

# Global Stagflation and Reverse Currency Wars

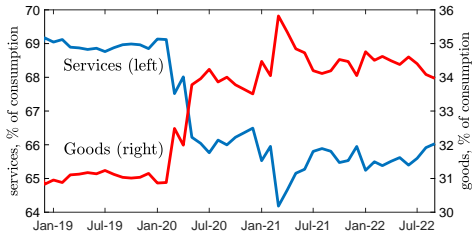
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## Motivation and research questions

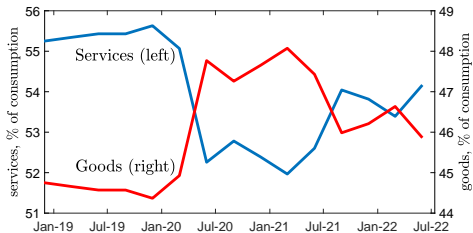
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- Unbalanced recovery from Covid recession
  - ▶ Buoyant demand for goods
  - ▶ Subdued demand for services

## United States



## Other G7 countries



## Motivation and research questions

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- Unbalanced recovery from Covid recession
  - ▶ Buoyant demand for goods
  - ▶ Subdued demand for services
- Reallocation of demand from non-tradable services to tradable goods
  - ▶ What is the optimal monetary policy response?
  - ▶ What is the role played by capital flows?
  - ▶ Are there gains from international cooperation?

## This paper

- Multi-country Keynesian model with multiple sectors
  - ▶ Continuum of small open economies
  - ▶ Each country produces a tradable good and a non-tradable one
  - ▶ Nominal wages are rigid
- Optimal monetary response to [global reallocation shock](#)
  - ▶ Temporary rise in consumers' demand for the tradable good, relative to the non-tradable one

## Preview of results

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- Reallocation shock triggers a rise in (tradable good) inflation (Olivera, 1964; Tobin, 1972; Guerrieri et al., 2021)
  - ▶ Trade off between inflation and unemployment ([global stagflation](#))
- Capital flows transmit inflation internationally
  - ▶ Trade deficits contain domestic inflation and unemployment
  - ▶ But trade deficits export inflation and unemployment abroad
- [Reverse currency wars](#) (parallel with the 1980s; Frankel, 2022)
  - ▶ Countries try to appreciate exchange rate and run trade deficits
  - ▶ As a result interest rates and unemployment end up being too high

# Outline of the talk

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- ① Model
- ② Optimal monetary policy during a reallocation shock
  - ▶ Financial autarky
  - ▶ Free capital mobility
- ③ International spillovers and gains from cooperation

## Households

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- Lifetime utility of the representative household in country  $i$

$$\sum_{t=1}^{\infty} \beta^{t-1} \left( \log(C_{i,t}) - \chi \left( \frac{P_{i,t}}{P_{i,t-1}} \right) \right)$$

$$C_{i,t} = \left( \frac{C_{i,t}^T}{\omega_{i,t}} \right)^{\omega_{i,t}} \left( \frac{C_{i,t}^N}{1 - \omega_{i,t}} \right)^{1 - \omega_{i,t}}$$

- $\chi(P_{i,t}/P_{i,t-1})$  is a convex function capturing disutility from deviations of CPI inflation from target (normalized to zero)
- No disutility from working, labor endowment  $\bar{L}$

$$\begin{aligned} P_{i,t}^T C_{i,t}^T + P_{i,t}^N C_{i,t}^N + P_{i,t}^T B_{i,t+1} + B_{i,t+1}^n &= \\ &= W_{i,t} L_{i,t} + \Pi_{i,t} + P_{i,t}^T R_{i,t-1} B_{i,t} + R_{i,t-1}^n B_{i,t}^n \end{aligned}$$



## Optimality conditions

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- Euler equation for T good

$$C_{i,t}^T = \frac{C_{i,t+1}^T}{\beta R_{i,t}} \frac{\omega_{i,t}}{\omega_{i,t+1}}$$

- No arbitrage between the two bonds

$$R_{i,t} = \frac{R_{i,t}^n P_{i,t}^T}{P_{i,t+1}^T}$$

- Demand for NT goods

$$C_{i,t}^N = \frac{1 - \omega_{i,t}}{\omega_{i,t}} \frac{P_{i,t}^T}{P_{i,t}^N} C_{i,t}^T$$

