Bank of Canada Annual Economic conference

Discussion of Rubbo's

"What Drives Inflation? Lessons from Disaggregated Price Data"

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The Paper

- Great paper!
- Different angle to look at the drivers of aggregate (and sectoral) inflation, with an application to the period during and after the C0VID-19 pandemic
- Paper does a lot of interesting things; my discussion will focus on a subset of them

The Paper in a Nutshell

- Assume potential and actual output are subject to the same supply shocks
- In one-sector (or fully symmetric multi-sector) models:

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa \tilde{y}_t$$

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- In heterogeneous multi-sector models, shocks lead to changes in sectoral relative prices

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa \tilde{y}_t + u_t$$

$\downarrow$

endogenous

cost-push residual

The Paper in a Nutshell

- Example: toy 2-sector model
  - Production only depends on labor (with CRS)
  - Labor is mobile and Frisch elasticity is infinite
  - Discount factor is nil
  - Only source of heterogeneity is sectoral price rigidity ($\phi_f < \phi_r$)
  - Only shocks are sectoral productivity shocks

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- NKPC:

$$\pi_t = \kappa \tilde{y}_t + \underbrace{\frac{\phi_f - \bar{\phi}}{2\bar{\phi}} z_{f,t} + \frac{\phi_r - \bar{\phi}}{2\bar{\phi}} z_{r,t} + \mathcal{F}(\mathbf{p}_{t-1})}_{u_t}$$

where $\kappa = \frac{1-\bar{\phi}}{\bar{\phi}}$ and $\bar{\phi} = \frac{\phi_f + \phi_r}{2}$

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- Under zero output gap, aggregate inflation rises when a negative productivity shock originates in the flex-price sector

The Paper in a Nutshell

- In more general settings:
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- In more general settings:
- u_t depends on price gaps: $\chi_t = \mathbf{p}_{t-1} - \mathbf{p}_t^{nat}$
- Under zero output gap, aggregate inflation is higher when negative productivity shocks (or positive demand shocks) originate in industries that:
  - Have higher cost pass-through (i.e., sectors with less rigid prices, closer to the final consumer, etc.): Prediction 1
  - Use relatively inelastic primary factors: Prediction 2

The Paper in a Nutshell

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    - Takes the underlying model too seriously (rational expectations, monetary policy rule, shock processes)

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- Standard approach to decompose inflation is to measure the relative contribution of the different structural shocks to its variance
  - Takes the underlying model too seriously (rational expectations, monetary policy rule, shock processes)
- Elisa's contribution: alternative decomposition that focuses on $\tilde{y}_t$ and χ_t as the drivers of inflation
  - Inflation component driven by output being different from potential vs component driven by relative price gaps under zero output gap
  - Amounts to constructing suitably weighted aggregate and relative inflation indices: π_t^{DC} and π_t^{χ}
  - **Advantage**: Only requires knowledge of sectoral Phillips curves $\Longrightarrow$ robust to expectation formation, monetary policy, etc.
  - **Drawback**: Without further assumptions, one cannot identify (fundamental) aggregate and industry-specific shocks

The Paper in a Nutshell

- Industry-specific shocks played a significant role in explaining aggregate inflation in the U.S. during the pandemic
- After 2021, U.S. inflation was mostly driven by the aggregate output gap
- Generally consistent with Ruge-Murcia and Wolman (2024)'s results

Testing Predictions 1 and 2

- Prediction 1: Negative productivity shocks to flexible-price sectors should lead to a larger response of aggregate inflation
- Prediction 2: Negative productivity shocks to inelastic sectors should lead to a larger response of aggregate inflation

Testing Predictions 1 and 2

- Use data from the NBER-CES Manufacturing industry database:
  - Annual data on output, employment, payroll and other input costs, investment, capital stocks, five-factor TFP for a pool of 462 manufacturing industries
- Construct utilization-adjusted sectoral TFP measures, $z_{s,t}$, following Kimball (2014)
- Estimate sectoral VARs using the observables $z_{s,t}, y_{s,t}, \pi_{s,t}, y_t, \pi_t$
- Identify sectoral productivity shocks as the reduced-form innovations to $z_{s,t}$ that lead to negative comovement b/w $y_{s,t}$ and $\pi_{s,t}$

