

# TRADE FRAGMENTATION, INFLATIONARY PRESSURES AND MONETARY POLICY

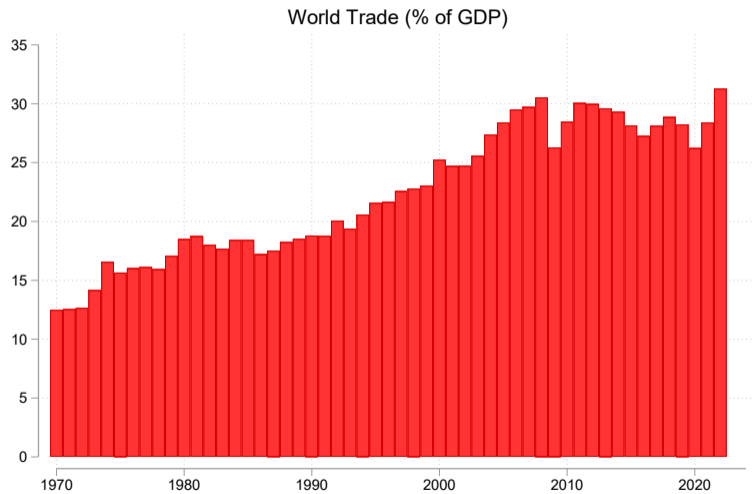
Ludovica Ambrosino<sup>1</sup>   Jenny Chan<sup>2</sup>   Silvana Tenreyro<sup>3</sup>

<sup>1</sup>London Business School   <sup>2</sup>Bank of England   <sup>3</sup>London School of Economics, CFM, CEPR

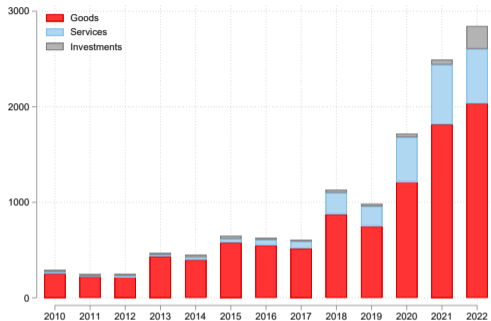
**June 28, 2024**

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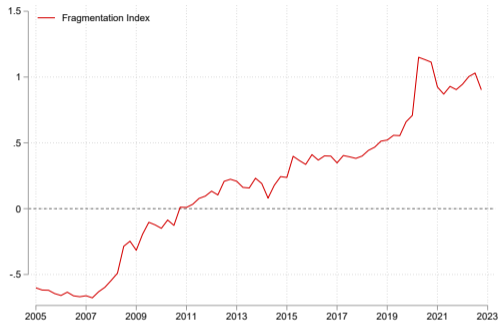
# GLOBALISATION HAS STALLED...



## ... AND TRADE IS INCREASINGLY INFLUENCED BY GEOPOLITICS



**FIGURE:** Number of Harmful Restrictions on Trade and Investment - Global Trade Alert & IMF



**FIGURE:** Fragmentation Index - Fernández-Villaverde, Song & Mineyama (2024)

## BACKGROUND AND TWO QUESTIONS

- ▶ Trade fragmentation driven by geopolitics will in all likelihood lead to:
    - ▶ Higher imported goods prices
    - ▶ Lower real incomes
1. Will fragmentation lead to a high-inflation environment?
  2. What would be the monetary policy response needed to keep inflation at target?

# PREVIEW OF ANSWERS

1. Will fragmentation lead to a high-inflation environment?
  - ▶ Fragmentation does not imply central banks should change their remits
  - ▶ Rephrase: will it lead to higher inflationary pressures? **It depends**
    - ▶ Front-loaded fragmentation might create a short-term tradeoff
    - ▶ Gradual fragmentation might lead to stagnation, with lower demand and lower domestic inflationary pressures
2. What is the monetary policy response needed to keep inflation at target? (How will the equilibrium  $r^*$  respond?) **It depends**
  - ▶ On how demand responds to (permanently) lower real incomes
    - ▶ Fragmentation might increase or lower  $r^*$

# MODEL ECONOMY: STARTING POINT

- ▶ Small open economy New Keynesian setting with heterogeneous agents
  - ▶ Financially unconstrained households maximise their utility over consumption, labour supply and asset holdings, subject to their budget constraints
  - ▶ Hand-to-mouth households spend all their disposable income within a period
  - ▶ Firms optimise profits, given technology
  - ▶ Monopolistic competition in the domestic good sector and sticky prices

# MODEL ECONOMY: FINANCIAL MARKETS AND MONETARY POLICY

- ▶ Unconstrained households have access to domestic financial markets with a complete set of domestic AD securities
- ▶ Global financial markets are imperfect (different from Gali-Monacelli's perfect risk sharing)
  - ▶ unconstrained households have access to a risk-free international asset
  - ▶ convex cost of adjusting asset holdings (Schmidt-Grohe and Uribe 2003)
- ▶ Monetary policy follows a Taylor rule that responds to deviations of CPI inflation from target

