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# Bank of Canada Monthly Research Update

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January 2019

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

### Forthcoming

- Bolt, Wilko & Van Oordt, Maarten, "On the Value of Virtual Currency", Journal of Money, Credit and Banking
- Cerezetti, Fernando & Cruz-Lopez, Jorge & Manning, Mark & Murphy, David, "Who Pays? Who Gains? CCP Resource Provision in the Post-Pittsburgh World", Journal of Financial Market Infrastructures
- Friedrich, Christian & Guerin, Pierre, "The Dynamics of Capital Flow Episodes", Journal of Money, Credit and Banking
- Gungor, Sermin & Luger, Richard, "Small-sample tests for stock return predictability with possibly non-stationary regressors and GARCH-type effects", Journal of Econometrics
- Hohberger, Stefan & Priftis, Romanos & Vogel, Lukas, "The distributional effects of conventional monetary policy and quantitative easing: evidence from an estimated DSGE model", Journal of Banking and Finance (2019)
- Hommes, Cars & Massaro, Domenico & Salle, Isabelle, "Monetary and Fiscal Policy at the Zero-Lower Bound: evidence from the lab", Economic Inquiry
- Hommes, Cars & Lustenhouwer, Joep, "Inflation targeting and liquidity traps under endogenous credibility", Journal of Monetary Economics
- Hommes, Cars & Lustenhouwer, Joep, "Managing unanchored, heterogeneous expectations and liquidity traps", Journal of Economic Dynamics and Control
- Imura, Yuko & Shukayev, Malik, "The Extensive Margin of Trade and Monetary Policy", Journal of Economic Dynamics and Control

## STAFF WORKING PAPERS

- Zhu, Yu & Hendry, Scott, "A Framework for Analyzing Monetary Policy in an Economy with E-money", Bank of Canada Staff Working Paper 2019-1
- Mollins, Jeffrey & St-Amant, Pierre, "The Productivity Slowdown in Canada: An ICT Phenomenon?", Bank of Canada Staff Working Paper 2019-2

Glover, Andrew & Short, Jacob, "[Can Capital Deepening Explain the Global Decline in Labor's Share?](#)", Bank of Canada Staff Working Paper 2019-3

Wright, Randall & Xiaolin Xiao, Sylvia & Zhu, Yu, "[Frictional Capital Reallocation I: Ex Ante Heterogeneity](#)", Bank of Canada Staff Working Paper 2019-4

Zivanovic, Jelena, "[Corporate Debt Composition and Business Cycles](#)", Bank of Canada Staff Working Paper 2019-5

Hohberger, Stefan & Priftis, Romanos & Vogel, Lukas, "[The Distributional Effects of Conventional Monetary Policy and Quantitative Easing: Evidence from an Estimated DSGE Model](#)", Bank of Canada Staff Working Paper 2019-6

## ABSTRACTS

### *On the Value of Virtual Currency*

Our economic framework suggests that the exchange rate of virtual currency is determined by three components. First, the current value of transactions in virtual currency which absorb part of the exchange rate risk. Second, the decisions and expectations of forward-looking investors to buy virtual currency (thereby effectively regulating its supply). Third, the elements that jointly drive future consumer adoption and merchant acceptance of virtual currency. The model predicts that, as virtual currency becomes more established, the exchange rate will become less sensitive to the impact of shocks to speculators' beliefs. This undermines the notion that excessive exchange rate volatility will prohibit widespread use of virtual currency.

### *Who Pays? Who Gains? CCP Resource Provision in the Post-Pittsburgh World*

At the Pittsburgh Summit in 2009, G-20 leaders agreed to wide-reaching reforms to OTC derivatives markets. One of these reforms required the clearing of standardized over-the-counter (OTC) derivatives through central counterparties (CCPs). Since then, CCPs have become increasingly important. There has been an extensive programme of regulatory change affecting CCPs, OTC derivatives markets, and their participants. As OTC clearing has grown, tension has grown between different classes of market participant over the

