Services Deepening and the Transmission of Monetary Policy

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The rise of the service share of intermediate inputs

- We document a new dimension of the structural change from manufacturing to services
- Advanced economies are experiencing a process of **services deepening**: the service share of intermediate inputs rises over time
- Manufacturing and services are becoming more intensive in services intermediate inputs

- **Transmission on monetary policy** correlates with sectoral composition of intermediate inputs
- In countries which are more intensive in services intermediates:

  - Inflation reacts **less** to monetary policy shocks

  - Output reacts mildly more to monetary policy shocks

Does the services deepening alter the transmission of monetary policy?

- Services prices are **much stickier** than manufacturing prices:

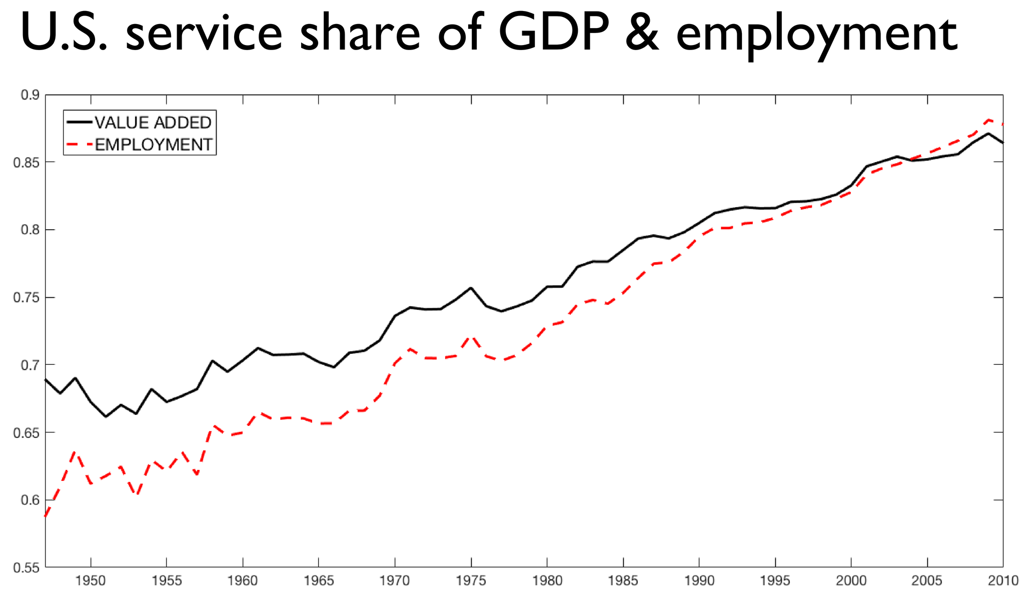
  - Duration of service prices ranges between 8 months and 13 months

  - Duration of manufacturing prices is 3 months

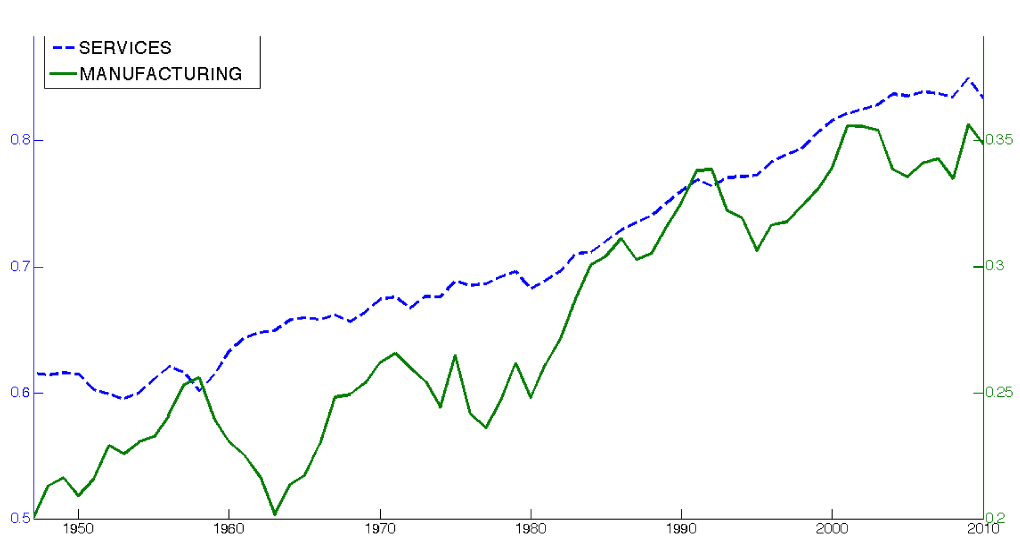
- Services deepening dampens the response of aggregate inflation to monetary policy shocks through a **marginal cost channel**
  - Rise of services intermediates increases the sluggishness of marginal costs & sectoral inflation
- Rise of services GDP dampens the response of aggregate inflation to monetary policy shocks through a **composition channel**
  - Neither sectoral marginal costs nor sectoral inflation rates change their dynamics

