Revisiting TFP Fluctuations: The Role of Goods Market Search and Time Allocation

Job Market Presentation 2025

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22.10.2025

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What Drives the (In-)Efficiency of an Economy over the Business Cycle?

Total Factor Productivity (Solow, 1957):

$$tfp = \underset{(+)}{output} - F\Big(\underset{(+)}{inputs}\Big) \tag{1}$$

- "measure of our ignorance" (Abramovitz, 1956) $\Rightarrow$ $40-50\%$ *of GDP variation.*

Common View: TFP driven by variable utilization of quasi-fixed input (Fernald, 2014).

$$tfp_{util,1} + F\Big(\underset{(+)}{utilization}\Big) = \underset{(+)}{output} - F\Big(\underset{(+)}{inputs}\Big) \tag{2}$$

- Input factors are **mismeasured** due to unobserved utilization.
- Utilization-adjusted TFP $\approx 25\%$ *of GDP variation* (Smets and Wouters, 2007).

Problem (for the New-Keynesian model)

Offered capacity = demand/output *(by assumption!)* $\rightarrow$ **what if offered capacity $\neq$ demand?**

$$tfp_{util,2} + F\Big(\underset{(+)}{utilization}\Big) + S\Big(\underset{(+)}{\text{excess demand}}\Big) = \underset{(+)}{output} - F\Big(\underset{(+)}{inputs}\Big) \tag{3}$$

Excess Demand and Supply are Common Features of the Data

Problem: offered capacity = demand $\rightarrow$ **what if offered capacity $\neq$ demand?**

- Capacity utilization is on average **incomplete** and highly procyclical:
  - $\rightarrow$ long-run average: $82 - 89\%$; standard deviation: $1.87 - 2.93\%$
- **Procyclical household effort** to match and buy goods:
  - $\rightarrow$ acquisition & usage of goods, travel time; **not:** information costs.
  - $\rightarrow$ shopping time (proxy) increases by $1.1 - 1.5\%$ in GDP (Petrosky-Nadeau et al., 2016).
- **Procyclical firm effort** to sell/match its available production capacity:
  - $\rightarrow$ Advertisement expenditures salient ($\sim 6\%$ of GDP) and procyclical (Hall, 2012).
  - $\rightarrow$ Excess capacity drives idiosyncratic demand for firm's goods (Sun, 2024).
  - $\rightarrow$ Countercyclical inventory-sales ratio (den Haan and Sun, 2024).

$\Rightarrow$ Input factor utilization **cannot** describe these stylized facts. They are a result of **imperfect trading technology!**

This Paper - Research Question

How does **unobserved search effort in frictional goods markets** affect ...

1. ... the *determinants* of the business cycle, in particular capacity utilization and TFP?
2. ... the *shock transmission* under varying excess demand and supply conditions?

This Paper - Key Challenges

Key Challenge 1: How to implement such a mechanism in a NK-DSGE model while *keeping it tractable and solveable?*

- **Baseline:** NK business cycle model as in Smets and Wouters (2007).
- **Excess demand & supply framework** based on labor market SaM (Michaillat and Saez, 2015):
  (1) **Convex search costs:** how do they affect the *price elasticity of demand*?
  (2) **CES matching function:** how productive is search effort in increasing *utilization*?

Key Challenge 2: How to identify unobserved aggregate search effort in the data through proxies and cross-equation restrictions?

- **Full information Bayesian estimation** for model comparison based on log data density:
  → **Eight macro time series** common in the literature to condition model parameters.
  → Adding **capacity utilization survey data** as a proxy for excess demand & supply.
  → **Cross-equation restrictions** to identify price elasticity of demand channel.
  → Channel decomposition by **marginal log data density** and nested model assumptions.

Main Findings of the Paper

Part 1 - Estimating the *explanatory power* of goods market SaM in a NK model:

1. Goods market SaM is **decisively improves** the data fit (esp. *utilization* and TFP).
   → **informative:** search is costly and productive, other utilization margins reduced impact;
2. Variance decomposition **shifts away from supply shocks.**
   → cost-push shock: 31% → 23% (GDP); 30% → 8% (Inflation); **19% → 3% (TFP);**

Part 2 - Simulating *shock transmission* in NK model under goods market SaM:

3. **Excess supply dampens TFP variation** (vice-versa): $Corr(x_t, \Phi_t) = 0.34$
   → **distorted time-allocation:** low search effort as prices are too high (sticky);
4. **Output gap almost acyclical** following technology shocks:
   → output gap and inflation **disconnected:** $\Rightarrow Corr(\pi_t, \tilde{GDP}_t) = 0.17 \rightarrow 0.03$

Contributions to the Literature

1. Literature on the Determinants of TFP Variation:

   Bils and Cho (1994), Burnside et al. (1995), Basu and Kimball (1997), Basu and Fernald (2002), Christiano et al.(2005), Basu et al. (2006), Fernald (2014), Comin et al. (2025).

   → **Contribution:** Implement and analyze **market-tightness-based** TFP variation.

2. Literature on Goods Market Search-and-Matching:

   Hall (2012), Bai and Rios-Rull (2015), Michaillat and Saez (2015), Petrosky-Nadeau and Wasmer (2015), Kaplan and Menzio (2016), Petrosky-Nadeau et al. (2016), Pytka (2018), Qiu and Rios-Rull (2022), den Haan and Sun (2024), Bai et al. (2025).

   → **Contribution:** analyze **Moen-Rotemberg framework** in a medium-sized NK model.

3. Literature on (estimating) medium-sized DSGE models:

   Christiano et al. (2005), Smets and Wouters (2007), Jaimovich and Rebelo (2009), Justiniano et al. (2010), Ohanian and Raffo (2012), Cacciatore et al. (2020), Lewis and Villa (2023).

   → **Contribution:** Revisit business cycle & **TFP determinants** and policy implications.

Outline of the Presentation

1. **Introduction:** Motivation and overview
2. **Simple Model:** Trade-off between sticky posted prices and flexible search prices
3. **Estimation Setup:** Data, calibration, and identification
4. **Estimation Results:** Log data densities, posteriors, and variance decomposition
5. **Simulations:** Efficiency wedges, the output gap, and inflation
6. **Concluding Remarks**