Discussion of “Endogenous Production Networks and Non-Linear Monetary Transmission” by Mishel Ghassibe (2022)

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Paper’s Summary (as I Understood It)

- Model ingredients:
  - endogenous production network
  - nominal rigidities
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- Main theoretical result: *nonlinear transmission of monetary policy*
  - cycle dependence
  - path dependence
  - size dependence
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• Key mechanism:
  ▶ “the strength of complementarities in price setting and monetary non-neutrality increase in the number of suppliers that firms optimally choose to have”
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This Discussion

- Recover the paper’s key insights in a simplified version of the model.
- Some comments on how one may want to interpret the results
A Micky Mouse Model of Endogenous Production Networks

- **Industry 2**: only uses labor for production and is subject to nominal rigidities

  \[
  mc_2 = \frac{w}{z_2}, \quad \log p_2 = (1 - \delta) \log mc_2
  \]
• Industry 2: only uses labor for production and is subject to nominal rigidities

\[ mc_2 = \frac{w}{z_2}, \quad \log p_2 = (1 - \delta) \log mc_2 \]

• Industry 1: No nominal rigidities, but a flexible production technology:

\[ p_1 = mc_1 = \min \left\{ \frac{1}{A} w^{1-\alpha} p_2^\alpha, \frac{1}{B} w^{1-\beta} p_2^\beta \right\} \]

where \( \alpha > \beta \) and \( A > B \).
• **Representative household**: consumes good 1 and has utility: \( u(C, L) = \log C - L. \)

\[ w = m. \]
Micky Mouse Endogenous Networks

\[ mc_1 = \min \left\{ \frac{1}{A} w^{1-\alpha} p_2^\alpha, \frac{1}{B} w^{1-\beta} p_2^\beta \right\} \]

- Industry 1 would use the A-technology if and only if
  \[ \frac{A}{B} \geq \left( \frac{p_2}{w} \right)^{\alpha/\beta}. \]

- Therefore,
  \[
  \log \text{GDP} = \begin{cases} 
  \log A + \alpha (\log m - \log p_2) & \text{if } \frac{A}{B} \geq \left( \frac{p_2}{w} \right)^{\alpha/\beta} \\
  \log B + \beta (\log m - \log p_2) & \text{if } \frac{A}{B} < \left( \frac{p_2}{w} \right)^{\alpha/\beta}
  \end{cases}
  \]
\[
\log \text{GDP} = \max \left\{ \log A + \alpha (\log m - \log p_2), \log B + \beta (\log m - \log p_2) \right\}
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• But recall that

\[
\log p_2 = (1 - \delta) \log m_c = (1 - \delta)(\log m - \log z_2).
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Micky Mouse Endogenous Networks

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- But recall that
  \[ \log p_2 = (1 - \delta) \log m c_2 = (1 - \delta) (\log m - \log z_2). \]

- Therefore,
  \[ \log \text{GDP} = \max \left\{ \log A + \alpha \delta \log m + \alpha (1 - \delta) \log z_2, \right. \]
  \[ \left. \log B + \beta \delta \log m + \beta (1 - \delta) \log z_2 \right\}. \]
Model’s Key Insights

\[
\log GDP = \max \left\{ \log A + \alpha \delta \log m + \alpha (1 - \delta) \log z_2, \quad \log B + \beta \delta \log m + \beta (1 - \delta) \log z_2 \right\}.
\]

- Degree of monetary non-neutrality:

\[
\frac{d \log GDP}{d \log m} = \begin{cases} 
\alpha \delta & \text{if } (m^\delta z_2^{1-\delta})^{\alpha-\beta} > B/A \\
\beta \delta & \text{if } (m^\delta z_2^{1-\delta})^{\alpha-\beta} < B/A 
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(1) *Cycle dependence*: monetary non-neutrality is increasing in \( z_2 \)
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1. *Cycle dependence*: monetary non-neutrality is increasing in \(z_2\)

2. *Path dependence*: monetary non-neutrality is increasing in \(m\)
Model’s Key Insights

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\log GDP = \max \left\{ \log A + \alpha \delta \log m + \alpha (1 - \delta) \log z_2, \log B + \beta \delta \log m + \beta (1 - \delta) \log z_2 \right\}.
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1. **Cycle dependence**: monetary non-neutrality is increasing in \( z_2 \)
2. **Path dependence**: monetary non-neutrality is increasing in \( m \)
3. **Size dependence**: \( \log GDP \) is nonlinear in \( \log m \).
Comment 1

The mini model recovered all insights of the model (albeit in a simplified way).

Yet, it exhibits neither

- extensive margin adjustments (unless $\beta = 0$)
- strategic complementarities in price setting (single sticky industry)

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The mini model recovered all insights of the model (albeit in a simplified way).

Yet, it exhibits neither
- extensive margin adjustments (unless $\beta = 0$)
- strategic complementarities in price setting (single sticky industry)

What matters is that endogenous choice of technology by industry 1 changes the effective degree of price stickiness in the economy.
Comment 2: Pushing Even Further

- same setting as before, but replace endogenous network with a CES technology

\[ mc_1 = \left( (1 - \alpha)w^{1-\theta} + \alpha p_2^{1-\theta} \right)^{\frac{1}{1-\theta}}. \]
Comment 2: Pushing Even Further

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mc_1 = \left( (1 - \alpha)w^{1-\theta} + \alpha p_2^{1-\theta} \right)^{1/(1-\theta)}.
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\[
\log \text{GDP} = \frac{1}{\theta - 1} \log \left( 1 - \alpha + \alpha (m^\delta z_2^{1-\delta})^{\theta-1} \right).
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• degree of monetary non-neutrality:

\[ \frac{d GDP}{d \log m} = \delta \left[ 1 - \frac{1 - \alpha}{1 - \alpha + \alpha (m^{\delta} z_2^{1-\delta})^{\theta - 1}} \right] \]
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\[ \frac{d\text{GDP}}{d\log m} = \delta \left[ 1 - \frac{1 - \alpha}{1 - \alpha + \alpha (m^\delta z_2^{1-\delta})^{\theta-1}} \right] \]

- As long as \( \theta > 1 \), monetary policy is cycle, path, and size dependent.

- **Intuition**: the effective of degree of price stickiness depends on the initial conditions.
Summary

• Really nice paper, masterfully done, and with novel empirical findings (on how monetary shocks reshape the extensive margin of the network).

• More thought about the actual underlying mechanism and interpretation:
  ▶ how central is network endogeneity?
  ▶ how central are the strategic complementarities in price setting?

• What seems to matter is how firms’ input adjustments change the effective of degree of nominal rigidities
  ▶ can happen even in a model with a simple CES technology
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• Would be nice to get results/insights that are fundamentally due to network endogeneity.