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Monthly Research Update

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This monthly 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

Daniela Balutel & Christopher Henry & Jorge Vásquez & Marcel Voia, "Bitcoin adoption and beliefs in Canada", Canadian Journal of Economics, Vol. 55(4): 1729-1761, November 2022

Audra Bowlus & Émilien Gouin-Bonenfant & Huju Liu & Lance Lochner & Youngmin Park, "Four decades of Canadian earnings inequality and dynamics across workers and firms", Quantitative Economics, Vol. 13(4): 1447-1491, November 2022

Antoine Camous & Dmitry Matveev, "The Central Bank Strikes Back! Credibility of Monetary Policy under Fiscal Influence", The Economic Journal, Vol. 133(649): 1-29, January 2023

Mario Cipriani & Antonio Guarino & Andreas Uthemann, "Financial transaction taxes and the informational efficiency of financial markets: A structural estimation", Journal of Financial Economics, Vol. 146(3): 1044-1072, December 2022

Maarten Janssen & Edona Reshidi, "Regulating recommended retail prices", International Journal of Industrial Organization, Vol. 85, December 2022

DongIk Kang & Andrew Usher, "Does product revenue matter for price setting and monetary policy transmission?", Review of Economic Dynamics, Vol. 47: 297-345, January 2023

Danilo Leiva-León & Luis Uzeda, "Endogenous Time Variation in Vector Autoregressions", The Review of Economics and Statistics, Vol. 105(1): 125-142, January 2023

Forthcoming

Jasmina Arifovic & Cars Hommes & Anita Kopányi-Peuker & Isabelle Salle, "Ten Isn't Large! Group Size and Coordination in a Large-Scale Experiment", American Economic Journal: Microeconomics

Alexandre Corhay & Thilo Kind & Howard Kung & Gonzalo Morales, "Discount Rates, Debt Maturity, and the Fiscal Theory", Journal of Finance

Ingomar Krohn & Philippe Mueller & Paul Whelan, "Foreign Exchange Fixings and Returns Around the Clock", Journal of Finance

STAFF WORKING PAPERS

Julien Champagne & Émilien Gouin-Bonenfant, "Monetary Policy, Credit Constraints and SME Employment", Bank of Canada Staff Working Paper 2022-49

Martin Harding & Jesper Lindé & Mathias Trabandt, "Understanding Post-COVID Inflation Dynamics", Bank of Canada Staff Working Paper 2022-50

Cars Hommes & Mario He & Sebastian Poledna & Melissa Siqueira & Yang Zhang, "CANVAS: A Canadian Behavioral Agent-Based Model", Bank of Canada Staff Working Paper 2022-51

Johan Brannlund & Geoffrey R. Dunbar & Reinhard Ellwanger, "Are Temporary Oil Supply Shocks Real?", Bank of Canada Staff Working Paper 2022-52

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STAFF DISCUSSION PAPERS

Annetta Ho & Sriram Darbha & Yuliya Gorelkina & Alejandro García, "The Relative Benefits and Risks of Stablecoins as a Means of Payment: A Case Study Perspective", Bank of Canada Staff Discussion Paper 2022-21

Kun Mo & Michel Soudan, "Financial Constraints and Corporate Investment in China", Bank of Canada Staff Discussion Paper 2022-22

Christopher Henry & Matthew Shimoda & Julia Zhu, "2021 Methods-of-Payment Survey Report", Bank of Canada Staff Discussion Paper 2022-23

ABSTRACTS

Bitcoin adoption and beliefs in Canada

We develop a tractable model of Bitcoin adoption with network effects and social learning, which we then connect to unique data from the Bank of Canada's Bitcoin Omnibus Survey for the years 2017 and 2018. The model determines how the probability of Bitcoin adoption depends on: (i) network effects, (ii) individual learning effects and (iii) social learning effects. After accounting for the endogeneity of beliefs, we find that both network effects and individual learning effects have a positive and significant direct impact on Bitcoin adoption, whereas the role of social learning is to ameliorate the marginal effect of the network size on the likelihood of adoption. In particular, in 2017 and 2018, a one percentage point increase in the network size increased the probability of adoption by 0.45 and 0.32 percentage points, respectively. Similarly, a one percentage point increase in Bitcoin beliefs increased the probability of adoption by 0.43 and 0.72 percentage points. Our results suggest that network effects, individual learning and social learning were important drivers of Bitcoin adoption in 2017 and 2018 in Canada.