traditional CCP model of resource provision through loss mutualization. We argue that most of this tension can be explained by a misalignment between the policy goal of enhancing financial stability and the delivery of that goal by mandating clearing through CCPs as they are currently organized. Specifically, the traditional model for resource provision makes most CCPs suitable for managing 'club goods', whereas financial stability is a 'public good'. The key differences between these two types of goods, driven by the wedge between those who pay for them and those who derive the benefits, create the observed tensions. Based on this analysis, we propose a framework to analyse the functional elements of a CCP and examine whether an alternative clearing model might be more effective. We conclude that incentives would be better aligned if the functions of CCPs were unbundled and the ownership and funding structures that best suits their individual characteristics were selected. Functions that are critical for the provision of financial stability might suggest some form of public sector involvement, whereas other services might lend themselves to a for-profit or traditional club model.

### *The Dynamics of Capital Flow Episodes*

We first propose a novel methodology for identifying episodes of strong equity and bond flows using estimates from a regime-switching model that keeps context- and sample-specific assumptions to a minimum. We then assess the impacts of U.S. stock market volatility (VIX) and U.S. monetary policy shocks on equity and bond flow episodes. Our results indicate that the impacts of both shocks differ across in- and outflow episodes and, based on an assessment of equity flows, vary considerably over time. While VIX shocks are mostly associated with asymmetric impacts across episodes, U.S. monetary policy shocks generate such asymmetries primarily over time.

### *Small-sample tests for stock return predictability with possibly non-stationary regressors and GARCH-type effects*

We develop a simulation-based procedure to test for stock return predictability with multiple regressors. The process governing the regressors is left completely free and the test procedure remains valid in small samples even in the presence of non-normalities and GARCH-type effects in the stock returns. The usefulness of the new procedure is demonstrated in a simulation study and by examining the ability of a group of financial variables to predict excess stock

returns. We find some evidence of predictability during the period 1948–2014, driven entirely by the term spread. This empirical evidence, however, is much weaker over subsamples.

### *The distributional effects of conventional monetary policy and quantitative easing: evidence from an estimated DSGE model*

This paper compares the distributional effects of conventional monetary policy and quantitative easing (QE) within an estimated open-economy DSGE model of the euro area. The model includes two groups of households: (i) wealthier households, who own financial assets and are able to smooth consumption over time, and (ii) poorer households, who only receive labor and transfer income and live 'hand to mouth'. We use the model to compare the impact of policy shocks on constructed measures of income and wealth inequality (net disposable income, net asset position, and relative per-capita income). Except for the short term, expansionary conventional policy and QE shocks tend to mitigate income and wealth inequality between the two population groups. In light of the coarse dichotomy of households that abstracts from richer income and wealth dynamics at the individual level, the analysis emphasizes the functional distribution of income.

### *Monetary and Fiscal Policy at the Zero-Lower Bound: evidence from the lab*

The global economic crisis of 2007–2008 has pushed many advanced economies into a liquidity trap. We design a laboratory experiment on the effectiveness of policy measures to avoid expectation-driven liquidity traps. Monetary policy alone is not sufficient to avoid liquidity traps, even if it preventively cuts the interest rate when inflation falls below a threshold. However, monetary policy augmented with a fiscal switching rule succeeds in escaping liquidity trap episodes. We measure the effect of fiscal policy on expectations, and report larger-than-unity fiscal multipliers at the zero lower bound. Experimental results in different treatments are well explained by adaptive learning.

### *Inflation targeting and liquidity traps under endogenous credibility*

Policy implications are derived for an inflation targeting central bank, whose credibility is endogenous and depends on its past ability to achieve its targets. This is done in a New Keynesian framework with heterogeneous and boundedly rational expectations. We find that the

region of allowed policy parameters is strictly larger than under rational expectations. However, when the zero lower bound on the nominal interest rate is accounted for, self-fulfilling deflationary spirals can occur, depending on the credibility of the central bank. Deflationary spirals can be prevented with a high inflation target and aggressive monetary easing.