- Consumer price index given by

$$P_{i,t} = (P_{i,t}^T)^{\omega_{i,t}} (P_{i,t}^N)^{1-\omega_{i,t}}$$

## Nominal wage rigidities

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- Nominal wage is fixed in the short run ( $t = 1$ )

$$W_{i,1} = 1$$

- Involuntary unemployment may arise in the short run
  - ▶  $L_{i,1} = \bar{L}$ : full employment
  - ▶  $L_{i,1} < \bar{L}$ : involuntary unemployment
- Wages are fully flexible in the long run ( $t \geq 2$ )

## Firms and production

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- Short run ( $t = 1$ ): competitive firms, perfect sectoral labor mobility
- Non-tradable sector

$$Y_{i,1}^N = L_{i,1}^N \rightarrow P_{i,1}^N = W_{i,1}$$

- Tradable sector

$$Y_{i,t}^T = (L_{i,t}^T)^\alpha \rightarrow P_{i,t}^T = \frac{W_{i,t}}{\alpha} (Y_{i,t}^T)^{\frac{1-\alpha}{\alpha}}$$

- Law of one price

$$P_{i,t}^T = \mathcal{E}_{i,t}^j P_{j,t}^T$$

- Long run ( $t \geq 2$ ): constant endowments  $Y^T$  and  $Y^N$

## Market clearing

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- Normalize  $B_{i,t}^n = 0$ , tradable good market clearing

$$Y_{i,t}^T - C_{i,t}^T = B_{i,t+1} - R_{i,t-1}B_{i,t}$$

- NT good market clearing

$$C_{i,t}^N = Y_{i,t}^N$$

- Labor market

$$L_{i,t} = L_{i,t}^T + L_{i,t}^N \leq \bar{L}$$

## Optimal monetary policy during a reallocation shock

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- Long run ( $t \geq 2$ ): optimal monetary policy targets zero inflation
- Short run ( $t = 1$ ): central bank sets  $P_{i,1}^T$  to maximize domestic utility
- Temporary reallocation shock
  - ▶ Initial steady state  $\omega_{i,0} = \omega$
  - ▶ Short run:  $\omega_{i,1} > \omega$  for at least some  $i$
  - ▶ Long run:  $\omega_{i,t} = \omega$  for  $t \geq 2$
- Symmetric initial steady state  $B_{i,1} = 0$ ,  $W_{i,1} = 1$  and  $P_{i,0}^T = P_0^T$
- $P_0^T$  such that if  $P_1^T > P_0^T$  then  $Y_1^T > Y_0^T$

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## Optimal policy problem

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- Central bank sets  $P_{i,1}^T$  to maximize

$$\omega_1 \log Y_{i,1}^T + (1 - \omega_1) \log Y_{i,1}^N - \chi \left( \frac{P_{i,1}}{P_{i,0}} \right)$$

- Subject to

$$Y_{i,1}^T = (\alpha P_{i,1}^T)^{\frac{\alpha}{1-\alpha}}$$

$$Y_{i,1}^N = \frac{1 - \omega_1}{\omega_1} Y_{i,1}^T P_{i,1}^T$$

$$(Y_{i,1}^T)^{\frac{1}{\alpha}} + Y_{i,1}^N \leq \bar{L}$$

## Optimal monetary policy response to reallocation shock

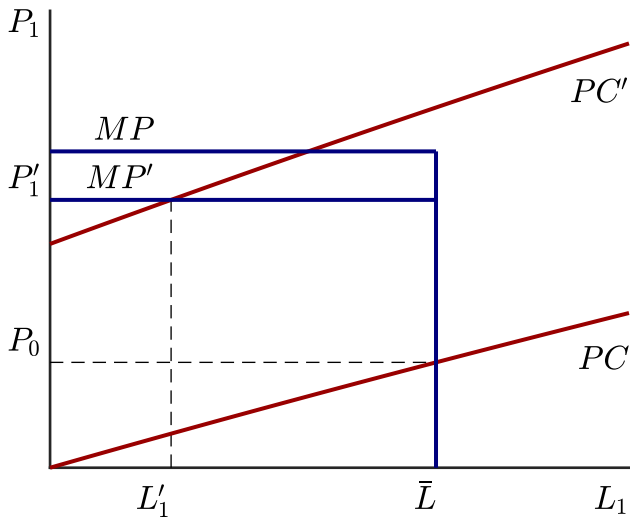
- Private sector behavior gives rise to a Phillips curve

$$P_{i,1}^T = \frac{1}{\alpha} \left( \frac{\omega_1 \alpha L_{i,t}}{1 - \omega_1 (1 - \alpha)} \right)^{1-\alpha}$$

