Bank of Canada Quarterly Research Update

2025Q3

This quarterly newsletter features the latest research publications by Bank of Canada economists. The report includes papers appearing in external publications and staff working papers published on the Bank of Canada's website.

PUBLISHED PAPERS

In-Press

Christopher Naubert & Lilia Maliar, "Monetary Policy Transmission with Endogenous Central Bank Responses in Tank", *Journal of Economic Dynamics and Control*, Vol. 178, September 2025

Jon Danielsson & **Andreas Uthemann**, "Artificial Intelligence and Financial Crises", *Journal of Financial Stability*, Vol. 80, September 2025

Xing Guo, "Reassessing the Relevance of Financial Shocks in an Estimated Heterogeneous Firm Model", *American Economic Journal: Macroeconomics*, Vol. 16(3), July 2025

Katya Kartashova & Xiaoqing Zhou, "How Do Mortgage Rate Resets Affect Consumer Spending and Debt Repayment? Evidence from Canadian Consumers", *Journal of Money, Credit and Banking*, Vol. 57(5): 1167-1210, August 2025

Radoslav Raykov, "Decomposing Large Banks' Systemic Trading Losses", *IMF Economic Review*, August 2025

Forthcoming

Chinara Azizova & **Jonathan Witmer** & **Xu Zhang**, "Assessing the Impact of the Bank of Canada's Government Bond Purchases", *Canadian Public Policy-Analyse De Politiques*

Chao Gu & Janet Hua Jiang & Liang Wang, "Credit Conditions, Inflation, and Unemployment", *Journal of Economic Theory*

Nikolai Cook & **Thibaut Duprey** & Anthony Heyes & Martino Pelli, "The Origin of the State: Land Productivity or Appropriability? Comment", *Journal of Political Economy*

Lu Fang & Ginger Zhe Jin & **Zhentong Lu** & Xiaolu Zhou, "Flagship Entry in Online Marketplaces", *Journal of Industrial Economics*

Rodney Garratt & **Zhentong Lu** & **Phoebe Tian**, "How Banks Create Gridlock to Save Liquidity in Canada's Large Value Payment System", *Journal of Money, Credit and Banking*

Helmut Lütkepohl & Fei Shang & **Luis Uzeda** & Tomasz Woźniak, "Partial Identification of Structural Vector Autoregressions with Non-Centred Stochastic Volatility", *Journal of Econometrics*

Monica Jain & **Olena Kostyshyna** & **Xu Zhang**, "Expectations of Inflation, Wages and Spending: Evidence from a Consumer Survey", *Economic Letters*

Olena Kostyshyna, "Household Food Inflation in Canada", *Canadian Journal of Economics*

STAFF WORKING PAPERS

Fabienne Schneider, "On-the-Run Premia, Settlement Fails, and Central Bank Access", Bank of Canada Staff Working Paper 2025-19

Xing Guo & Pablo Ottonell & Toni Whited & Thomas Winberry, "Firm Heterogeneity and Adverse Selection in External Finance: Micro Evidence and Macro Implications", Bank of Canada Staff Working Paper 2025-20

Lilia Maliar & **Chris Naubert**, "Monetary Policy Transmission with Endogenous Central Bank Responses in Tank", Bank of Canada Staff Working Paper 2025-21

Kim Huynh & **Oleksandr Shcherbakov** & **André Stenzel**, "Dynamic Consumer Cash Inventory Model", Bank of Canada Staff Working Paper 2025-22

William Du & Adrian Monninger & Xincheng Qiu & **Tao Wang**, "Perceived Unemployment Risks Over Business Cycles", Bank of Canada Staff Working Paper 2025-23

Jean-Paul L'huillier & Kirill Shakhnov & **Laure Simon**, "Short-Run and Long-Run News: Evidence from Giant Commodity Discoveries", Bank of Canada Staff Working Paper 2025-24

Francois-Michel Boire & **Thibaut Duprey** & **Alexander Ueberfeldt**, "Financial Shocks and the Output Growth Distribution", Bank of Canada Staff Working Paper 2025-25

Chao Gu & **Janet Hua Jiang** & Liang Wang, "Credit Conditions, Inflation, and Unemployment", Bank of Canada Staff Working Paper 2025-26

STAFF DISCUSSION PAPERS

Dylan Hogg & **Hossein Hosseini Jebeli**, "Examining the Links Between Firm Performance and Insolvency", Bank of Canada Staff Discussion Paper 2025-10

