Could Intra-Firm Misalignment Explain Price-Setting Patterns?

Victor Monteiro and Diogo Guillén

Presented by Victor Monteiro

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Motivation

- The literature on price-setting is based, mainly, on two frictions:
  - Physical Cost Friction - Menu Cost
  - Information Friction - Rational Inattention and Sticky Information
- However, both strands overlook managerial decisions and firms' structure even though papers had already cited its relevance as:
  - *Zbaracki et al (2004):*
    "The evidence suggests that the internal structure of the organization plays an important role in shaping the outcomes of pricing interventions."
- Thus, we try to fill this gap looking to:
  - Firms' incentives and their within communication
- Then, a question comes up, what happens when we look to information, structure and incentives within the firm in a macro model?

Theoretical Contribution

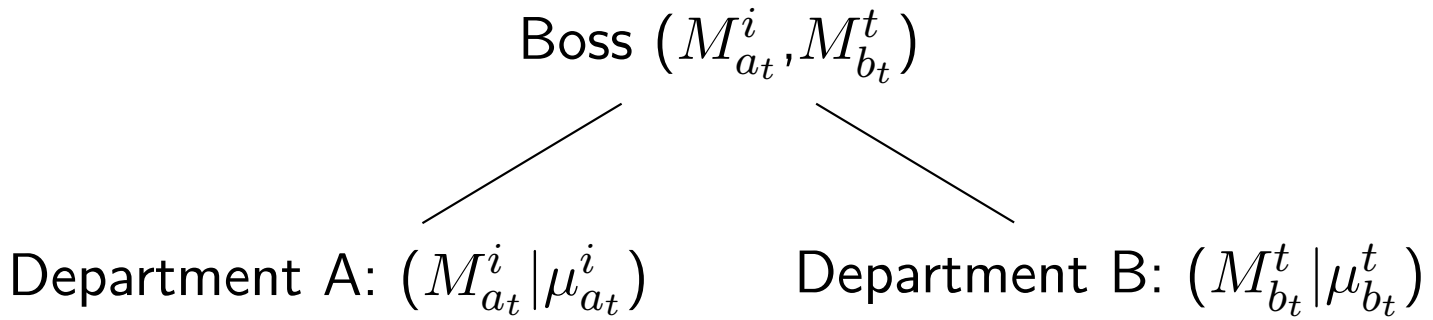
- We derive a newly multi-sector NK DSGE model, under incomplete information, due misalignment intra-firm.
- Show that within-firm misalignment in the communication generates price stickiness and non-neutrality of money.
- Elucidate how it also matters to find price-setting behavior, optimal policy and welfare of the economy.
- Derive a new Phillips curve where the misalignment of incentives and the number of divisions of a given firm drive their slope.

Contribution

- Combining our intra-firm communication mechanism with a proprietary scraped price database we fit the price behavior and its stylized facts, as:
  - Small changes in prices;
  - Heterogeneity on price-setting;
  - Reference/Sales price behavior;
  - Gathering information-misalignment;
- On the macro side, our New Keynesian model highlights the relevance of within firm incentives on optimal monetary policy and welfare:
  - Generating non-neutrality of money;
  - Reducing power of monetary policy according to the number of sectors;
  - Creates a negative relationship between intra-firm misalignment and welfare.

Intuition of Partial Equilibrium Model

- This intuition can be illustrated by the following representation:



Where:
$M^i_{a_t}$ = Message sent by micro department to the boss
$M^t_{b_t}$ = Message sent by macro department to the boss
$\mu^i_{a_t}$ = Private Belief of micro department
$\mu^t_{b_t}$ = Private Belief of macro department

Partial Equilibrium Model

- Then, the profit problem of the boss incorporates the message received by each department:

$$Max[\sum_{t=0}^{\infty}\beta^t\pi(P_{it}, P_t, Y_t, Z_{it}|M_i, M_j)]$$

- It is important to highlight that one way to understand the misalignment is the private information, μ_j, μ_i, be different than the message sent, M_i and M_j.

Partial Equilibrium Model

- Then, optimal price set by the firm under symmetric equilibrium is given by:

$$p_{it} = p_t + \frac{\pi_{13}}{|\pi_{11}|}(1 + t_i)(1 + h)^{t_i} + \frac{\pi_{14}}{|\pi_{11}|}(1 + t)(1 + k)^t \qquad (1)$$

- Following Ball and Romer (1990) higher the misalignment of each margin greater should be the importance of the respective margin to explain variation in prices.

