Monetary Policy and the Performance of SME Loans:

Analysis of Loan-Level Data from the Business Development Bank of Canada

Preliminary

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The views expressed are those of the authors and not of the Bank of Canada.

Motivation

- MP has a large impact on SMEs through financial channels (Gertler and Gilchrist, 1994).
  - ▷ financial accelerator (Bernanke *et al.*, 1999), collateral channel (Kiyotaki and Moore, 1994) etc.
  - ▷ floating-rate channel of MP: direct impact on firms' variable-rate loans (Ippolito *et al.*, 2018)
- Relatitve to investment and output, little is known about how MP affects SMEs' liquidity
- Want to examine existing SME loans to see how MP impacts their performance over time.
  - ▷ an important indicator for new loans;
  - ▷ has implications for firms' cash flows and future investment;
  - ▷ helps us understand whether and how MP affects SMEs through the floating-rate channel.
- Also want to understand which types of loans are reacting to MP changes–including interest and non-interest characteristics such as collateral.

Question

- How does a change in MP affect private SMEs' loan performance over time?
  - ▷ how quickly does loan performance respond to a change in MP?
  - ▷ is the response in loan performance persistent?
- On what types of loans, MP has larger impacts?
  - ▷ does variable-rate loans show stronger sensitivity as predicted by the floating-rate channel?
  - ▷ how does the response of loan performance depend on the *ex-ante* risk of loans?
- How does collateral change the impact of MP changes on loan performance?

What we do

- Examine loan-level data from the Business Development Bank of Canada (BDC)
  - ▷ monthly observation from Jan 2000 to Feb 2018
  - ▷ observed loan characteristics: loan rates, variable vs fixed, collateralized vs unsecured
- Identify MP shocks from the changes in market expectations around MP announcement dates (Gertler and Karadi, 2015)
- Panel Local-Projections method (Jordà, 2005) to estimate the impulse response of loan performance following a MP shock
  - ▷ loan-level fixed effects to control for permanent unobserved heterogeneity
  - ▷ decompose the impact of MP shocks by loan characteristics

Main results

- The loan performance reacts quickly to MP, consistent with the floating-rate channel. The response is persistent as in the case for the conventional channel.
- The effect of MP transmits most strongly through variable-rate loans. Moreover, loans with high loan rates are more sensitive to MP shocks than low-rate loans.
- *Ex-post*, collateral may improve the moral hazard problem, but this effect seems to be quantitatively limited after controlling for interest-rate information.
  - ▷ the interest-rate effect captures the correlation between secured loans and less-risky loans $\Rightarrow$ collateral is associated with less risky SMEs that use collateral to signal their types

Contributions of this paper

- Provides micro evidence that MP affects the liquidity of *private SMEs* mainly through variable rates, which is consistent with the floating-rate channel.
  - ▷ complements studies on listed firms (e.g. Ippolito et al., 2018)
  - ▷ quicker response in contrast to the evidence using US aggregate data (Piffer, 2018)
- Estimates the effect of collateral on SME loan performance, controlling for the effects of loan interest rates and loan-interest types: collateral is associated with better loan performance both *ex post* and *ex ante*.
  - ▷ in contrast to Berger and Udell (1990), Berger *et al.* (2011), Jimènez and Saurina (2002)
  - ▷ consistent with Caglio et al. (2021)

Business Development Bank of Canada (BDC)

BDC is a Federal Crown Corporation with

- a mission to assist SMEs as complementary source of financing for SMEs
- most of assets in loans
  - 90% of loans are in variable rates with mechanical relationship with market interest rates

Borrowers

- private SMEs

BDC is an important player in the SME loan market in Canada.

- for loans less than 5 million CAD, BDC provides approximately 12 % of these loan provided by BDC and systemically-important banks.

BDC loan-level data

- Monthly panel from 2000M1 to 2018M2:
  - 8.7 million month-loan observations
- Granular information on loan characteristics:
  - loan rate
  - variable or fixed
  - collateralized or unsecured

High-frequency Measure of Monetary Policy Shocks

BAX contract:

- Futures contract on 3-month bankers' acceptance – very liquid.
- One-day window to compute the difference in BAX yields around a MP announcement date to capture a MP surprise in the market.
- Measures the change in market expectations due to MP announcement, used as an external instrument in VAR to extract MP shocks.
  - ▷ Identification assumption: changes in BAX within the window is induced by a MP shock only.