Jacob Dolinar & **Patrick Sabourin** & Matt West, "Synthesizing Signals from the Canadian Survey of Consumer Expectations", Bank of Canada Staff Discussion Paper 2025-11

Anna Chernesky & **Marie-Hélène Felt** & **Angelika Welte**, "2024 Methods-of-Payment Survey Report: Cash in an Era of Alternatives", Bank of Canada Staff Discussion Paper 2025-12

ABSTRACTS

Papers In-Press

Monetary Policy Transmission with Endogenous Central Bank Responses in Tank

We study how the transmission of monetary policy innovations is affected by the endogenous response of the central bank to macroeconomic aggregates in a two-agent New Keynesian model. We focus on how the stance of monetary policy and the fraction of savers in the economy affect transmission. We show that the indirect effect of an innovation is negative when the indirect real rate effect exceeds the indirect income effect. The relative magnitude of the indirect real rate effect increases with the share of savers and the strength of the central bank's response and decreases with the horizon of the innovation.

Artificial Intelligence and Financial Crises

The rapid adoption of artificial intelligence (AI) poses new and poorly understood threats to financial stability. We use a game-theoretic model to analyse the stability impact of AI, finding that it amplifies existing financial system vulnerabilities — leverage, liquidity stress and opacity — through superior information processing, common data, speed and strategic complementarities. The consequence is crises become faster and more severe, where the likelihood of a crisis is directly affected by how effectively the authorities engage with AI. In response, we propose that the financial authorities develop their own AI systems and expertise, establish direct AI-to-AI communication, implement automated crisis facilities and monitor AI use.

Reassessing the Relevance of Financial Shocks in an Estimated Heterogeneous Firm Model

I study the transmission of financial shocks using an estimated heterogeneous firm model. Following a contractionary financial shock, financially constrained firms cut investment, but unconstrained firms increase investment due to the lower capital price and interest rate. After matching the empirical dynamics of prices and the price elasticity of investment, I find a limited role of the unconstrained firms' response in dampening the aggregate investment decline. Nonfinancial capital adjustment friction is the key to generating this result. Without the capital adjustment friction, unconstrained firms'

investment becomes unrealistically sensitive to prices, and the model would understate the financial shocks' aggregate relevance

How Do Mortgage Rate Resets Affect Consumer Spending and Debt Repayment? Evidence from Canadian Consumers

One of the most important channels through which monetary policy affects the real economy is changes in mortgage rates. This paper studies the effects of mortgage rate changes resulting from monetary policy shifts on homeowners' spending, debt repayment, and defaults. The Canadian institutional setting facilitates the design of identification strategies for causal inference, since the vast majority of mortgages in the country experience predetermined, periodic, and automatic contract renewals with the mortgage rate reset based on the prevailing market rate. This allows us to exploit quasi-random variation in the timing of the rate reset and to present causal evidence for both rate declines and increases using detailed, representative consumer credit panel data. We find asymmetric effects of rate changes on spending, debt repayment, and defaults. Our results can be rationalized by the conventional cash-flow effect in conjunction with changes in consumer expectations about future interest rates upon the reset. Given the pervasiveness of Canadian-type mortgages in many other OECD countries, our findings have broader implications for the transmission of monetary policy to the household sector.

Decomposing Large Banks' Systemic Trading Losses

Large banks' tendency to suffer simultaneous trading losses, which strengthen systemic risk, is often attributed to portfolio overlap. By contrast, I show that common macro-shocks that cause non-overlapping assets to move together in crises are at least as important as portfolio overlap, but are inadequately treated by Basel III capital requirements. This highlights an unintended consequence of portfolio differentiation, whereby reducing portfolio overlap can increase trading loss comovements from common shocks. I propose three policy options for improving the Basel III standard and advocate for higher regulatory scrutiny on banks' internal risk models.

