Optimal Monetary Policy in Production Networks

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Discussed by
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Introduction

- Outline for this discussion
  1. Brief overview of standard production network model
  2. Overview of findings from the paper
  3. Comments and suggestions

Simplest production network model

- We have n firms $i \in \{1, \ldots, n\}$ each with CRS technology

$$y_i = z_i \zeta_i l_i^{\alpha_i} \prod_{j=1}^{n} x_{ij}^{a_{ij}}$$

where z_i is TFP and ζ_i is a constant.

- Look at the minimal cost of producing one unit (numeraire = wage)

$$K_i(p_1, \ldots, p_n) = \min_{x,l} l + \sum_{j=1}^{n} p_j x_{ij}$$

$$\text{subject to } y_i \geq 1$$

- With Cobb-Douglas

$$K_i(p_1, \ldots, p_n) = \frac{1}{z_i} \prod_{j=1}^{n} p_j^{a_{ij}}$$

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Simplest production network

- Under perfect competition, it must be that

$$p_i = K_i\left(p_1, \ldots, p_n\right)$$

$$p_i = \frac{1}{z_i} \prod_{j=1}^{n} p_j^{a_{ij}} \qquad (\star)$$

- **Things to notice:**
  1. Price of a good depends on its TFP and on the price of its inputs.
  2. Prices propagate **downstream**

- **Hulten's theorem**:

$$\frac{d \log Y}{d \log z_i} = v_i$$

where $v_i = \frac{p_i y_i}{\sum_{j=1}^{n} p_j c_j}$ is the **Domar weight** of i (its sales share)

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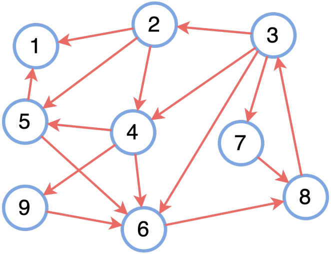
Monetary policy in a network

- Network of firms with sticky prices



- Standard monetary policy in many models: Stabilize the price level to minimize distortions
  - Should we still target a price? Which price? Consumer price index? Producer price index? Some other average of firm prices?
  - All prices are all related

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If we stabilize one price there are consequences all through supply chains.

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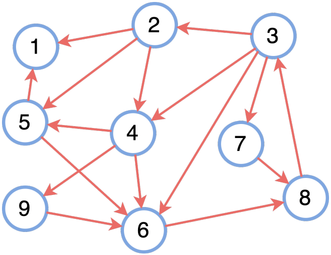

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Production network in the U.S.

Source: Taschereau-Dumouchel (2020), data from Factset 2015

This paper: best way to conduct monetary policy in production network

- Great question without an obvious answer!
- Two key results:
  1. No monetary policy can implement first-best allocation
  2. The optimal monetary policy takes the form

$$\sum_{s=1}^{n} \psi_s \log p_s = 0$$

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Optimal Monetary Policy

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The paper shows that optimal policy puts larger weight ψ_s on

1. industries with larger Domar weights
   - These have the most influence from Hulten's theorem
2. stickier industries
   - These are where the inefficiencies are largest
3. more upstream industries
   - Those have the most impact on other firms (recall prices propagate from a supplier to its customer)
4. industries with less sticky upstreams suppliers and stickier downstream customers
   - Less sticky suppliers $\rightarrow$ own price is volatile
   - Stickier customers $\rightarrow$ large misallocation from volatility

Comments

- Broad comments:
  - Great paper!
  - Elegant theory:
    - just the right ingredients to capture the main forces
    - characterize things sharply even with all the complexity
- Comments that follow
  - Thoughts about big picture and next steps
  - Suggestions about exposition

Thoughts/Suggestions

- **Static model in a dynamic world**
  - In reality, price setting is a forward looking activity
    - Firms want to minimize future cost of price adjustment
  - This is absent from the paper
  - Not clear what are the implications of introducing dynamics here
    - Best guess: no fundamental change in main mechanism but maybe in magnitude
  - Dynamics in network models can easily become intractable...

Thoughts/Suggestions

- **Only downstream propagation of shocks (I think)**
  - Under different demand structure they could also propagate upstream
    - If a customer changes its price, its sales might change and its demand from a supplier would also change. If supplier has monopoly power they might change their price.
  - This would add an additional channel for monetary policy to operate
  - Not clear how important this channel is in reality

Thoughts/Suggestions

- **What if the policy maker does not know the detailed micro-structure?**
  - Lots of information is needed to conduct optimal monetary policy
    - Full network, price stickiness parameters, etc...
  - Surprising finding from the paper: stabilizing the output gap is almost as good as the optimal policy

	optimal policy (1)	output-gap stabilization (2)
Welfare loss (percent consumption)	2.98	2.99
within-industry misallocation	2.66	2.67
across-industry misallocation	0.32	0.32
output gap volatility	10^{-5}	0
Cosine similarity to optimal policy	1	0.9957

  - Is that a general result? Or is it a coincidence?
  - Would be very interesting if a general (Hulten like) result could be established

Concluding thoughts

- Great paper!
- Opens the door to further work on this topic