

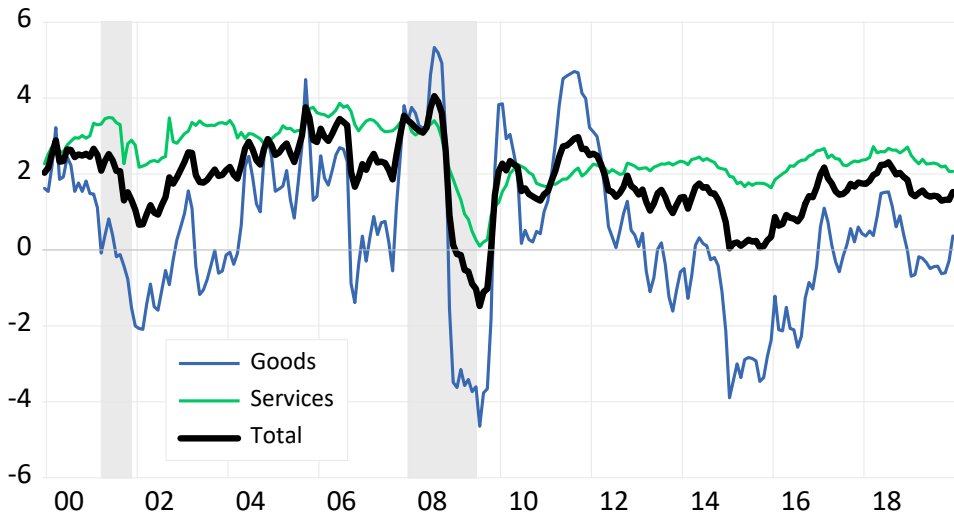
Discussion of “Supply Chain Constraints and Inflation” by Comin, Johnson and Jones

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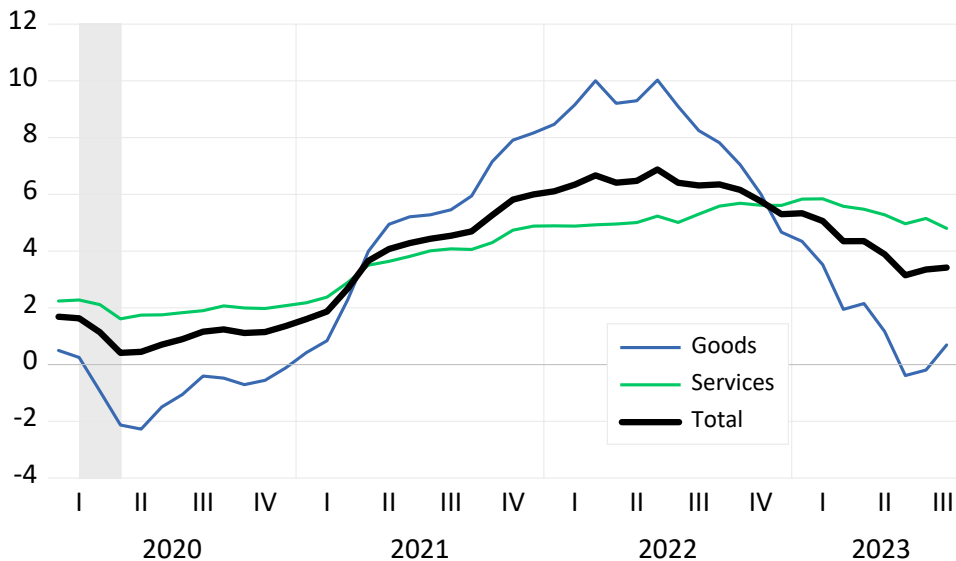
October 13, 2023 (Friday)

Federal Reserve Bank of Philadelphia & NBER
Methods and Applications for DSGE Models Conference

PCE Inflation (2000-2019)



PCE Inflation (2020-2023)



What Happened?

- Nonlinearities!
- Impulse? (in no particular order)
 - Fiscal stimulus
 - Labor market (shrinking labor supply, shift in preferences)
 - External demand shocks
 - Monetary policy shock (?)
- Propagation / Amplification?
 - Supply chain issues
 - Labor market frictions

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Some Alternative Explanations - One Sector

- **Fornaro and Wolf (forthcoming, JME)**

- One-sector New Keynesian and endogenous growth model (firm investment effects productivity growth).
- The Pandemic and energy price shocks at the Ukraine war lead to negative supply shocks which reduce investment, permanently reducing the level of productivity (scarring effect). They also increase inflation.
- Even after the shock disappears and productivity growth goes back to normal, scarring effect produces increase in inflation.

- **Harding, Linde and Trabandt (forthcoming, JME)**

- Klenow (1995) aggregator exhibits a quasi-linear demand function for goods (demand elasticity increases in price).
- Firms reluctant to cut prices when marginal cost is low and are more willing to increase prices when marginal cost is high. High degree of price rigidity.
- Excess propagation (higher persistence in shocks).