VAR to identify MP shocks (Gertler and Karadi, 2015)

$\mathbf{y}_t = [\text{2-year CGB yield}, \text{employment rate}, \log \text{GDP}, \text{inflation rate}, \text{external bond premium}]$.

$z_t = \Delta BAX_t$.

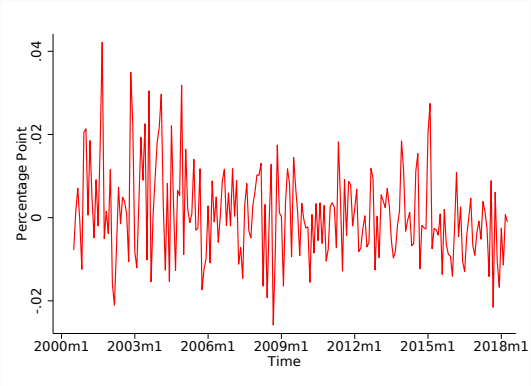
1st stage: reduced form VAR

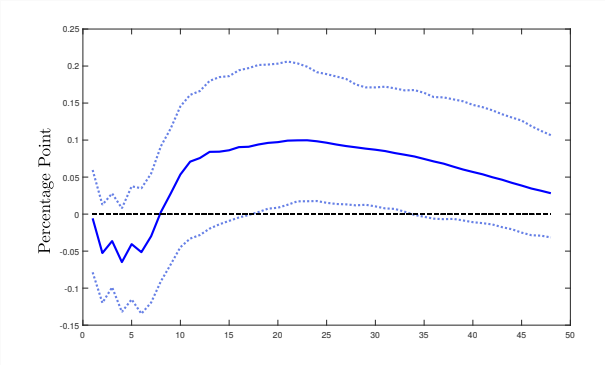
$$\mathbf{y}_t = \mathbf{c} + \sum_{\ell=1}^{p} \mathbf{B}^{\ell} \mathbf{y}_{t-\ell} + \mathbf{u}_t$$

2nd stage: IV regression

$$u_t^{(1)} = \overline{u} + \delta z_t + \varepsilon_t$$

MP shocks and employment response to a 25-bp MP easing





How does the SME loans react to MP?

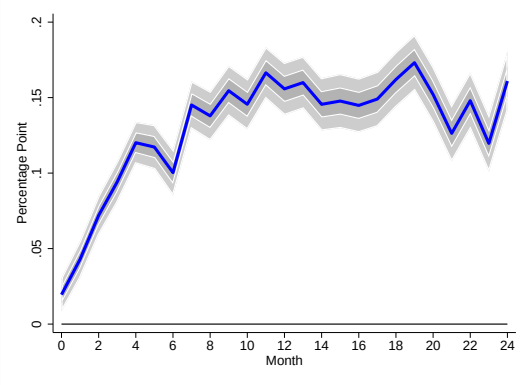
- Using the identified MP shocks, we examine how SMEs' loan performance changes over time.
  - ▷ How quickly does it respond to MP?
  - ▷ How persistent is the response to MP?

Fixed-Effects Panel Local-Projection

$$w_{t+h,i} - w_{t-1,i} = \beta_h \cdot x_t + \alpha_{h,i} + \sum_{\ell=1}^{12} \phi^{\ell} w_{t-\ell,i} + \varepsilon_{t+h,i}$$

- w: Performance dummy = 1 if either in arrear, impaired, delinquent or written-off
- i: Index for a loan
- t: time $= 2000\text{M}1, \ldots, 2018\text{M}2$
- h: projection horizon $= 0, \ldots, 24$ month
- x: MP shock based VAR-IV

IRF: 1-std MP shock (easing) on loan performance



- Quick response relative to output, consistent with the floating-rate channel of monetary policy of Ippolito *et al.* (2018).
- The response is also persistent due to the effects of conventional channels.

What types of SME loans react to MP?