### *Managing unanchored, heterogeneous expectations and liquidity traps*

We study the possibility of (almost) self-fulfilling waves of optimism and pessimism and self-fulfilling liquidity traps in a New Keynesian model with a continuum of heterogeneous expectations. In particular, all agents choose, based on past forecasting performance, expectation values out of a distribution around the targets of the central bank. This framework allows us to explicitly model the “anchoring” of expectations as the variance of this distribution of possible expectation values. We find that when the zero lower bound on the nominal interest rate is not binding, adequate monetary policy can prevent waves of optimism and pessimism and exclude near unit root dynamics, even when expectations are unanchored. However, as shocks bring the economy to a situation with a binding zero lower bound, there is a danger of a long lasting self-fulfilling liquidity trap that can take the form of a deflationary spiral. This can be prevented if expectations are strongly enough anchored to the targets, or if the inflation target is high enough.

### *The Extensive Margin of Trade and Monetary Policy*

This paper studies the effects of monetary policy shocks on firms’ participation in exporting. The VAR analysis shows that the extensive margin of exports declines in response to domestic expansionary monetary shocks. We develop a two-country dynamic stochastic general equilibrium model in which heterogeneous firms make forward-looking decisions on whether to participate in the export market and prices are staggered across firms and time. We show that while lower interest rates and a currency depreciation associated with an expansionary monetary policy help to increase the value of exporting, the inflationary effects of the policy stimulus weaken the competitiveness of some firms, resulting in a contraction in firms’ export participation. In contrast, positive productivity shocks lead to a currency depreciation and an expansion in export participation at the same time. We show that, overall, the extensive margin is more

sensitive to firms' price competitiveness with other firms in the export market than to exchange rate movements or interest rates.

### *A Framework for Analyzing Monetary Policy in an Economy with E-money*

This paper considers an economy where central-bank-issued fiat money competes with privately issued e-money. We study a policy-setting game between the central bank and the e-money issuer and find (1) the optimal monetary policy of the central bank depends on the policy of the private issuer and may deviate from the Friedman rule; (2) there may exist multiple equilibria; (3) when the economy approaches a cashless state, the central bank's optimal policy improves the market power of the e-money issuer and can lead to a discrete decrease in welfare and a discrete increase in inflation; and (4) first best cannot be achieved. Central-bank-issued e-money leads to a simple optimal policy that achieves the first best.

### *The Productivity Slowdown in Canada: An ICT Phenomenon?*

We ask whether a weaker contribution of information and communication technologies (ICT) to productivity growth could account for the productivity slowdown observed in Canada since the early 2000s. To answer this question, we consider several methods capturing channels through which ICT could affect aggregate productivity growth. This includes an approach "à la Cetté et al. (2015)" that focuses on the use of ICT capital. We also examine two-sector models including a simple approach with use and production effects, and an approach "à la Oulton (2012)" that highlights the role of relatively weak growth in ICT prices. However, Oulton's approach is based on strong assumptions about the structure of the economy, some of which are clearly inconsistent with Canadian data. We therefore propose a different model based on assumptions that are less restrictive but that still capture various channels (production, capital deepening, price effects). Our results indicate that ICT continues to contribute to productivity growth, but that this contribution has declined and accounts for part of the productivity slowdown. However, the slowdowns in productivity and in the contribution of ICT do not seem to have the same timing. While productivity slowed in the early 2000s, ICT contribution does not appear to have fallen until around the Great Recession. This prompts the conclusion that while ICT had little to no role in the initial productivity slowdown, it has been a major determinant of the subdued productivity growth since around the recession.

### *Can Capital Deepening Explain the Global Decline in Labor's Share?*

We estimate an aggregate elasticity of substitution between capital and labor near or below one, which implies that capital deepening cannot explain the global decline in labor's share. Our methodology derives from transition paths in the neo-classical growth model. The elasticity of substitution is identified from the cross-country correlation between trends in the labor share and (a proxy for) the rental rate of capital. Trends in labor's share and the rental rate are weakly correlated across countries, and inversely related in most samples. Previous cross-country estimates of this elasticity were substantially greater than one, which we show was partly due to omitted variable bias: earlier studies used investment prices alone to proxy for the rental rate, whereas the growth model relates rental rates to investment prices and consumption growth.