Four decades of Canadian earnings inequality and dynamics across workers and firms

This paper studies the evolution of individual earnings inequality and dynamics in Canada from 1983 to 2016 using tax files and administrative records. Linking individual tax filers to their employers (and rich administrative records on firms) beginning in 2001, it also documents the relationship between the earnings dynamics of workers and the size and growth of their employers. It highlights three main patterns over this period: First, with a few exceptions (sharp increase in top 1% and declining gender gap), Canada has experienced relatively modest changes in overall earnings inequality, volatility, and mobility between 1983 and 2016. Second, earnings inequality and the distribution of earnings growth vary substantially over the business cycle. Third, the earnings dynamics of individuals are strongly related to the size and employment growth of their employers.

The Central Bank Strikes Back! Credibility of Monetary Policy under Fiscal Influence

How should independent central banks react if pressured by fiscal policymakers? We contrast the implications of two monetary frameworks: one, where the central bank follows a standard rule aiming exclusively at price stability against the other, where monetary policy additionally leans against fiscal influence. The latter rule improves economic outcomes by providing appropriate incentives to the fiscal authority. More importantly, the additional fiscal conditionality can enhance the credibility of the central bank to achieve price stability. We emphasise how the level and structure of government debt emerge as key factors affecting the credibility of monetary policy with fiscal conditionality.

Financial transaction taxes and the informational efficiency of financial markets: A structural estimation

We develop a new methodology to estimate the impact of a financial transaction tax (FTT) on financial market outcomes. In our sequential trading model, there are price-elastic noise and informed traders. We estimate the model through maximum likelihood for a sample of 60 NYSE stocks in 2017. We quantify the effect of introducing an FTT given the parameter estimates. An FTT increases the proportion of informed trading, improves information aggregation, but lowers trading volume and welfare. For some less liquid stocks, however, an FTT blocks private information aggregation.

Regulating recommended retail prices

This paper analyses the effects of regulated recommended retail prices (RRPs). Such recommendations by manufacturers are non-binding in nature and thus retailers do not have to adhere to them. We look at regulations, similar to that by the Federal Trade Commission (FTC), requiring at least some sales to take place at RRPs. Such regulations were introduced with the aim of protecting consumers. In the absence of regulation an equilibrium exists where the manufacturer charges the same wholesale prices across retailers. We show that regulating RRPs enables manufacturers to commit to their unobserved contracts, creating an equilibrium with wholesale price discrimination. We find that such an equilibrium increases manufacturer’s profits, but harms retailers and consumers.

Does product revenue matter for price setting and monetary policy transmission?

Using retail scanner data, we find that the probability of price adjustment increases with a product's revenue, and the average

absolute size of price adjustment decreases with the product's revenue. Furthermore, the responsiveness of prices to monetary shocks increases with product revenue. These facts are consistent with menu cost models in which the menu cost increases less than one-for-one with revenue, and inconsistent with models in which the menu cost increases one-for-one with revenue. In a calibrated menu cost model, the real effect of monetary policy is smaller in economies in which the price response to monetary policy shocks increases with revenue than in economies where no such relationships exist. Together with cyclical shifts in the revenue distribution, the increase in price responsiveness with revenue introduces a counter-cyclical effect that strengthens the real effect of monetary policy during recessions.

Endogenous Time Variation in Vector Autoregressions

We introduce a new class of time-varying parameter vector autoregressions (TVP-VARs) where the identified structural innovations are allowed to influence the dynamics of the coefficients in these models. An estimation algorithm and a parameterization conducive to model comparison are also provided. We apply our framework to the U.S. economy. Scenario analysis suggests that once accounting for the influence of structural shocks on the autoregressive coefficients, the effects of monetary policy on economic activity are larger and more persistent than in an otherwise standard TVP-VAR. Our results also indicate that cost-push shocks play a prominent role in understanding historical changes in inflation-gap persistence.