- Loan-level dataset allows the decomposition of MP effects by loan characteristics:
  - ▷ loan rate types = {variable, fixed}
  - ▷ loan rate levels = {high, low}
  - ▷ collateral = {collateralized, unsecured}
- Decomposition gives information about the channels of MP that impact SME loans.

Decomposing the effects of MP shock by loan characteristics

Decompose the effect of MP shocks following the methodology of Cloyne *et al.* (2018):

$$y_{t+h,i} - y_{t-1,i} = \sum_{j=1}^{J} \beta_h^j \mathbb{1}_j \cdot x_t + \alpha_{h,i} + \sum_{\ell=1}^{12} \phi^\ell y_{t-\ell,i} + \varepsilon_{t+h,i}$$

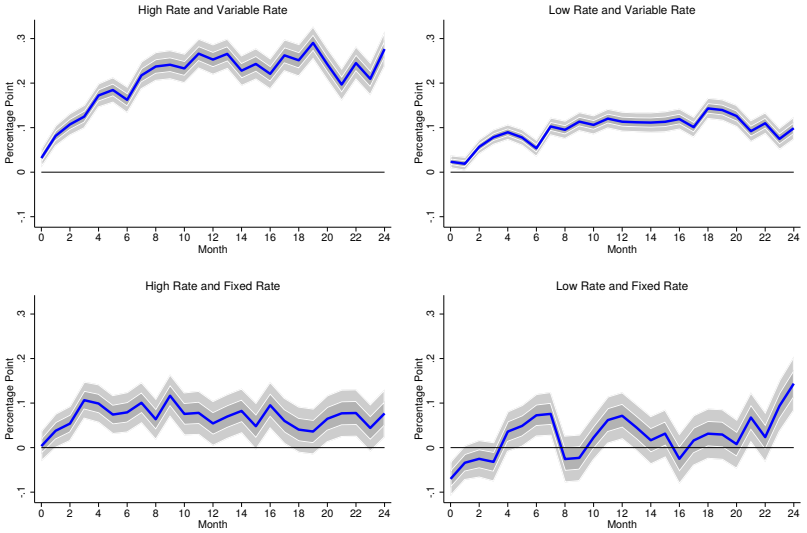
Example 1: $J = 2$
loan-rate types = {variable, fixed}.

j	interest-rate type
1	variable
2	fixed

Example 2: $J = 2 \times 2$
loan-rate levels = {high, low},
loan-rate types = {variable, fixed}.

j	interest-rate level	interest-rate type
1	high	variable
2	high	fixed
3	low	variable
4	low	fixed

Decomposition by interest-rate types and levels



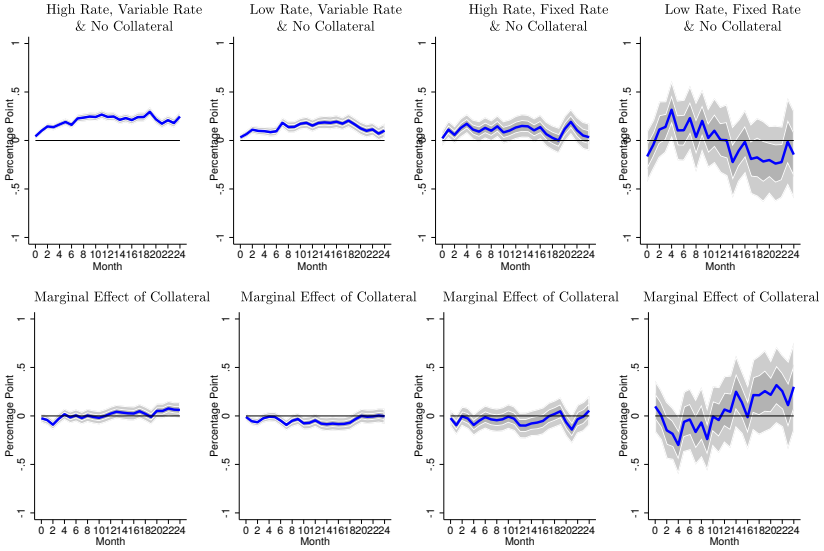
Decomposition by interest-rate types and levels (continued)

- The impact of MP translates into loan performance mainly through variable rates.
  - ▷ consistent with the floating-rate channel of MP (Ippolito *et al.*, 2018)
- High-rate loans are more responsive to MP shocks, especially for variable-rate loans.
  - ▷ ex-ante risky loans are more susceptible to interest-rate changes
- High- and variable-rate loans are most sensitive to MP shocks.