### *Frictional Capital Reallocation I: Ex Ante Heterogeneity*

This paper studies dynamic general equilibrium models where firms trade capital in frictional markets. Gains from trade arise due to ex ante heterogeneity: some firms are better at investment, so they build capital in the primary market; others acquire it in the secondary market. Cases are considered with random search and bargaining, or directed search and posting. For each, we provide results on existence, uniqueness, efficiency and comparative statics. Monetary and fiscal policy are discussed at length. We also discuss how productivity dispersion can be countercyclical while capital reallocation and its price are procyclical.

### *Corporate Debt Composition and Business Cycles*

Based on empirical evidence, I propose a dynamic stochastic general equilibrium model with two financial sectors to analyze the role of corporate debt composition (bank versus bond financing) in the transmission of economic shocks. It is shown that in the presence of monetary and financial shocks, cyclical changes in corporate debt composition significantly attenuate the effects on investment and output. An additional result of the theoretical model is that a bank-dependent economy is more affected by financial shocks, which is in line with empirical results by Gambetti and Musso (2016), who report stronger real effects of loan supply shocks in Europe (with an excessive reliance on bank debt) than in the US.

### *The Distributional Effects of Conventional Monetary Policy and Quantitative Easing: Evidence from an Estimated DSGE Model*

This paper compares the distributional effects of conventional monetary policy and quantitative easing (QE) within an estimated open-economy DSGE model of the euro area. The model includes two groups of households: (i) wealthier households, who own financial assets and can smooth consumption over time, and (ii) poorer households, who only receive labor and transfer income and live “hand to mouth.” We compare the impact of policy shocks on constructed measures of income and wealth inequality (net disposable income, net asset position, and relative per-capita income). Except for the short term, expansionary conventional policy and QE shocks tend to mitigate income and wealth inequality between the two population groups.

## UPCOMING EVENTS

George Pennacchi (University of Illinois), 23 March 2019  
Organizer: Toni Ahnert (FSD)

Christopher Rauh (University of Montreal), 23 March 2019  
Organizer: Gabriella Galassi (CEA)

Darrell Duffie (Stanford), 2 April 2019  
Organizer: Jean-Sébastien Fontaine (FMD)

Simon Gilchrist (NYU), 5 April 2019  
Organizer: Anthony Landry (CEA)

Daniel Andrei (McGill Desautels), 18 April 2019  
Organizer: Guihai Zhao (FMD)

David M. Arseneau (Federal Reserve Board), 25 April 2019  
Organizer: Corey Garriott & Jason Allen (FMD)

Alexander Bick (Arizona State University), 1 May 2019  
Organizer: Natalia Kyui (CEA)

Yueran Ma (Chicago Booth), 2 May 2019  
Organizer: Guihai Zhao (FMD)

Toni M. Whited (University of Michigan), 9 May 2019  
Organizer: Jason Allen (FMD)

Michael Kiley (Federal Reserve Board), 10 May 2019  
Organizer: Laurent Martin (CEA)

Olivier Coibion (University of Texas at Austin), 16 May 2019  
Organizer: Lerby (Murat) Ergun (FMD)

Gregory R. Duffee (John Hopkins University), 23 May 2019  
Organizer: Jean-Sébastien Fontaine (FMD)

Adriana Z. Robertson (University of Toronto), 13 June 2019  
Organizer: Corey Garriott & Jason Allen (FMD)

Linda Tesar (University of Michigan), 21 June 2019  
Organizer: Daniela Hauser (CEA)

Domenico Giannone (Federal Reserve Bank of New York), 27 June  
2019  
Organizer: Rodrigo Sekkel (FMD)

Ben Lester (Federal Reserve Bank of Philadelphia), 12 September  
2019  
Organizer: Jean-Sébastien Fontaine (FMD)

David Berger (Northwestern), 13 September 2019  
Organizer: Anthony Landry (CEA)

Lucian (Luke) Taylor (Wharton), 26 September 2019  
Organizer: Jon Witmer (FMD)

Giorgio Primiceri (Northwestern), 27 September 2019  
Organizer: Joel Wagner (CEA)

Patrick Augustin (McGill Desautels), 3 October 2019  
Organizer: Corey Garriott (FMD)

Catherine Tucker (Massachusetts Institute of Technology), 19  
November 2019  
Organizer: Shota Ichihashi (CEA)