Ten Isn’t Large! Group Size and Coordination in a Large-Scale Experiment

We provide experimental evidence on coordination within large groups that could proxy the atomistic nature of real-world markets. We use a bank-run game where the two pure-strategy equilibria can be ranked by payoff and risk-dominance and a sequence of public announcements introduces stochastic sunspot equilibria. We find systematic group-size effects that theory fails to predict. When the payoff-dominant strategy is risky enough, the behavior of small groups is uninformative of the behavior in large groups: unlike 'smaller' groups of size 10, larger groups exclusively coordinate on the Pareto inferior strategy and never coordinate on sunspots.

Discount Rates, Debt Maturity, and the Fiscal Theory

This paper examines how the transmission of government portfolio risk arising from maturity operations depends on the stance of monetary/fiscal policy. Accounting for risk premia in the fiscal theory allows the government portfolio to affect the expected inflation, even in a frictionless economy. The effects of maturity rebalancing on expected inflation in the fiscal theory directly depend on the conditional nominal term premium, giving rise to an optimal debt maturity policy that is state dependent. In a calibrated macro-finance model, we demonstrate that maturity operations have sizable effects on expected inflation and output through our novel risk transmission mechanism.

Foreign Exchange Fixings and Returns Around the Clock

The U.S. dollar appreciates in the run-up to foreign exchange fixes and depreciates thereafter, tracing a W-shaped return pattern around the clock. Return reversals for the top nine traded currencies over a 21-year period are pervasive, highly statistically significant, and imply daily swings of more than one billion U.S. dollars based on spot volumes. Using natural experiments, we show the existence of a published reference rate determines the timing of intraday return reversals. We present evidence consistent with an inventory risk explanation whereby foreign exchange dealers intermediate an unconditional demand for U.S. dollars at the fixes.

Monetary Policy, Credit Constraints and SME Employment

Do financial constraints amplify or dampen the transmission of monetary policy to the real economy? To answer this question, we propose a simple empirical strategy that combines (i) firm-level employment and balance sheet data, (ii) identified monetary policy shocks and (iii) survey data on financing activities. The key novelty of our approach is a new proxy for the likelihood of being credit constrained, which is constructed using survey data on realized outcomes of financing requests. Leveraging cross-sectional heterogeneity in the proxy and the sensitivity of employment to monetary policy shocks, we find that credit constraints amplify the transmission of monetary policy. In the aggregate, credit constraints account for roughly a third of the employment response. Our findings are consistent with a strong financial accelerator, whereby accommodative monetary policy has the indirect effect of improving the ability of firms to obtain credit.

Understanding Post-COVID Inflation Dynamics

We propose a macroeconomic model with a nonlinear Phillips curve that has a flat slope when inflationary pressures are subdued and steepens when inflationary pressures are elevated. The nonlinear Phillips curve in our model arises due to a quasi-kinked demand schedule for goods produced by firms. Our model can jointly account for the modest decline in inflation during the Great Recession and the surge in inflation post-COVID-19. Because our model implies a stronger transmission of shocks when inflation is high, it generates conditional heteroskedasticity in inflation and inflation risk. Hence, our model can generate more sizable inflation surges due to cost-push and demand shocks than a standard linearized model. Finally, our model implies that central banks face a more severe trade-off between inflation and output stabilization when inflation is high.

CANVAS: A Canadian Behavioral Agent-Based Model

We develop a Canadian behavioral agent-based model (CANVAS) that utilizes Canadian microand macroeconomic data for forecasting and policy analysis. CANVAS represents a nextgeneration modelling effort, as it improves upon the previous generation of models in three dimensions: introducing household and firm heterogeneity, departing from rational expectations, and explicitly modelling the Canadian production network. This modelling capacity is achieved by harnessing large-scale Canadian micro- and macroeconomic datasets (of financial flows and national balance sheet accounts, input-output tables, government finance statistics, and the Labour Force Survey). By incorporating adaptive learning and heuristics, we equip the model to examine macroeconomic dynamics under significant uncertainty. We assess the out-of-sample forecasting performance of CANVAS against a benchmark vector auto-regressive (VAR) model and a DSGE model (Terms of Trade Economic Model, ToTEM). CANVAS advances several new frontiers of macroeconomic modelling for the Canadian economy. First, the detailed structure of the model allows for forecasting of the medium-run macroeconomic effects of the economy at the sector level. For instance, this structure allows us to assess the macroeconomic impact of the COVID-19 pandemic in Canada. Second, the realistic agent behaviour in CANVAS makes the model an ideal candidate for evaluating the effects of multiple macroeconomic policies. Third, the enriched modelling of the financial market structure allows policy-makers to conduct stress testing and assess the implication of macroprudential policies in Canada.