Partial Equilibrium Model

- Using the previous setup we engage the players in a sender-receiver game, where their payoffs are given by:

$$
\begin{aligned}
L^{boss} &= \left[p_{it} - \left(p_t + \frac{\pi_{13}}{|\pi_{11}|} y_t + \frac{\pi_{14}}{|\pi_{11}|} z_{it}\right)\right]^2 \\
L^{micro} &= \left[p_{it} - \left(p_t + \frac{\pi_{13}}{|\pi_{11}|} y_t + \frac{\pi_{14}^{micro}}{|\pi_{11}|} z_{it}\right)\right]^2 \\
L^{macro} &= \left[p_{it} - \left(p_t + \frac{\pi_{13}^{macro}}{|\pi_{11}|} y_t + \frac{\pi_{14}}{|\pi_{11}|} z_{it}\right)\right]^2
\end{aligned}
$$

- Then, this environment guarantees that such information revelation game is partitioned.

Partitioned-Equilibrium

Lemma

If the optimal actions chosen from the micro research department and the boss are different, for every realization of z_{it}, then $\exists \varepsilon$: $\forall u, v$, $|u - v| \geq \varepsilon$, where u and v are actions induced in equilibrium. Further, the set of actions induced in equilibrium is finite.

The Dynamic Phillips Curve

- Our sectoral Phillips curve is given by:

$$\pi^*_{kt} = \alpha_j \pi_t - (1-\alpha_j) E_t \pi_{t+1} + \gamma_j \Delta E_t y_{t+1} + \chi_j \pi_{kt} + E_t(\pi^*_{k,t+1} - \pi_{t+1}) \tag{2}$$

  Where: $\alpha = \frac{\Pi_{12}}{|\Pi_{11}|}$, $\gamma = \frac{\Pi_{13}}{|\Pi_{11}|}$, $\chi = \frac{\Pi_{15}}{|\Pi_{11}|}$.

- To get the aggregate Phillips curve we consider the following aggregation:

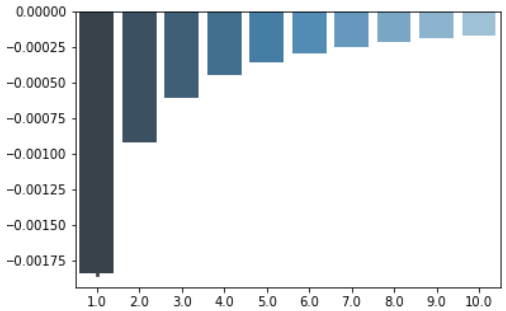
$$\pi^*_t = \sum_{i=1}^{K} \mu_i \pi^*_{kt} \tag{3}$$

- Then, our Phillips curve elucidates two new results:
  - Misalignment of incentives and the number of divisions of a given firm drive the slope of the Phillips curve.
  - Communication within the firm affects directly the sectoral inflation and the persistence of monetary policy.

Database

- Daily price data collected from online and offline retailers (mainly supermarkets) to Brazil;
- From July first of 2018 until August first of 2021, with more than 6 millions of observations per supermarket;
- Classified in four levels:
  - Supermarket
  - Sector
  - Category
  - Individual

Misalignment x Partitions



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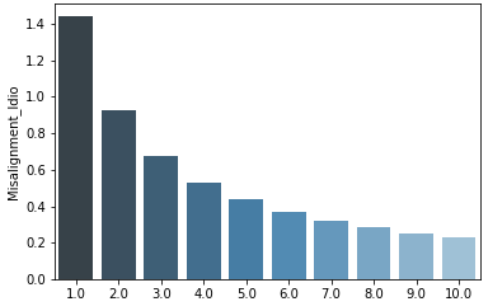

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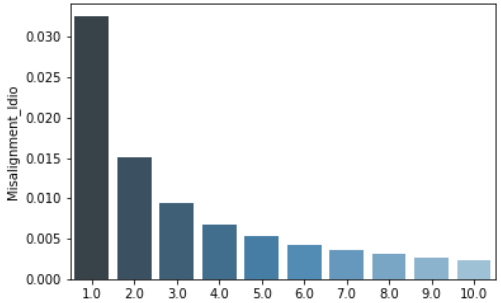

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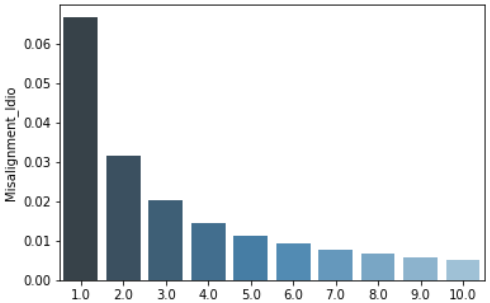

