On the Propagation of Demand Shocks

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Outline

1. Introduction
2. Environment
3. Equilibrium
4. Additional Results
Popular Narrative

*Household deleveraging or other AD shock*

⇒ *consumers spend less*

⇒ *firms produce and hire less*

⇒ *consumers get poorer and spend even less*

⇒ *firms produce and hire even less*

⇒ ...

⇒ *the Great Recession!*
Does It Make Sense?

- **NO** in the baseline RBC framework (Barro & King, 1984)
  - in GE, interest rates adjust, offsetting shock

- **YES** in the NK framework, provided
  - prices are sticky and **MP is constrained**
  - effects of AD shock rest on **gaps** from flexible price outcomes

- **BUT**
  - ZLB constraint not relevant in earlier recessions

- Does the narrative really require nominal rigidity?
This Paper

- A model of demand driven fluctuations with flexible prices

Key elements:
- Remove CK of aggregate demand shocks (discount & G)
- Forward looking demand and supply decisions

Key mechanisms:
- Confused about whether demand shocks are aggregate or idiosyncratic
  - ⇒ firms & households excessive optimism/pessimism after the shock
  - consistent with survey evidence (e.g. Gennaioli et al., Macro annual)
- Also firm-side feedback loop (e.g. pessimism ↔ produce less)
- Triggers household-side feedback, dynamic, Keynesian multiplier
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Baseline Model

- Two periods, \( t \in \{1, 2\} \): the present and the future
  - AD shock: relative demand between \( t = 1, 2 \)

- A continuum of islands, \( i \in [0, 1] \)
  - decentralized trading, localized info

On each island \( i \),

- A continuum of firms \((i, j)\), each produces differentiated good

- A representative household, \( h = i \)
  - a worker, who works for firms on island \( i \)
  - consumers, consuming on randomly subsets of islands \((C_t^h)\)
Preferences

\[ U^h = U\left(c^h_1, n^h_1\right) + \beta^h U\left(c^h_2, n^h_2\right), \]
\[ U(c, n) = \frac{1}{1-1/\sigma} c^{1-1/\sigma} - \frac{1}{1+\varepsilon} n^{1+\varepsilon} \]

\[ c^h_t = F\left(\left\{ c^h_{i,t} \right\}_{i\in \mathcal{C}^h_t}\right) \quad \text{and} \quad c^h_{i,t} = \xi_i H\left(\left\{ c^h_{i,j,t} \right\}_{j\in [0,1]}\right) \]

- \( c^h_{i,t} \): consumption index for goods on island \( i \) ("category" \( i \))
- \( F \) and \( H \): CES aggregator (with elasticity 1 & \( \rho > 1 \) respectively)

Demand Shocks:

- \( \beta^h \): discount-rate, with \( \log \beta^h = \log \bar{\beta} + \log \delta^h \)
  - \( \bar{\beta} \): AD shocks (proxy Mian-Sufi shock)
- \( \xi_i \): persistent island-specific demand shock
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Firms

**Technology:** Firm \((i, j)\) on island \(i\) producing variety \(j\):

\[
y_{i,j,t} = l_{i,j,t}
\]  \hspace{1cm} (1)

Adjustment cost of labor (real rigidity). With probability \(\theta\):

\[
l_{i,j,1} = l_{i,j,2}
\]

- Key: *forward looking production*
Labor Supply

Labor supply:

\[ w_{i,t} - q_t^i = \kappa n_t^i + \kappa' c_t^i, \quad (2) \]

- \( q_t^i \): price index faced by the representative household on island \( i \)
- Competitive benchmark: \( \kappa = \varepsilon \) and \( \kappa' = \frac{1}{\sigma} \)
- Here for simplicity: \( \kappa' = 0 \) (no wealth effect, like GHH)
Trading is segmented in every island during the first period

- Medium of exchange & numeraire
  - Real: period-2 CES composite
  - no money confusion, Philips curve etc.

- $P_1$: price index of first period composite
  - effectively real interest rate

- Later (nominal): money
Information

- Complete info at $t = 2$ ("long run"), but not at $t = 1$ ("short run")

- Each household $h$ has perfect knowledge
  - her current wage and dividend $(w_{h,t}, e_{h,t})$
  - her discount rate $\beta_t^h$
  - prices of all goods she is purchasing, $(p_{i,j,t})_{i \in J, j \in [0,1]}$

- Each firm $(i,j)$ has perfect knowledge
  - her discount rate $\beta_t^i$
  - her labor cost $w_{i,t}$
  - the demand curve she faces, summarized by $d_{i,j,t}$

$$\int_{\{h : j \in C_t^h\}} c_{j,t}^h dh = d_{i,j,t} (p_{i,j,t})^{-\rho}.$$ (3)
Remark on Informational Assumptions