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- **Harding, Linde and Trabandt (forthcoming, JME)**

● Khalil (2015) argues that there is a high-level demand function for goods (demand elasticity increases in price).

● Firms reluctant to cut prices when marginal cost is low and are more willing to increase prices when marginal cost is high (asymmetric price adjustment).

● Low inflation persistence due to faster convergence to equilibrium.

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- **Harding, Linde and Trabandt (forthcoming, JME)**

Global (US) production and demand have fallen, but demand is more elastic than production (price).

Large reduction in the price of investment goods is low and the price of consumption goods is high, leading to a large increase in the price of investment goods relative to the price of consumption goods.

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- **Harding, Linde and Trabandt (forthcoming, JME)**

- Global supply chain disruptions and the Ukraine war have led to negative supply shocks, which reduce investment, permanently reducing the level of productivity. (scarring effect) They also increase inflation.
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- Kimball (1995) aggregator creates a quasi-linked demand function for goods. (demand elasticity increases in price).

→ The demand for goods is more elastic than the demand for services. This is because the demand for goods is more sensitive to changes in the price of goods than the demand for services is to changes in the price of services.

→ This leads to a larger increase in demand for goods than for services.

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- Kimball (1995) aggregator creates a quasi-kinked demand function for goods. (demand elasticity increases in price).
- Firms reluctant to cut prices when marginal cost is low and are more willing to increase prices when marginal cost is high. Non-linear Phillips curve.
- Creates propagation (when economy is shocked).

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Some Alternative Explanations - Multi Sector

- Ferrante, Graves and Iacoviello (forthcoming, JME)

- Multi-sector (66 sectors) model with input-output linkages with pricing rigidities and cost of reallocating labor across sectors.
- Demand for goods relative to services increases. It is costly to immediately increase employment in the goods sector. Prices go up. Overall inflation is up 3.5 p.p. after a year.
- Services employment immediately falls. Prices fall initially and then start to increase due to input-output linkages with goods sector (e.g. retailing services).

- di Giovanni, Kalemli-Ozcan, Silva and Yildirim (2023, AEA P&P)

- Use Kaplan and Pakti (2022) multi-sector macro-network model (with two periods)
- Aggregate demand shocks account for 2/3 of increase in inflation between December 2019 and June 2022, with fiscal shocks accounting for half of this.

- Amiti, Heise, Karahan and Sahin (2023 NBER MA)

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- **di Giovanni, Kalemli-Ozcan, Silva and Yildirim (2023, AEA P&P)**

Use Bopwin and Forni (2022) multi-sector macro-network model (with two periods)

Assume demand shock account for 2/3 of increase in inflation between December 2019 and June 2020, with total shocks accounting for half of this.

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- Use Baqaee and Farhi (2022) multi-sector macro-network model (with two periods).

● Findings: Demand for goods increases, demand for services falls. Demand for services falls more than demand for goods rises. Demand for services falls more than demand for goods rises. Demand for services falls more than demand for goods rises.

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Model Features

- Small open economy, two sectors, sticky prices, risk-sharing between home and foreign consumers.
- Consumers consume home and imported goods, aggregate demand shock.
- Home / foreign producers produce intermediate goods, combined into composite goods.
- Key constraint: $Y_t(s, \omega) \leq \bar{Y}_t(s)$ and same for foreign.
- Binding capacity constraints show up as **endogenous markup shocks** in the Phillips Curves. (they create nonlinearities!)
- Solved / estimated using local methods in Kulish, Morley and Robinson (2017), extracting an array of shocks including whether or not the constraints bind.

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Story for 2020-2022

- **March 2020:** A -7 s.d. shock to aggregate demand, $+3$ s.d. monetary policy shock and a $+3$ s.d. shock to goods TFP at the outset of the lock down.
- **By June 2020**, goods demand is above the pre-Pandemic trend (aided by a $+2$ standard deviation aggregate demand shock). As a share of overall demand, it is 3 p.p. higher relative to pre-Pandemic. Domestic and foreign capacities fall (both about 10% of respective GDPs) but constraints are not binding (much) yet.
- **2021:** foreign capacity falls 20% overall, domestic capacity down around 7%.
- A -4 s.d. monetary policy shock (equivalent to a decline of 1.8 p.p.) boost domestic consumption but domestic production remains constant. Imports of consumer goods go up. This is because domestic capacity constraints for final goods and foreign capacity constraints for (their) exported inputs have been reached. Supply chain problems.
- Goods prices increase since prices are now set at the demand curve. Profits of domestic producers increase.
- **2022:** No further shocks. Foreign capacity improves, domestic capacity about same.