Motivating evidence

U.S. service share of GDP & employment



- U.S. service share of intermediate inputs



- We estimate a **SVAR** at quarterly frequency for 25 countries

- For each country we have a system of 3 variables:

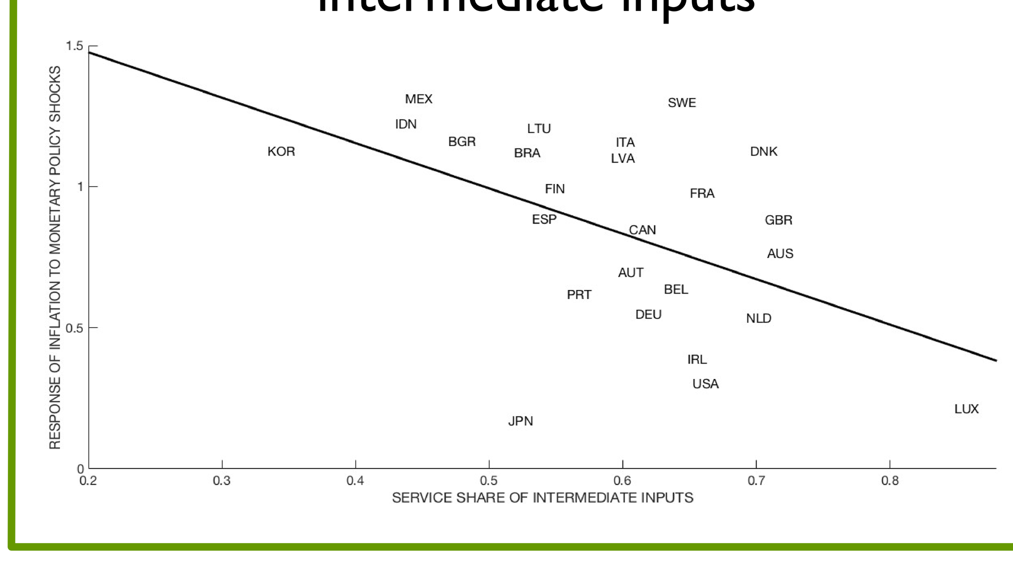
  - log difference of GDP
  - log difference of CPI
  - nominal short-term interest rate

- We identify monetary policy shocks with **sign restrictions:**

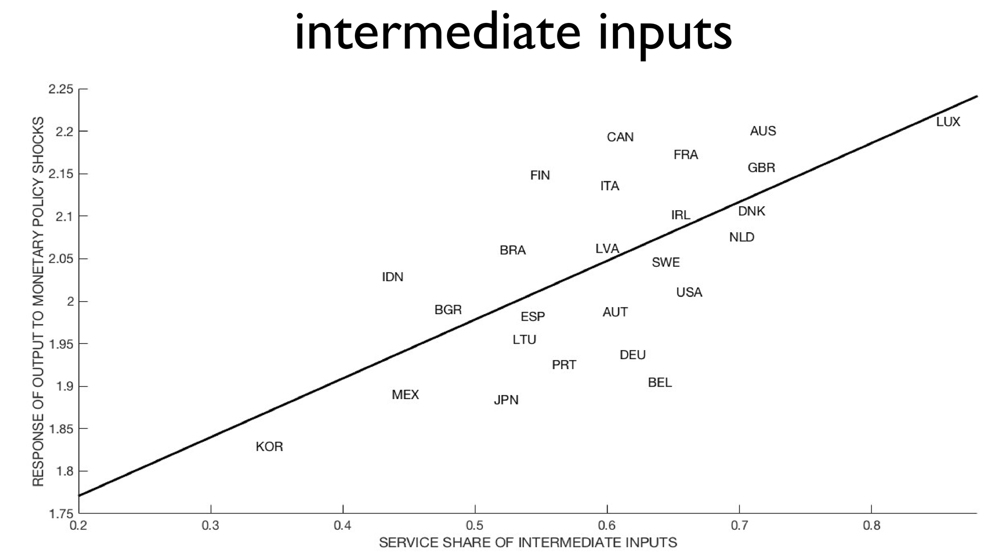
  - shocks raise nominal interest rates
  - shocks reduce output and inflation
  - restrictions imposed on impact & following quarter