Forthcoming Papers

Assessing the Impact of the Bank of Canada's Government Bond Purchases

In March 2020, the Bank of Canada implemented the Government of Canada Bond Purchase Program, eventually purchasing approximately $340 billion of government bonds. In this paper, we first analyze the impact of this program on financial market prices and yields. Using an event study analysis, we find that long-term government bond yields declined by between 10 and 20 basis points (bps) across these announcements. Since these announcements do not capture the full yield impact of the purchase program, we perform a back-of-the-envelope counterfactual and estimate that it may have had an impact of almost 80 bps on ten-year bond yields. Then, using a macrofinance model, we can map yield changes into impacts on GDP and inflation. In the scenario where ten-year bond yields decline by almost 80 bps, there is a peak impact of about 2.8 percent on real GDP and 0.7 annualized percentage points on inflation. Nevertheless, there is a lot of uncertainty around the size of this impact.

Credit Conditions, Inflation, and Unemployment

We construct a New Monetarist model with labor market search and identify two channels that affect the long-run relationship between inflation and unemployment. First, inflation lowers wages through bargaining because unemployed workers rely more heavily on cash transactions and suffer more from inflation than employed workers; this wage-bargaining channel generates a downward-sloping Phillips curve without assuming nominal rigidity. Second, inflation increases firms' financing costs, which discourages job creation and increases unemployment; this cash-financing channel leads to an upward-sloping Phillips curve. We calibrate our model to the U.S. economy. The improvement in firm financing conditions can explain the observation that the slope of the long-run Phillips curve has switched from positive to negative post-2000.

The Origin of the State: Land Productivity or Appropriability? Comment

Mayshar et al. (2022) apply an instrumental variables identification strategy to data from nearly 1,000 societies included in the Ethnographic Atlas to claim that cultivation of cereals (appropriable by elites), rather than increased land productivity following the adoption of agriculture, led to the development of the state. We show two things. (1) Evidence for the appropriability theory holds when moving

from a tribe-chiefdom to a state and not more broadly. (2) Conclusions are driven by a handful of outliers with statistical significance at the 10% level lost with winsorization at 2.1% (or trimming at 1.2%) of locations by cereal advantage.

Flagship Entry in Online Marketplaces

In this paper, we empirically study how flagship entry in an online marketplace affects consumers, the platform, and various sellers on the platform. We find flagship entry may benefit consumers by expanding the choice set, by intensifying price competition within the entry brand, and by improving consumer perception for parts of the platform. In the meantime, flagship entry cannibalizes the sales of same-brand sellers, while other brands may gain as the buyer base expands on the platform. Counterfactual simulation suggests that flagship entry improves the gross merchandise value (GMV) of the platform and overall consumer welfare in most cases.

How Banks Create Gridlock to Save Liquidity in Canada's Large Value Payment System

Using detailed data from Canada's new high-value payment system (HVPS), we show how participants of the system save liquidity by exploiting the new gridlock resolution arrangement. These observed behaviors are consistent with the equilibrium of a "gridlock game" that captures the key incentives that participants face in the system. The findings have important implications for the design of HVPSs and shed light on financial institutions' liquidity preference.

Partial Identification of Structural Vector Autoregressions with Non-Centred Stochastic Volatility

We consider structural vector autoregressions that are identified through stochastic volatility under Bayesian estimation. Three contributions emerge from our exercise. First, we show that a non-centred parameterization of stochastic volatility yields a marginal prior for the conditional variances of structural shocks that is centred on homoskedasticity, with strong shrinkage and heavy tails—unlike the common centred parameterization. This feature makes it well suited for assessing partial identification of any shock of interest. Second, Monte Carlo experiments on small and large systems indicate that the non-centred setup estimates structural parameters more precisely and normalizes conditional variances efficiently. Third, revisiting prominent fiscal structural vector autoregressions, we show how the non-centred approach identifies tax shocks that are consistent with estimates reported in the literature.

Expectations of Inflation, Wages and Spending: Evidence from a Consumer Survey

Using household-level data from the Canadian Survey of Consumer Expectations over 2014Q4– 2022Q3, we provide insight into the formation of expectations for inflation, wage and spending growth. The literature has documented that households associate higher expected price inflation with worse economic conditions, but that higher expected wage inflation is linked to better economic outcomes. Our paper finds that these views extend to households' spending decisions: higher expected price inflation is also associated with lower expected household spending, while higher expected wage growth is linked to higher expected spending. These relationships became stronger during the high-inflation period.