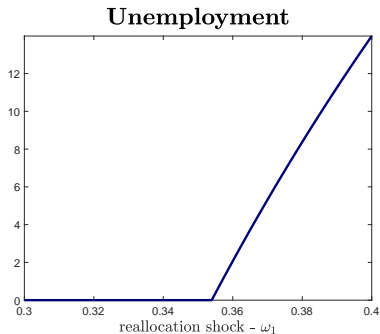
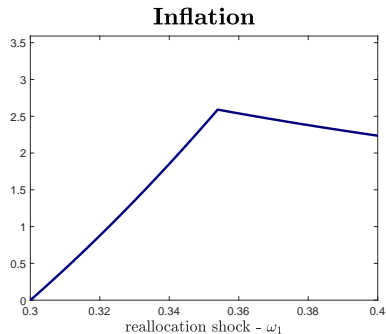
- Rise in  $P_{i,1}^T$  sustains demand and employment in both sectors
  - ▶ Labor reallocation:  $\uparrow Y_{i,1}^T, \uparrow L_{i,1}^T$
  - ▶ Expenditure switching:  $\uparrow \frac{P_{i,1}^T}{P_{i,1}^N} \uparrow C_{i,1}^N, \uparrow L_{i,1}^N$
  - ▶ Income effect:  $\uparrow Y_{i,1}^T, \uparrow C_{i,1}^T, \uparrow C_{i,1}^N, \uparrow L_{i,1}^N$
- Reallocation shock lowers demand for NT goods and shifts the Phillips curve (cost-push shock)
- Optimal monetary policy trades off the inflation cost against the employment benefits



## Optimal monetary policy response to reallocation shock



## Optimal monetary policy response to reallocation shock



- Sufficiently large reallocation shock leads to **stagflation**

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## Optimal policy problem under free capital mobility

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- Countries may use the international credit markets to smooth the impact of the reallocation shock on consumption

$$C_{i,1}^T = \frac{\omega_{i,1}(1-\beta)}{\omega_{i,1}(1-\beta) + \omega\beta} \left( Y_{i,1}^T + \frac{R}{R-1} \frac{Y^T}{R_1} \right)$$

- Capital flows affect demand for non-tradables

$$Y_{i,1}^N = \frac{1 - \omega_{i,1}}{\omega_{i,1}} C_{i,1}^T P_{i,1}^T$$

- Now a monetary expansion ( $\uparrow P_{i,1}^T$ ) has a smaller impact on domestic demand for NT goods because **income effect is weaker**

$$\frac{\partial C_{i,1}^T}{\partial Y_{i,1}^T} \ll 1$$

- The reason is that part of the increase in  $Y_{i,1}^T$  due to a monetary expansion is sold to foreign consumers

## An idiosyncratic reallocation shock

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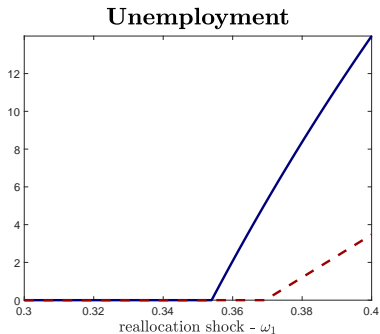
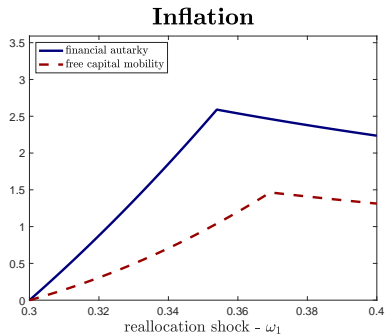
- Start by considering a rise in  $\omega_{i,1}$  occurring in a single country  $i$
- Country  $i$  reacts by running a trade deficit ( $C_{i,1}^T/Y_{i,1}^T$  rises)
- Trade deficit sustains demand for NT goods and improves the trade off between inflation and unemployment

$$P_{i,1}^T = \frac{1}{\alpha} \left( \frac{\alpha\omega_{i,1}L_{i,1}}{\alpha\omega_{i,1} + (1 - \omega_{i,1}) \frac{C_{i,1}^T}{Y_{i,1}^T}} \right)^{1-\alpha}$$

