BANK OF CANADA
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# Bank of Canada Monthly Research Update

April 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

## In-Press

Chiu, Jonathan & Koeppl, Thorsten, "Blockchain-Based Settlement for Asset Trading", The Review of Financial Studies, Vol 32(5): 1716–1753, May 2019.

Van Oordt, Maarten & Zhou, Chen, "Systemic Risk and Bank Business Models", Journal of Applied Econometrics, Vol 34(3): 365-384, 2019.

## Forthcoming

Glover, Andrew & Short, Jacob, "Can Capital Deepening Explain the Global Decline in Labor's Share?", Review of Economic Dynamics (RED)

# STAFF WORKING PAPERS

Albouy, David & Chernoff, Alex & Lutz, Chandler & Warman, Casey, "Local Labor Markets in Canada and the United States", Bank of Canada Staff Working Paper 2019-12

Brouillette, Dany & Robitaille, Marie-Noëlle & Savoie-Chabot, Laurence & St-Amant, Pierre & Gueye, Bassirou & Nelson, Elise, "The Trend Unemployment Rate in Canada: Searching for the Unobservable", Bank of Canada Staff Working Paper 2019-13

Shcherbakov, Oleksandr, "Firm-level Investment Under Imperfect Capital Markets in Ukraine", Bank of Canada Staff Working Paper 2019-14

Hauser, Daniela & Seneca, Martin, "Labor Mobility in a Monetary Union", Bank of Canada Staff Working Paper 2019-15

Kerem Tuzcuoglu, "Composite Likelihood Estimation of an Autoregressive Panel Probit Model with Random Effects", Bank of Canada Staff Working Paper 2019-16

Mayer, Thierry & Steingress, Walter, "Estimating the Effect of Exchange Rate Changes on Total Exports", Bank of Canada Staff Working Paper 2019-17

## STAFF DISCUSSION PAPERS

Bailliu, Jeannine & Bilgin, Doga & Mo, Kun & Niquidet, Kurt & Sawatzky, Benjamin, "Global Commodity Markets and Rebalancing in China: The Case of Copper", Bank of Canada Staff Discussion Paper 2019-3

Mo, Kun & Suvankulov, Farrukh & Griffiths, Sophie, "Financial Distress and Hedging: Evidence from Canadian Oil Firms", Bank of Canada Staff Discussion Paper 2019-4

## ABSTRACTS

### *Blockchain-Based Settlement for Asset Trading*

Can securities be settled on a blockchain, and, if so, what are the gains relative to existing settlement systems? The main benefit of a blockchain is faster and more flexible settlement, whereas settlement fails need to be ruled out where participants fork the chain to cancel trading losses. With a proof-of-work protocol, the blockchain needs to restrict settlement speed through block size and time in order to generate transaction fees, which finance costly mining. Despite mining being a deadweight cost, our estimates for the U.S. corporate debt market yield net gains from a blockchain in the range of 1–4 bps.

### *Estimating the Effect of Exchange Rate Changes on Total Exports*

In this paper, we decompose banks' systemic risk into two dimensions: the risk of a bank ("bank tail risk") and the link of the bank to the system in financial distress ("systemic linkage"). Based on extreme value theory, we estimate a systemic risk measure that can be decomposed into two subcomponents reflecting these dimensions. Empirically, we assess the relationships of bank business models to the two dimensions of systemic risk. The observed differences in these relationships partly explain why micro- and macroprudential perspectives sometimes have different implications for banking regulation.

### *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.

### *Local Labor Markets in Canada and the United States*

We examine local labor markets in the United States and Canada from 1990 to 2011 using comparable household and business data. Wage levels and inequality rise with city population in both countries, albeit less in Canada. Neither country saw wage levels converge despite contrasting migration patterns from/to high-wage areas. Local labor demand shifts raise nominal wages similarly, although in Canada they attract immigrant and highly skilled workers more, while raising housing costs less. Chinese import competition had a weaker negative impact on manufacturing employment in Canada. These results are consistent with Canada's more redistributive transfer system and larger, more-educated immigrant workforce.

### *The Trend Unemployment Rate in Canada: Searching for the Unobservable*

In this paper, we assess several methods that have been used to measure the Canadian trend unemployment rate (TUR). We also consider improvements and extensions to some existing methods. The assessment is based on four criteria: (i) the extent to which methods provide explanations for changes in trend unemployment; (ii) whether revisions to unemployment gap (UGAP, the difference between the actual unemployment rate and TUR) estimates are well behaved; (iii) if UGAPs provide information about future inflation; and (iv) if UGAPs help explain historical data about wages and consumer price inflation. In our assessment of conformity to the second and third criteria, we use real-time data, i.e., the data available to policymakers at the time of making decisions. We find that while all methods we consider have both strengths and weaknesses, those based on variables thought to determine TUR provide better interpretation and tend to do at least as well as others against the other criteria. These are most promising for future work.

Nevertheless, there is considerable uncertainty about the value of TUR, which suggests it would be prudent to use a range of models in research or policy work. While estimates of TUR have declined since the mid-1990s, it is assessed to range between 5.6 and 6.7 per cent in 2018Q4.

## *Firm-level Investment Under Imperfect Capital Markets in Ukraine*

This paper develops and estimates a model of firm-level fixed capital investment when firms face borrowing constraints. Dynamically optimal investment functions are derived for the firms with and without financial constraints. These policy functions are then used to construct the likelihood of observing each of the investment regimes in the data. Structural parameters are estimated using data from the Ukrainian manufacturing sector in 1993–1998. I provide empirical evidence of the role of market and ownership structure for firm-level investment behavior. I also discuss the effects of international trade exposure and involvement in non-monetary transactions on the probability of facing financial constraints and the resulting fixed capital accumulation path. Estimation results are used to illustrate the welfare implications of financial constraints in the Ukrainian manufacturing sector.