Household Food Inflation in Canada

We study household-level food inflation rates during low-inflation, pandemic and post-pandemic inflation surge periods using Canadian homescan data for 2012Q4–2023Q4. Our results about household inflation rates during low inflation are consistent with evidence for the U.S. (Kaplan and Schulhofer-Wohl (2017)). During post-pandemic inflation surge, we find that the dispersion in household-level inflation rates has increased and that correlation between household-level inflation rates and aggregate inflation became stronger. Households shopping more frequently, shopping at more stores, or buying more on sale experience lower food inflation, and households have relied more on these strategies to lower their inflation in high-inflation period. Consumers have substituted more towards lower-priced products with post-pandemic increase in inflation. Lower-income households experienced higher food inflation rates. These findings have implications for the welfare costs of inflation.

Staff Working Papers

On-the-Run Premia, Settlement Fails, and Central Bank Access

The premium on "on-the-run" Treasuries (i.e., the most recently issued ones) is an anomaly. I explain it using a model in which primary dealers hold inventories of Treasuries. There is less variation across primary dealers' inventories of on-the-run Treasuries compared with off-the-run Treasuries. Because there is less inventory uncertainty, on-the-run Treasuries fail to settle less frequently and trade at a premium. My theory is consistent with the USD 33 billion of Treasury contracts that fail to settle each day, with the median failure rate of off-the-run Treasuries being almost twice that of on-the-run

Treasuries. I use the model to analyze the effects of granting access to central bank facilities to non-banks active in the Treasury market. Broad access stimulates trading and reduces the on-the-run premium, but settlement fails increase and, counterintuitively, only primary dealers benefit.

Firm Heterogeneity and Adverse Selection in External Finance: Micro Evidence and Macro Implications

We study the macroeconomic consequences of asymmetric information between firms and external investors. To do so, we develop a heterogeneous firm macro model in which firms have private information about their quality. Private information creates a lemons problem in the market for external finance, depressing investment relative to the full information benchmark. We measure the distribution of private information, and therefore the magnitude of this lemons problem, using high-frequency stock price changes when firms raise new funding (revealing their quality to the market). We find that changes in distribution of private information are a quantitatively important determinant of aggregate fluctuations. For example, a spike in private information accounts for 40% of the decline in aggregate investment during the 2007-2009 financial crisis and made monetary stimulus significantly less effective at that time.

Monetary Policy Transmission with Endogenous Central Bank Responses in Tank

We study how the transmission of monetary policy innovations is affected by the endogenous response of the central bank to macroeconomic aggregates in a two-agent New Keynesian model. We focus on how the stance of monetary policy and the fraction of savers in the economy affect transmission. We show that the indirect effect of an innovation is negative when the indirect real rate effect exceeds the indirect income effect. The relative magnitude of the indirect real rate effect increases with the share of savers and the strength of the central bank's response and decreases with the horizon of the innovation.

Dynamic Consumer Cash Inventory Model

We study consumer cash inventory behavior by developing a dynamic model of forward-looking consumers and estimating structural parameters of the model using detailed consumer survey data. Consumers facing holding and withdrawal costs solve a discrete-time continuous-control dynamic programming problem to optimally use cash at the point of sale. Our findings suggest that it is

crucial to account for persistent heterogeneity in consumer preferences to accurately measure the demand for cash and consumer welfare. We show that deteriorating access to cash triggers a bi-modal response. Some consumers substantially reduce or even stop the use of cash in favor of digital means of payment, while others exhibit a limited response and instead withdraw and hold larger amounts.

Perceived Unemployment Risks Over Business Cycles

We backcast subjective expectations on job finding and separation in the Survey of Consumer Expectations to 1978, and use real-time machine learning forecasting to proxy their objective counterparts. We document stickiness in job finding and separation expectations in reflecting changes in real-time job finding and separation risks and their substantial heterogeneity across observable and unobservable dimensions. Calibrating these facts into a heterogeneous-agent consumption-saving model reveals that belief stickiness attenuates the precautionary saving channel. As a result, workers under-insure during recessions, leading to a more sluggish recovery afterwards. The combination of high risk exposure and under-insurance due to belief stickiness operates as a novel amplification mechanism over the business cycle.

Short-Run and Long-Run News: Evidence from Giant Commodity Discoveries

The bulk of the news shocks literature focuses on shocks materializing after four or five quarters, with limited evidence on news about longer-run events. We build a new dataset of discovery and production start dates for a wide range of giant commodity discoveries worldwide from 1960 to 2012. Standard open economy models match the empirical responses of short-run news but fail in the case of long-run news. Incorporating financial frictions in the form of collateral constraints is crucial for capturing the dynamics implied by long-run news. We also provide direct evidence on the role of these frictions.