Testing Predictions 1 and 2

- Prediction 1: Negative (positive) productivity shocks to flexible-price (stickier-price) sectors should lead to a larger response of aggregate inflation
- For well-behaved sectoral TFPs, run the regression (Bouakez, Höynck and Rachedi, 2024):

$$\begin{aligned}\pi_t &= \beta_1 \Delta z_{s,t} + \beta_2 \Delta z_{s,t} \times \mathbb{I}_{s \in \text{Calvo }_{25-50}} \\ &\quad + \beta_3 \Delta z_{s,t} \times \mathbb{I}_{s \in \text{Calvo }_{50-75}} + \beta_4 \Delta z_{s,t} \times \mathbb{I}_{s \in \text{Calvo }_{75-100}} + \epsilon_{s,t}\end{aligned}$$

- Expect: $0 \leq \beta_2 \leq \beta_3 \leq \beta_4$

Testing Predictions 1 and 2

Results (Bouakez, Höynck and Rachedi, 2024)

	Dependent Variable: π_t			
	Baseline	Fixed Effects	Sectoral Controls	Value Added Weighted
$\Delta z_{s,t}$	-0.026** (0.013)	-0.031** (0.013)	-0.030** (0.014)	-0.028*** (0.008)
$\Delta z_{s,t} \times \mathbb{I}_{s \in \text{Calvo}\ 25-50}$	0.035** (0.014)	0.044*** (0.015)	0.044*** (0.015)	0.041*** (0.011)
$\Delta z_{s,t} \times \mathbb{I}_{s \in \text{Calvo}\ 50-75}$	0.030** (0.015)	0.035** (0.014)	0.041*** (0.016)	0.040*** (0.011)
$\Delta z_{s,t} \times \mathbb{I}_{s \in \text{Calvo}\ 75-100}$	0.042*** (0.015)	0.047*** (0.015)	0.045*** (0.016)	0.045*** (0.011)
Industry Fixed Effects	NO	YES	YES	YES
Sectoral Controls	NO	NO	YES	YES
N. Observations	18,560	18,560	18,240	18,240
$\beta_1 + \beta_4$	0.016** (0.007)	0.015** (0.007)	0.017** (0.007)	0.017** (0.007)

Testing Predictions 1 and 2

- Prediction 2: Negative productivity shocks to sectors that use more inelastic factors should lead to a larger response of aggregate inflation
- Example of inelastic sectors:
  - Wood Product Manufacturing
  - Paper Manufacturing
  - Petroleum and Coal Products Manufacturing
  - Chemical Manufacturing
  - Primary Metal Manufacturing

Testing Predictions 1 and 2

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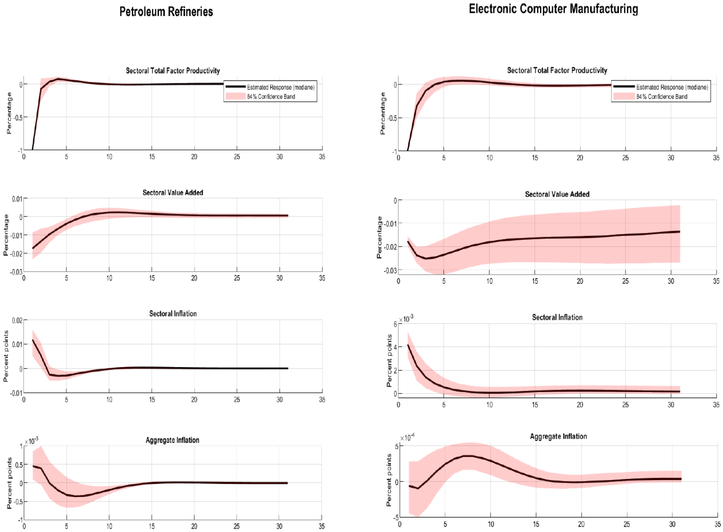
- I find:

$$\frac{d\pi_t}{dz_{s,t}^{inelastic}} > \frac{d\pi_t}{dz_{s,t}^{elastic}}$$

Testing Predictions 1 and 2

Figure: IRFs to a Negative TFP Shock.



Robustness

- Reliability of the decomposition crucially depends on sectoral Phillips curves being correctly specified and calibrated
- How robust are the results to:
  - Non-homothetic preferences and technology?
  - Indexation?
  - Trend inflation?
  - Alternative price-setting protocols?
- How sensitive is the decomposition to small perturbations in the values of the micro-level primitives?