How does collateral affect SMEs' *ex-post* loan performance?

- Competing theories on collateral and loan performance:
  - ▷ collateralized loans are riskier than unsecured ones (Berger and Udell, 1990)
  - ▷ collateralzed loans are safer
    1. prevents moral hazard (Lacker, 2001)
    2. safe borrowers pledge collateral for signalling (Chan and Kanatas, 1987)
- Our analytical framework and data allow us to evaluate the *ex-post* impact of collateral on loan performance, controlling for *ex-ante* risk of borrwers by lending rates and interest-rate types.
- To do so, we consider a triple-interaction of loan-rate levels={high, low}, loan-rate types={variable, fixed}, and collateral={collateralized, unsecured} to decompose the effect of MP shocks.

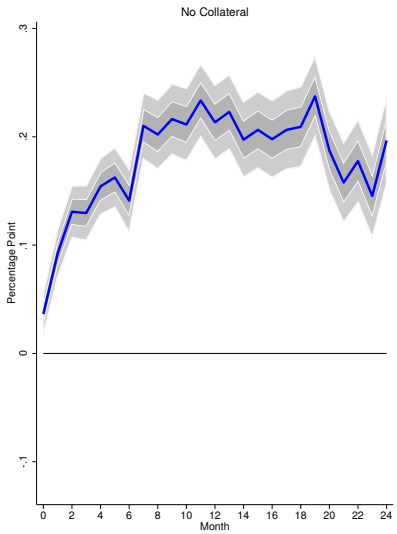
Decomposition by collateral, interest-rate types and levels

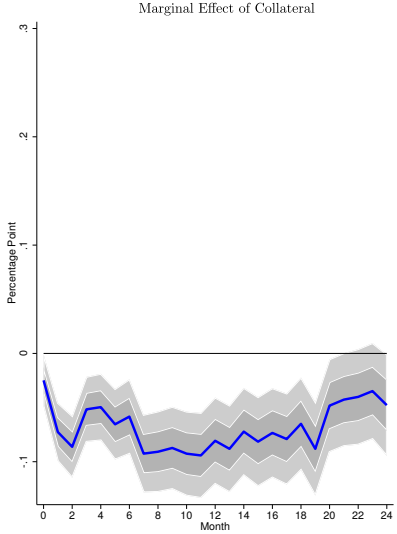


Correlation between collateral and SMEs' loan performance

- Controlling for interest-rate information, collateral has positive *ex-post* impacts on loan performance although quantitatively limited or statistically insignificant.
- What is the *unconditional* correlation between collateral and loan performance?

The marginal effect of collateral: not conditional on interest rates





Collateral and loan performance: results and interpretation

- Secured loans are correlated with safer loans, captured by the loan-rate effects. Controlling for *ex-ante* loan risk, any residual effects of collateral (e.g. mitigation of moral hazard) is limited .
  - ▷ consistent with Caglio *et al.* (2021)'s finding for smaller firms
  - ▷ in contrast to Berger and Udell (1990), Berger *et al.* (2011), Jimènez and Saurina (2002)
- An interpretation: safer SMEs use collateral to signal their types.

Conclusion

- The impact of MP quickly impinges on the performance of SME loans through variable-rate loans. Moreover, high-rate loans are more sensitive to interest-rate shocks than low-rate loans.
  - ▷ loan-level information is useful for disentangling the immediate impacts of MP
- Conditional on loan interest rates, collateral has positive but limited *ex-post* effect on SME loan performance. Secured loans are correlated with safer loans, and the loan-rate information captures much of the unconditional collateral effects.
  - ▷ loan-rate information is useful for distinguishing the different effects of collateral
  - ▷ unobserved characteristics could make it valuable for SMEs to use collateral for signalling