637***	-0.144***
	(-5.94)	(-9.66)	(-4.76)	(-8.29)
TED Spread	0.00141	0.00296	0.0750	0.00713
	(0.01)	(0.45)	(0.46)	(0.91)
Dummy	-2.109***	-0.0694***		
	(-4.99)	(-3.21)		
Non-bank Business Credit - Flows			0.0129***	0.000537***
			(3.96)	(3.53)
Bank Business Credit - Flows			-0.0277***	-0.000955***
			(-3.93)	(-2.76)
Constant	16.82***	0.848***	17.18***	0.891***
	(14.69)	(19.69)	(15.74)	(19.95)
Observations	297	297	297	297
Adjusted R^2	0.872	0.880	0.869	0.876

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dummy spans the Nov 2011 - Oct 2012 period, and reflects the outsized change in year over year growth rates as a result of the switch to International Financial Reporting Standards, which, in part, moved off-balance sheet securitization and mortgage-backed securities onto bank balance sheets

Table 5: Primary Regression Results - Inflation-Targeting Period

4.3 Robustness

TO DO AFTER CEA CONFERENCE

5 Conclusion

Shadow bank assets have continued to grow in Canada since the global financial crises and account for a larger share of total global financial assets than prior to the crisis. A more important shadow banking sector has multiple impacts on the financial system and the economy. Several recent US studies find contractionary monetary policy shifts deposits from banks to shadow banks, increasing financial instability. In this paper, we use Canadian data to first test how monetary policy impacts the growth of shadow banks, and, by extensions based on the resulting dynamic shift in assets between traditional shadow banks, systemic risk to the financial sector. We then assess how growth in the shadow banking sector impacts the effectiveness of monetary policy.

First, we find a contractionary monetary policy does not cause deposits to shift from banks to the shadow banks as it does in the US. Instead, deposits tend to decrease in shadow banks, and increase in chartered banks following tightening monetary policy. On aggregate, monetary policy is effective in shrinking total deposits in the financial system. However, we do find that as shadow bank deposits increase in importance they can act as a drag to monetary policy transmission. These findings suggest that although shadow banks weaken the transmission of monetary policy, due to their relative smaller size, concerns over financial instability are muted. Another possible explanation behind this difference is that the Canadian shadow bank sector is smaller than the US counterpart and the rate premium it pays above the commercial bank rate might not widen as much during monetary policy tightening. A future extension could use rate data to investigate how the rate spread is linked to the policy rate.

Second, we find contractionary monetary policy shrinks bank mortgage loans, but has an ambiguous effect on shadow bank household mortgage and overall mortgage credit. The insignificant effect on the overall mortgage credit appears to be driven by the shadow banks and could be a concern from a financial stability perspective.

Lastly, we find that in the inflation-targeting period, contractionary monetary policy causes a longer lasting increase in business credit for shadow banks, and a fall in chartered bank business loans. Although the overall effect on business credit is the desired decrease, the shifting of business loans from banks to shadow banks results in a riskier composition and raises financial stability concerns. Furthermore, we also find that shadow bank business credit acts as a drag on monetary policy transmission during the the inflation-targeting period.