- Access to international credit markets facilitates the adjustment to idiosyncratic reallocation shocks

# An idiosyncratic reallocation shock

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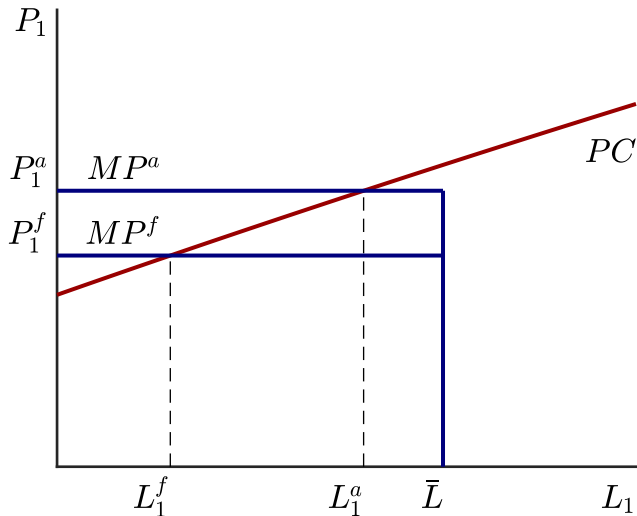
- Trade deficits contain domestic inflation and unemployment

## A global reallocation shock

- Now consider a rise in  $\omega_1$  occurring in every country
- Everyone tries to borrow on the international credit markets  $\rightarrow R_1$  rises until trade balance is restored ( $Y_{i,1}^T = C_{i,1}^T$ )
- Still, due to free capital mobility, unilateral monetary expansions have a smaller impact on domestic NT demand and employment
- Compared to financial autarky, national monetary authorities tolerate less inflation and more unemployment

## A global reallocation shock

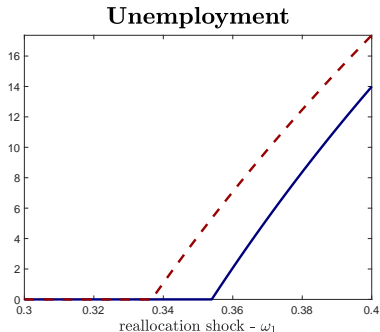
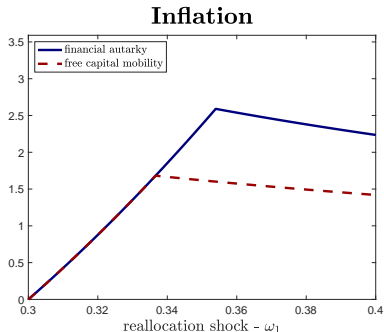
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# A global reallocation shock

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- Tighter monetary policy under free capital mobility, compared to financial autarky

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## Gains from cooperation

- With symmetric shock, problem of the global planner is isomorphic to the one of national central banks under financial autarky
- Under free capital mobility, tighter monetary policy and excessive unemployment compared to global optimum
- Suppose a single country increases  $P_{i,1}^T$  (and depreciates ER)
  - ▶  $Y_{i,1}^T$  rises, increase in net exports toward rest of the world
  - ▶ Higher demand for NT goods and employment in r.o.w.
  - ▶ But inflation cost is fully bore by domestic households
- National central banks do not internalize the positive demand externalities generated by monetary expansions

## Reverse currency wars

- Suppose that we start from the global optimum
  - ▶ Each country has an incentive to increase its policy rate, appreciate its exchange rate and run a trade deficit
  - ▶ But this policy exacerbates the global scarcity of traded goods, and leads to higher inflation and unemployment in the r.o.w.
  - ▶ If every country sets policy unilaterally, interest rates and unemployment will be too high from a global perspective
- **Competitive appreciations** pose a challenge to international cooperation
  - ▶ Contrast with the notion of competitive depreciations during periods of weak global demand (1930s, 2010s)
  - ▶ But now the issue is scarce global supply of traded goods: echoes of the 1980s and of the **Plaza Accord** (Sachs, 1985; Frankel, 2022)

# Inflation: goods vs. services

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