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- A -4 s.d. monetary policy shock (equivalent to a decline of 1.8 p.p.) boost domestic consumption but domestic production remains constant. Imports of consumer goods go up. This is because domestic capacity constraints for final goods and foreign capacity constraints for (their) exported inputs have been reached. Supply chain problems.
- Goods prices increase since prices are now set at the demand curve. Profits of domestic producers increase.
- **2022:** No further shocks. Foreign capacity improves, domestic capacity about same.

Comment #1 : Monetary Policy as the Impulse

- No explicit fiscal policy in the model.
- Discount rate shock is supposed to capture general aggregate demand shocks. It works through the Euler Equation where a pure government expenditure shock would enter through the resource constraint.
- The main impulse for inflation turns out to be a large monetary policy shock.
- Fed Funds Rate remained at 0% throughout 2021. The model thinks it should have increased to almost 2%. Inaction of the Fed causes inflation through increased demand.
- Binding capacity constraints amplify the effect. On impact response of inflation:
 - Without constraints: 1.4% total, 1% growth
 - With constraints: 2% total, 0.2% growth (1/3 amplification)
- “Long and variable lags”?

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 - With constraints: 2% point, 0.4% growth, 1.3 amplification
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0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04

Periods

0 1 2 3 4 5 6 7 8 9 10
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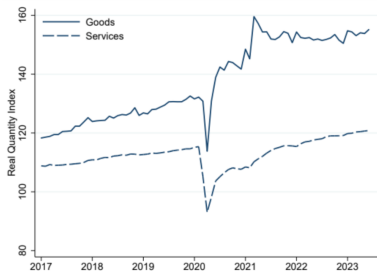
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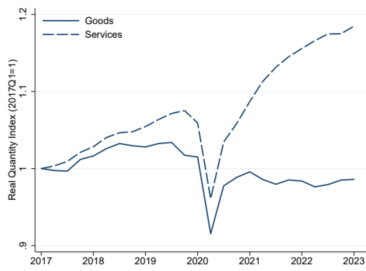
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Comment #2 : Consumption, Production and Imports

(b) Real Quantities Consumed by Sector



(a) Real Gross Output by Sector

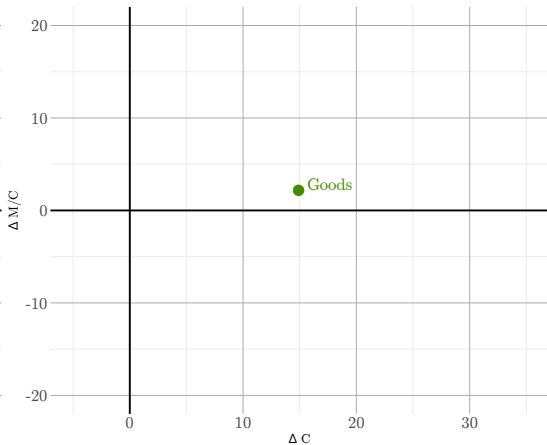
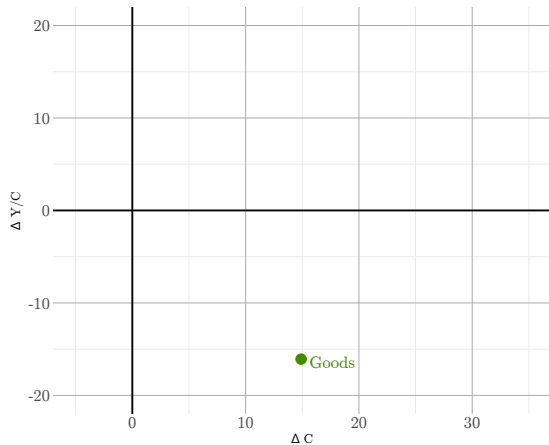


(b) Import Quantities by End Use

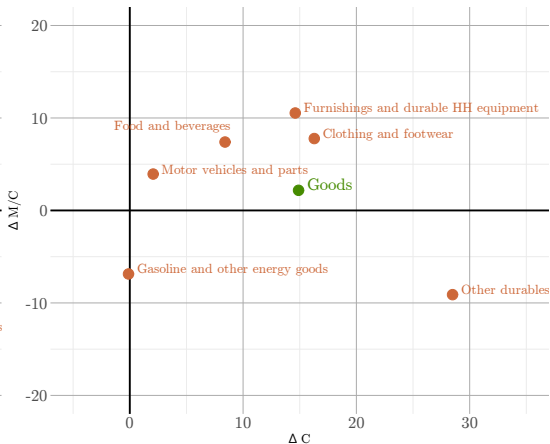
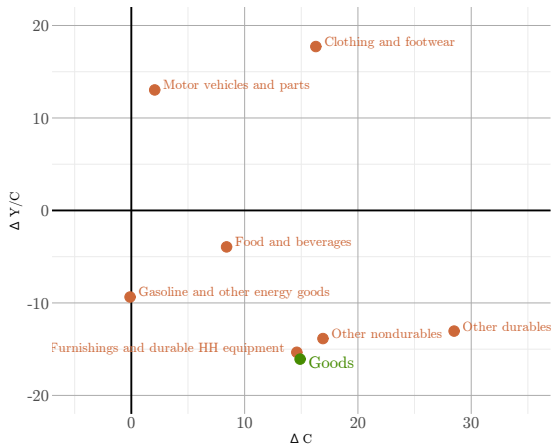