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Appendix A

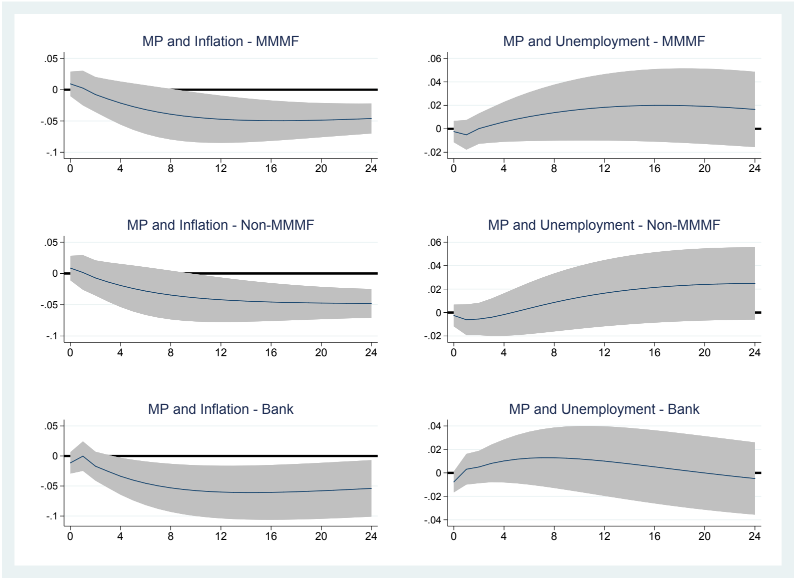

Figure 11: Contractionary MP shock on Macro Variables - Shadow/Chartered Banks Deposits

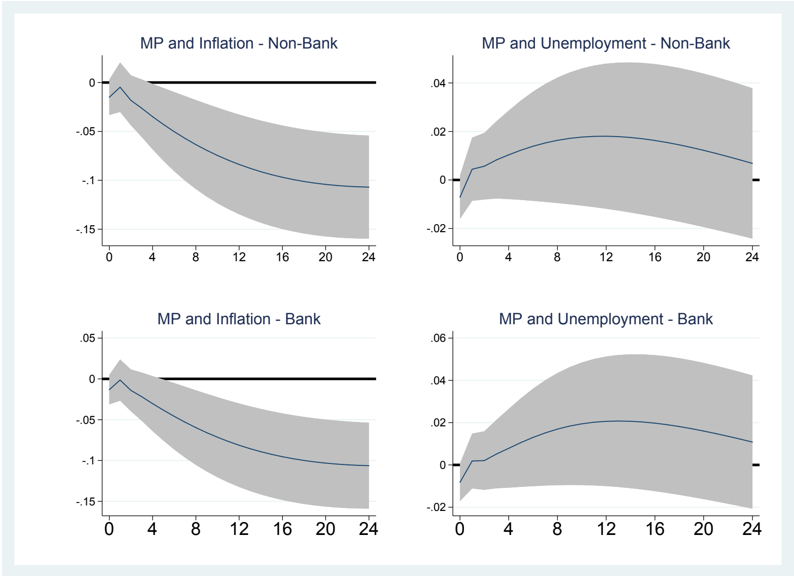

Figure 12: Contractionary MP shock on Macro Variables - Shadow/Chartered Banks HH Loans

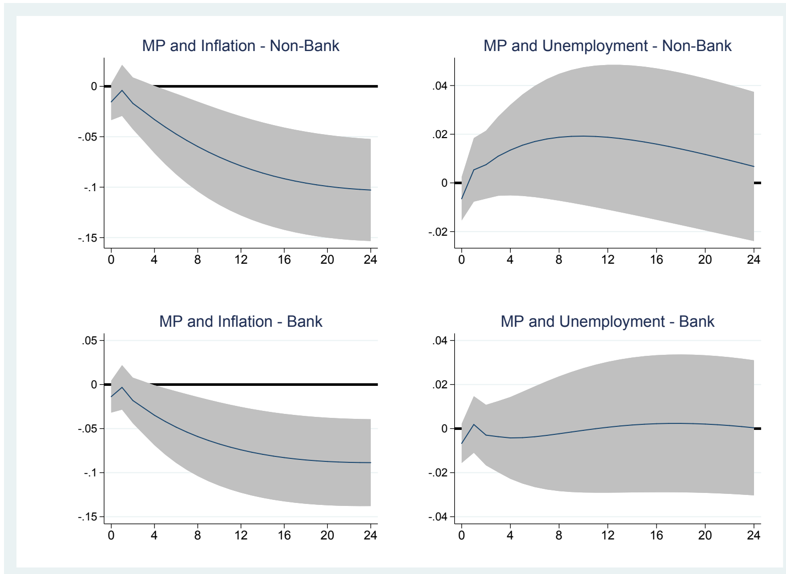

Figure 13: Contractionary MP shock on Macro Variables - Shadow/Chartered Banks Bus Loans