Financial Shocks and the Output Growth Distribution

This paper studies how financial shocks shape the distribution of output growth by introducing a quantile-augmented vector autoregression (QAVAR), which integrates quantile regressions into a structural VAR framework. The QAVAR preserves standard shock identification while delivering flexible, nonparametric forecasts of conditional moments and tail risk measures for gross domestic

product (GDP). Applying the model to financial conditions and credit spread shocks, we find that adverse financial shocks worsen the downside risk to GDP growth significantly, while the median and upper percentiles respond more moderately. This underscores the importance of nonlinearities and heterogeneous tail dynamics in assessing macro-financial risks.

Credit Conditions, Inflation, and Unemployment

We construct a New Monetarist model with labor market search and identify two channels that affect the long-term relationship between inflation and unemployment. First, inflation lowers wages through bargaining because unemployed workers rely more heavily on cash transactions and suffer more from inflation than employed workers: this wage-bargaining channel generates a downward Phillips curve without assuming nominal rigidity. Second, inflation increases the firm's financing costs, which discourages job creation and increases unemployment; this cash-financing channel leads to an upward-sloping Phillips curve. We calibrate our model to the U.S. economy. The improvement in firm financing conditions can explain the observation that the slope of the long-run Phillips curve has switched from positive to negative post-2000.

Staff Discussion Papers

Examining the Links Between Firm Performance and Insolvency

Assessing insolvency dynamics is essential for evaluating the financial health of non-financial corporations and mitigating macroeconomic and financial stability risks. This study leverages a newly created Statistics Canada dataset linking insolvency records with firm-level financial data to develop a robust framework for monitoring insolvency risk. We employ two complementary approaches: a univariate threshold method that establishes critical financial ratio benchmarks and a multivariate econometric model that accounts for interactions among financial indicators. These methods produce debt-at-risk measures that enhance risk assessment by combining simplicity with analytical depth. Finally, we apply these metrics to timely firm-level data, enabling continual monitoring of financial vulnerabilities.

Synthesizing Signals from the Canadian Survey of Consumer Expectations

We introduce a summary indicator based on the Canadian Survey of Consumer Expectations (CSCE). This indicator provides a summary measure of consumer opinions that we can track over time. We construct three underlying sub-indexes—financial health, labour market and consumer spending—that capture different factors influencing consumers' daily lives. We also leverage the rich demographic information available in the CSCE to construct summary indicators for different groups defined by characteristics such as age, home-ownership status and income. We show that there is significant heterogeneity across different demographic groups. This heterogeneity helps us understand how economic shocks disproportionately impact some households. Finally, we investigate which macroeconomic variables drive changes in the CSCE indicator and show that the fundamental drivers vary over time.

2024 Methods-of-Payment Survey Report: Cash in an Era of Alternatives

The Methods-of-Payment (MOP) Survey tracks consumer use of cash and other methods of payment. We present core findings from the 2024 MOP Survey, highlighting results from both the survey questionnaire and subsequent three-day shopping diary. Although cash holdings have increased in nominal terms, we find that cash usage remains unchanged since 2020. Mobile and other alternative payment methods continue to grow in importance. The 2024 MOP Survey also collects new data on how consumers perceive bank note quality.

UPCOMING EVENTS

Robert Gillezeau (University of Toronto)
Organizer: EFR Seminar
Date: 3 October 2025

Paul Gomme (Concordia University)
Organizer: CEA- EFR Seminar
Date: 3 October 2025

Annette Vissing-Jorgensen (FRB)
Organizer: EFR Seminar
Date: 7 October 2025

Dalibor Stevanovic (UQAM)
Organizer: CEA- EFR Seminar
Date: 14 October 2025

Maxi Guennewig (University of Bonn)
Organizer: BAP- EFR Seminar
Date: 14 October 2025

Donn Feir (University of Victoria)
Organizer: EFR Seminar
Date: 17 October 2025

Sriya Anbil (FED)
Organizer: FMD- EFR Seminar
Date: 21 October 2025

Juanma Castro-Vincenzi (University of Chicago)
Organizer: INT- EFR Seminar
Date: 24 October 2025

Jonathan Wallen (Havard)
Organizer: FMD- EFR Seminar
Date: 28 October 2025