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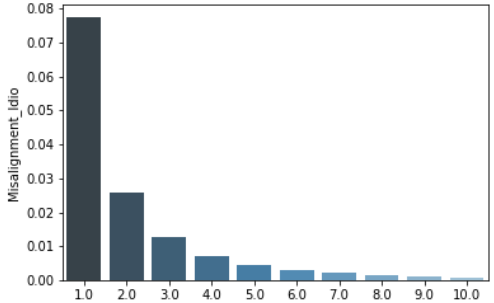

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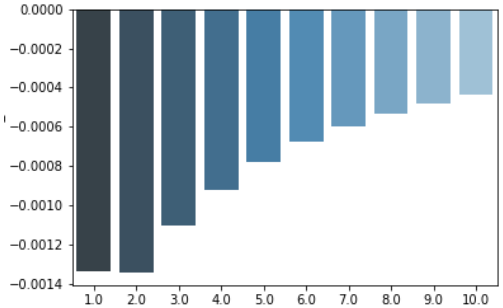
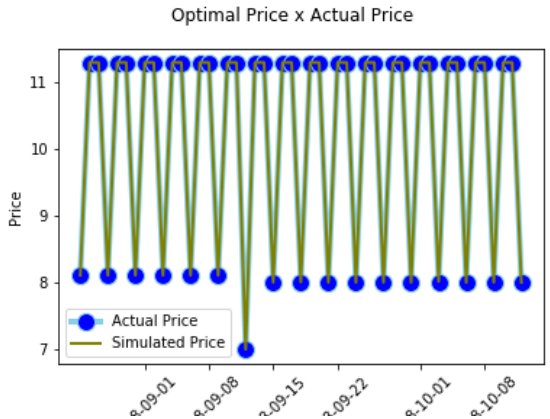


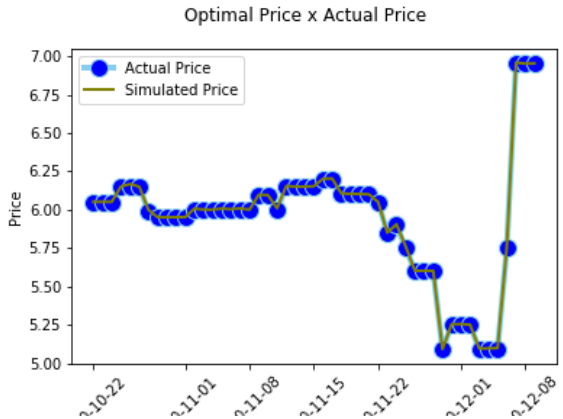
Retailer 6

Figure: Misalignment x Partition

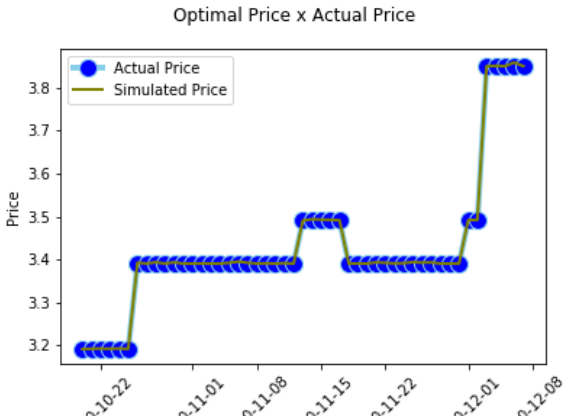
Do Retailers Match our Optimal Prices?



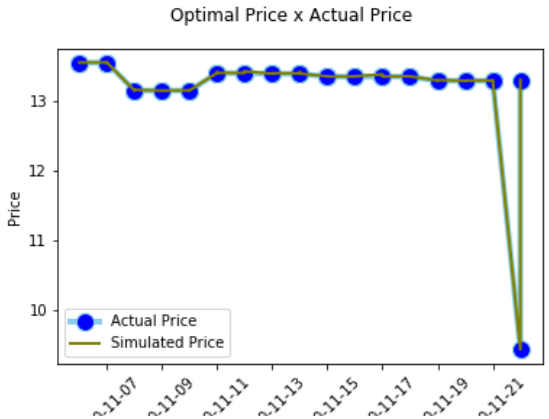
Apple



Rice



Tomato Sauce



Soap Powder

Figure: Examples of Optimal Price Simulation