- Remove **common knowledge** about the AD shock $\beta$

- Decisions based mostly on “local” information
  - “local” may refer to market segmentation

- Complementary foundations:
  - rational inattention (Sims, 2003)
  - behavioral (heuristics, salience)
Complete Information Benchmark

- In equilibrium: Negative AD shock does not cause a recession

\[
\text{Complete Information Benchmark}
\]

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\begin{align*}
\text{In equilibrium:} & \quad \text{Negative AD shock does not cause a recession} \\
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\end{align*}
\]
Incomplete Information: Supply Side

- Momentarily, no forward looking production ($\theta = 0$)

$$y_{i,j,1} = y_{i,1} = \frac{1}{1+\kappa} [d_{i,1} - q^i_1]$$

- Demand goes up, produce more
- Cost goes up, produce less

- Forward looking production ($\theta > 0$)

$$y_{i,j,1} = y_{i,1} = \frac{1}{1+\kappa} \left[ \frac{1}{1+\beta \theta} (d_{i,1} - q^i_1) + \frac{\beta \theta}{1+\beta \theta} E_{i,1} [d_{i,2}] \right]$$
Incomplete Information: Supply Side

\[ y_1 = \frac{1}{\kappa + 1} \left[ \frac{1}{1 + \beta \theta} y_1 + \frac{\beta \theta}{1 + \beta \theta} \int E_{i,1} [d_{i,2}] \, di \right] \]

- \( \bar{\beta} \uparrow \), firms see their own \( d_{i,1} \downarrow \), and expect \( d_{i,2} \downarrow \)

\( \Rightarrow \) AS positively sloped in \( P_1 \) (influences all \( d_{i,1} \))

- Reminiscent to Lucas, but
  - \( P_1 \) is real
  - forward looking
  - **beauty-contest** twist: even a perfectly informed farmer produces more, provided other farmers are confused and produce more
Incomplete Information: Supply Side
Incomplete Information: Demand Side

\[ c_1 = -\sigma \frac{\beta}{1+\beta} (\bar{\beta} + P_1) + \frac{1}{1+\beta} c_1 \]

\[ + \frac{\beta}{1+\beta} \left( \int E_{i,1} [d_{i,2}] di \right), \]

\[ \text{intertemporal substitution} \quad \text{current income} \]

\[ \text{future income} \]

- **Effect #1:** intertemporal substitution
- **Effect #2:** current income
  - current income ↓ -&gt; spending ↓
- **Effect #3:** future income (novel)
  - current income ↓ -&gt; perceived future income ↓ -&gt; spending ↓
Equilibrium (Frictional AS & Frictionless AD)

- Momentarily shut down perceived future income channel
Full Equilibrium

- Perceived future income $\downarrow$, further moves AD curves

With some parametrizations, could move infinitely
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Variant: Fiscal Policy

- Shut down discount-rate shock $\bar{\beta}$
- Add gov spending shock, $G_t$, with

$$G_t = F \left( \{g_{i,t}\}_{i \in [0,1]} \right), \quad g_{i,t} = \xi_{i,t} H \left( \{g_{i,j,t}\}_{j \in [0,1]} \right), \quad (5)$$

  ▶ spending per good in proportion to private consumption
  ▶ financed by lump sum tax in same period
Fiscal Multiplier

- No wealth effect on labor supply
  - frictionless fiscal multiplier 0

- When a positive $G$ shock hits
  - firms see that their demand curves move up and produce more
  - consumers, seeing higher income, demand more

- Like NK, our model can rationalize large fiscal multipliers

- Unlike NK, higher multiplier when the stimulus is front loaded
  - in NK, it’s about promising inflation in the future
  - here, it is about raising demand now
Nominal Variant

Numeraire: “dollar”
  • An unit of account controlled by a monetary authority

Suppose that monetary policy
a) maintains long-run price stability, \( P_2 = \bar{P} \).
b) lets the nominal interest rate \( i = m \), be common knowledge and orthogonal to \( \bar{\beta} \).

Proposition:
(i) Monetary policy is neutral: the equilibrium allocations are invariant to the realization of \( m \).
(ii) The equilibrium allocations are the same as in our baseline analysis.
Nominal Variant

- Price and quantity do co-move
  - but replicates the flexible price allocation

- Philips curves **not** about output gaps anymore

- Demand driven business cycle
  - not artifact of “mistakes” in monetary policy
Summary

- A theory of demand-driven fluctuations
- Does not require nominal rigidity
- Has distinct policy implications