- Relationship between sectoral composition of intermediates & responses to monetary policy shocks is left unrestricted

Inflation response & service share of intermediate inputs



Output response & service share of intermediate inputs



A two sector New Keynesian model with a time-varying Input-Output matrix

- Two inter-connected sectors: manufacturing (m) and services (s)
- Sectors differ in durability of the consumption goods, labor share & **degree of price rigidity**
- Intermediate inputs of services firms and manufacturing firms:

$$I^s_{i,t} = \left[\omega_s^{\frac{1}{\mu}}\left(S^s_{i,t} + \bar{s}_s\right)^{\frac{\mu-1}{\mu}} + (1-\omega_s)^{\frac{1}{\mu}}\left(M^s_{i,t}\right)^{\frac{\mu-1}{\mu}}\right]^{\frac{\mu}{\mu-1}}$$

$$I^m_{j,t} = \left[\omega_m^{\frac{1}{\mu}}\left(S^m_{j,t} + \bar{s}_m\right)^{\frac{\mu-1}{\mu}} + (1-\omega_m)^{\frac{1}{\mu}}\left(M^m_{j,t}\right)^{\frac{\mu-1}{\mu}}\right]^{\frac{\mu}{\mu-1}}$$

- Changes in sectoral productivities generate **endogenous** variations in the Input-Output matrix:

  - Non-unitary elasticity of substitution (Ngai and Pissarides, 2007)
  - Non-homothetic component (Kongsamut, Rebelo and Xie, 2001)

- Calibration matches services deepening between 1947 and 2005
- We evaluate the responses of monetary policy shocks in the 1947 steady-state and in the 2005 steady-state

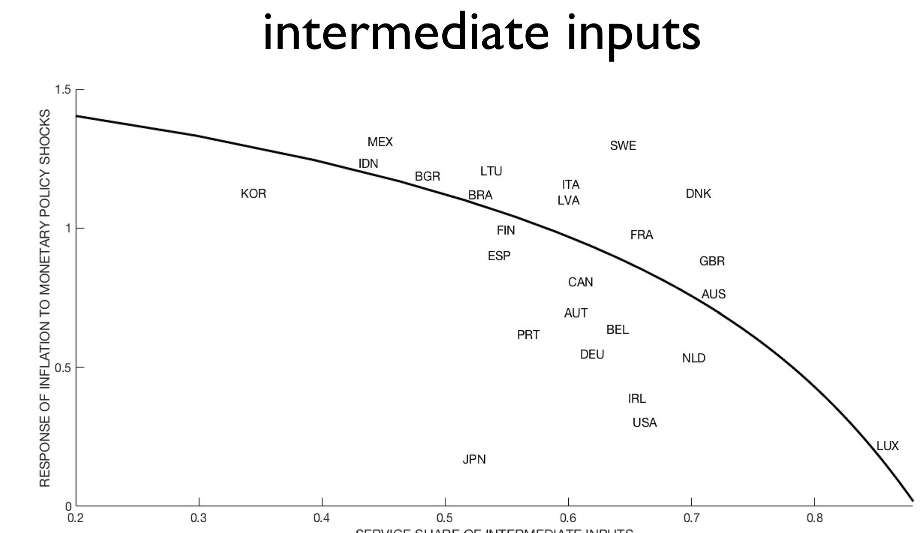
Quantitative Results

- From 1947 to 2005, services deepening reduced the response of inflation to monetary policy shocks by 37%
- A third of this change is due to the dampening effect on sectoral marginal cost & inflation rates

	Benchmark Economy			Counterfactual Economy without Services Deepening
	Model 1947	Model 2005	Ratio 2005/1947	Ratio 2005/1947
π_t	0.97%	0.61%	0.63	0.74
π^s_t	0.53%	0.49%	0.93	0.98
π^m_t	1.56%	1.40%	0.90	0.99
MC^s_t	2.15%	2.00%	0.93	0.99
MC^m_t	1.10%	0.98%	0.89	0.99
Y_t	1.79%	1.98%	1.10	1.05
Y^s_t	1.36%	1.40%	1.03	1.01
Y^m_t	3.15%	3.41%	1.08	1.02

Model vs. Data

Inflation response & service share of intermediate inputs



Output response & service share of intermediate inputs