Consumption increases, domestic output and imports of inputs stagnant, imports of consumer goods increases.

Comment #2 : Consumption, Production and Imports



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Sectoral evidence mostly backs the main story. Would be good to see firm-level data.

Comment #3 : Supply Constraints or Labor Market Frictions

- Recall Ferrante et al (2023). In both models output is constrained: exogenous capacity constraints versus labor market frictions. Inflation goes up. How to distinguish?
- **Services inflation:** Increases throughout 2021 and 2022, even though consumption is not back to trend even by end of 2023.
- Model targets and matches goods and services inflation. Unclear (to me) what explains the sustained increase in services inflation in the model.
- Ferrante et al (2023) explanation: linkages from goods to services and faster-than-expected return to normal for services demand. Services employment cannot adjust quickly enough leading to inflation. Quite plausible.
- **Profits:** Profits in the model go up because producers extract more surplus. Matches the data. How about Ferrante et al.? Unclear, though probably firms are worse off since they cannot use their desired amount of labor. Strong evidence in favor.
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- Exercise to consider: Estimate parameters pre-Pandemic. Filter Pandemic period with two versions of the model: with and without constraints. Compare marginal likelihood, extracted shocks, IRFs etc. How “extreme” do the shocks need to be to explain data without constraints?
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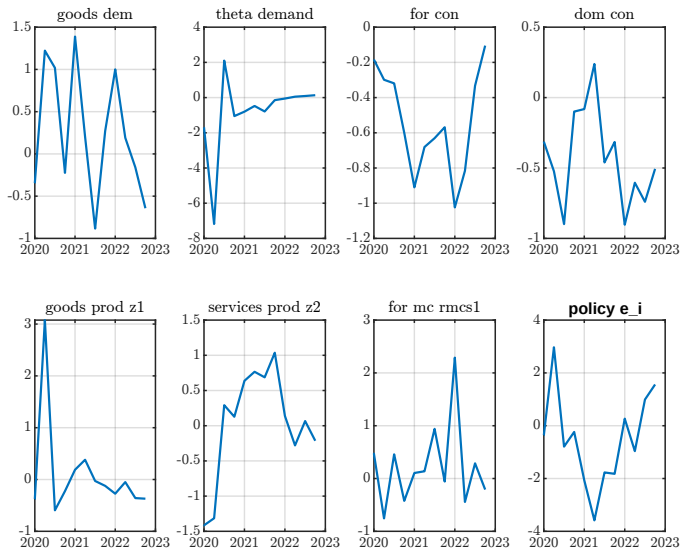
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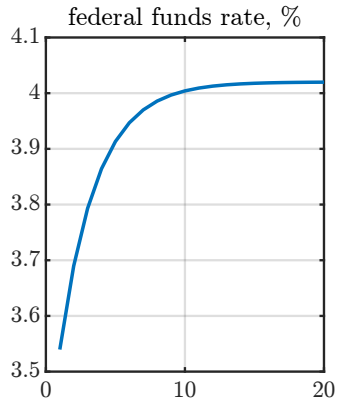
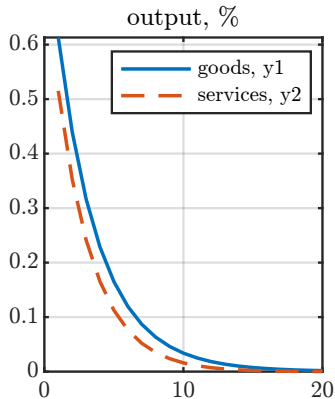
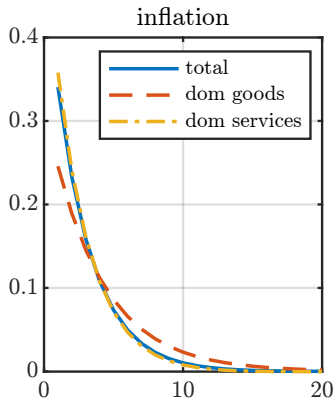
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Extracted Shocks (2020-2023)



IRF to Monetary Policy Shock (Unconstrained)



IRF to Monetary Policy Shock (Constrained on Impact)