## *Labor Mobility in a Monetary Union*

The optimal currency literature has stressed the importance of labor mobility as a precondition for the success of monetary unions. But only a few studies formally link labor mobility to macroeconomic adjustment and policy. In this paper, we study macroeconomic dynamics and optimal monetary policy in an economy with cyclical labor flows across two distinct regions that share trade links and a common monetary framework. In our New Keynesian dynamic, stochastic, general-equilibrium model calibrated to the United States, migration flows are driven by fluctuations in the relative labor market performance across the monetary union. While labor mobility can be an additional channel for cross-regional spillovers as well as a regional shock absorber, we find that a mobile labor force closes the efficiency gaps in the labor market and thus lessens the trade-off between inflation and labor market stabilization. As migration flows are generally inefficient, however, region specific disturbances introduce additional trade-offs with regional labor market conditions. Putting some weight on stabilizing fluctuations in the labor market enhances welfare when monetary policy follows a simple rule.

## *Composite Likelihood Estimation of an Autoregressive Panel Probit Model with Random Effects*

Modeling and estimating persistent discrete data can be challenging. In this paper, we use an autoregressive panel probit model where the autocorrelation in the discrete variable is driven by the autocorrelation in the latent variable. In such a non-linear model, the autocorrelation in an unobserved variable results in an intractable likelihood containing high-dimensional integrals. To tackle this problem, we use composite likelihoods that involve much lower order of integration. However, parameter identification becomes problematic since the information employed in lower dimensional distributions may not be rich enough for identification. Therefore, we characterize types of composite likelihoods that are valid for this model and study conditions under which the parameters can be identified. Moreover, we provide consistency and asymptotic normality results of the pairwise composite likelihood estimator and conduct Monte Carlo simulations to assess its finite-sample performances. Finally, we apply our method to analyze credit ratings. The results indicate a significant improvement in the estimated transition probabilities between rating classes compared with static models.

## *Estimating the Effect of Exchange Rate Changes on Total Exports*

This paper shows that real effective exchange rate (REER) regressions, the standard approach for estimating the response of aggregate exports to exchange rate changes, imply biased estimates of the underlying elasticities. We provide a new aggregate regression specification that is consistent with bilateral trade flows micro-founded by the gravity equation. This theory-consistent aggregation leads to unbiased estimates when prices are set in an international currency as postulated by the dominant currency paradigm. We use Monte-Carlo simulations to compare elasticity estimates based on this new “ideal-REER” regression against typical regression specifications found in the REER literature. The results show that the biases are small (around 1 percent) for the exchange rate and large (around 10 percent) for the demand elasticity. We find empirical support for this prediction from annual trade flow data. The difference between elasticities estimated on the bilateral and aggregate levels reduces significantly when applying an ideal-REER regression rather than a standard REER approach.

## *Global Commodity Markets and Rebalancing in China: The Case of Copper*

Given that China accounts for about half of global copper consumption, it is reasonable to expect that any significant change in Chinese copper consumption will have an impact on the global market. This paper examines the likely impact of the rebalancing of the Chinese economy on its copper consumption over the next decade, focusing on the relationship between the copper intensity of GDP and the share of investment in GDP. We use a panel smooth transition regression model to account for potential non-linearities in this relationship at different levels of urbanization and income. Our findings suggest that there is indeed a significant relationship between a country's copper intensity of GDP and its investment share. Our baseline rebalancing scenario for China implies that copper intensity in China has already peaked and is expected to decline steadily through the next decade. This anticipated reduction in Chinese copper intensity is the result of the dampening impact of rebalancing and higher per capita income on copper intensity, which more than offsets the upward pressure stemming from the ongoing process of urbanization. An exploration of alternative rebalancing scenarios suggests that China's rebalancing path could have a significant impact on global copper consumption.

### *Financial Distress and Hedging: Evidence from Canadian Oil Firms*

The paper explores the link between financial distress and the commodity price hedging behaviour of Canadian oil firms. Specifically, we argue that the expected costs of financial distress have been associated with the hedging behaviour for Canadian oil firms between 2005 and 2015. We use firm-level annual data for 92 Canadian-based, publicly traded oil extraction companies. Results from Honore's semiparametric model for panel data with fixed effects and Heckman's two-step model show that firms with higher short-term and long-term debt tend to hedge more. Furthermore, an increase in the Altman bankruptcy score by one is associated with the decline of the hedge ratio by 1.2 to 1.7 percentage points.

## UPCOMING EVENTS

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)

Oleksandr Talavera (Swansea University), 31 May 2019
Organizer: Oleksiy Kryvtsov (INT)

Cedric Tille (The Graduate Institute Geneva), 7 June 2019
Organizer: Gurnain Pasricha (INT)

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)

Harald Fadinger (University of Mannheim), 25 June 2019
Organizer: Walter Steingress (CEA/INT)

Bernabe Lopez-Martin (Central Bank of Chile), 2 July 2019
Organizer: Christopher Hajzler (INT)

Marc Giannoni (Federal Reserve Bank of Dallas), 6 September 2019
Organizer: José Dorich (CEA)

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)

Domenico Giannone (Federal Reserve Bank of New York), 2 October 2019
Organizer: Rodrigo Sekkel (FMD)

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

Ufuk Akcigit (University of Chicago), 11 October 2019
Organizer: Ben Tomlin (CEA)

Virgiliu Midrigan (New York University), 25 October 2019
Organizer: Katsiaryna Kartashova (CEA)

Morten Ravn (University College London), 15 November 2019
Organizer: Martin Kuncl (CEA)

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