Are Temporary Oil Supply Shocks Real?

Hurricanes disrupt oil production in the Gulf of Mexico because producers shut in oil platforms to safeguard lives and prevent damage. We examine the effects of these temporary oil supply shocks on real economic activity in the United States. We find no evidence that temporary oil supply shocks affect state-level employment or indirectly affect industrial production in sectors not immediately related to oil production. We find that the temporary oil supply shocks have local, temporary price effects—mainly on gasoline prices—and that broader consumer price index inflation is also temporarily affected. In addition, we find no effect on imports, exports, exchange rates or the import price of oil. Our results suggest that oil reserves held by US refineries are largely sufficient to absorb any temporary disruptions to production.

Improving the Efficiency of Payments Systems Using Quantum Computing

High-value payment systems (HVPSs) are typically liquidity-intensive because the payment requests are indivisible and settled on a gross basis. Finding the right order in which payments should be processed to maximize the liquidity efficiency of these systems is an NP-hard combinatorial optimization problem, which quantum algorithms may be able to tackle at meaningful scales. We develop an algorithm and run it on a hybrid quantum annealing solver to find an ordering of payments that reduces the amount of system liquidity necessary without substantially increasing payment delays. Despite the limitations in size and speed of today's quantum computers, our algorithm provides quantifiable efficiency improvements when applied to the Canadian HVPS using a 30-day sample of transaction data. By reordering each batch of 70 payments as they enter the queue, we achieve an average of Can$240 million in daily liquidity savings, with a settlement delay of approximately 90 seconds. For a few days in the sample, the liquidity savings exceed Can$1 billion. This algorithm could be incorporated as a centralized preprocessor into existing HVPSs without entailing a fundamental change to their risk management models.

The Relative Benefits and Risks of Stablecoins as a Means of Payment: A Case Study Perspective

Our paper contributes to the discussion about the utility of stablecoins for retail payments through an objective, evidence-based approach that compares stablecoins with traditional retail payment methods. The paper also provides insights that could be useful in the design of

central bank digital currencies. We identify the potential benefits, risks and costs of stablecoin arrangements used for retail payments relative to traditional retail payment methods. We select three real-world examples for comparison: (i) a Mastercard credit card payment through a traditional bank; (ii) a Unified Payments Interface fast payment through Paytm (a technology-enabled payments company regulated as a limited-purpose bank); and (iii) a stablecoin retail transaction using USD Coin and a BitPay wallet. We find that certain stablecoin arrangements offer end users greater control of their privacy, facilitate more rapid innovation and have the potential to increase transaction speeds, particularly for cross-border payments. At the same time, stablecoins may provide less consumer protection for fraud, present higher risks to the payment system and to efforts to combat financial crime (partly because of the more nascent regulatory framework), and be costlier relative to traditional payment arrangements. Our findings suggest that stablecoin arrangements do not currently serve as substitutes for the suite of traditional payment arrangements but instead address niche use cases or user segments that value their benefits and can accept their risks or costs.

Financial Constraints and Corporate Investment in China

Distortions in capital markets can create financial constraints that deter firms from pursuing optimal investment plans. This paper explores how much these constraints affect investment by ownership type in China, using a panel data model estimated with observations on listed firms for the period 2005–17. We find that privately owned enterprises (POEs) in China face greater financial constraints than state-owned enterprises (SOEs), as POE investment plans depend more on the availability of internally generated cash. Correspondingly, we find evidence that Chinese lenders appear less concerned about the credit risk of SOEs, and that an expansion in credit correlates with a disproportionally larger increase in investment for SOEs.

2021 Methods-of-Payment Survey Report

We present results from the 2021 Methods-of-Payment (MOP) Survey, including updated payment shares based on a three-day shopping diary. We highlight long-term trends observed across previous MOP surveys from 2009, 2013 and 2017. We also review patterns of the management and use of cash, the adoption and use of payment cards, and the use of alternative payment methods across different demographic groups. Using other survey and data sources,

we provide additional context for these results with respect to the COVID-19 pandemic.

UPCOMING EVENTS

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