# MODEL

## Households

$$C_t = \left[ (1 - \alpha)^{\frac{1}{\eta}} C_{H,t}^{\frac{\eta-1}{\eta}} + \alpha^{\frac{1}{\eta}} C_{F,t}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

$$C_{H,t} = \left[ (1 - \gamma)^{\frac{1}{\nu}} C_{N,t}^{\frac{\nu-1}{\nu}} + \gamma^{\frac{1}{\nu}} C_{T,t}^{\frac{\nu-1}{\nu}} \right]^{\frac{\nu}{\nu-1}}$$

$$\frac{1}{(1 + i_t)} = \beta \mathbb{E}_t \left[ \left( \frac{C_{t+1}^U}{C_t^U} \right)^{-\sigma} \frac{1}{(1 + \pi_{t+1})} \right]$$

$$[1 + \chi(b_t^* - \bar{b}^*)] = \beta \mathbb{E}_t \left[ \left( \frac{C_{t+1}^U}{C_t^U} \right)^{-\sigma} \frac{1 + i_t^*}{(1 + \pi_{t+1}^*)} \frac{S_{t+1}}{S_t} \right]$$

$$(N_t^U)^\phi = (C_t^U)^{-\sigma} w_t$$

$$C_t^C = w_t N_t^C + T_t^C$$

$$H_t = \frac{C_{u,t}}{C_t}$$

$$C_t = \lambda C_t^C + (1 - \lambda) C_t^U$$

## Non-Tradable Sector

$$Y_{N,t} = A_{N,t} M_{F,t}^\kappa N_{N,t}^{1-\kappa}$$

$$p_{F,t} M_{F,t} = m c_t \kappa Y_{N,t}$$

$$w_t N_{N,t} = m c_t (1 - \kappa) Y_{N,t}$$

$$\Pi_{N,t} (\Pi_{n,t} - \bar{\pi}) = \beta \mathbb{E}_t \left[ \frac{\delta_{t+1}}{\delta_t} \Pi_{n,t+1} (\Pi_{N,t+1} - \bar{\pi}) \frac{Y_{N,t+1}}{Y_{n,t}} \right] + \frac{\epsilon}{\xi} \left( m c_t - \frac{\epsilon - 1}{\epsilon} \right)$$

## Tradable Sector

$$Y_{T,t} = A_{T,t} N_{T,t}^{1-\zeta}$$

$$w_t N_{T,t} = (1 - \zeta) Y_{T,t} p_{T,t}$$

$$Y_{T,t} = \left( \frac{\gamma}{p_{T,t}} \right) [(1 - \alpha) C_t + \alpha S_t C_t^*]$$

## Prices and resource constraint

$$P_t = P_{H,t}^{1-\alpha} P_{F,t}^\alpha$$

$$P_{H,t} = P_{N,t}^{1-\gamma} P_{T,t}^\gamma$$

$$\frac{S_t}{S_{t-1}} = \Delta \mathcal{E}_t \frac{\Pi_t^*}{\Pi_t}$$

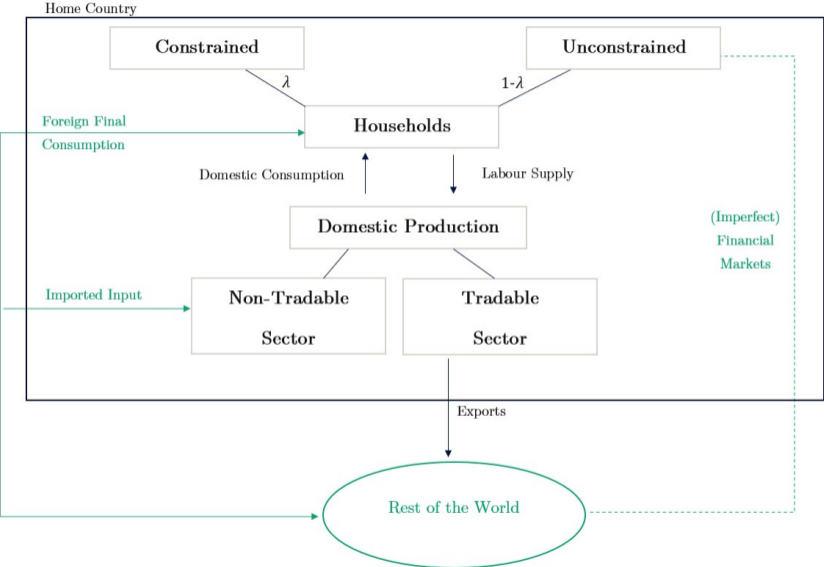
$$N_{T,t} + N_{N,t} = (1 - \lambda) N_t^U + \lambda N_t^C$$

## Government Transfers

$$\Psi = (1 - \lambda) T_t^U + \lambda T_t^C$$



# STRUCTURE OF THE ECONOMY



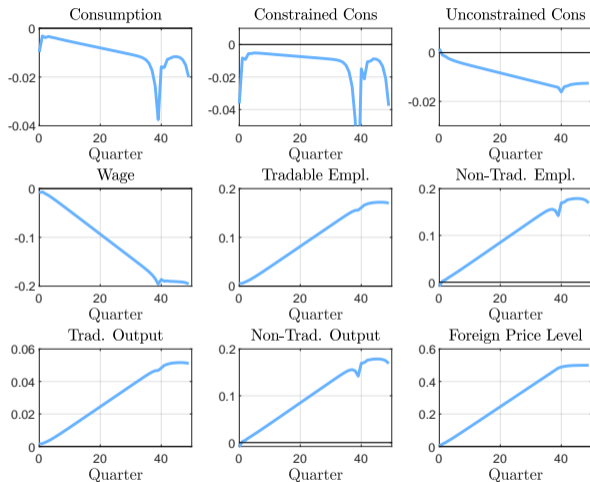
## CALIBRATION

Parameter	Benchmark Model	Description
$\beta$	0.99	Discount Factor
$\chi$	0.00001	Portfolio Adjustment cost
$1 - \alpha$	0.75	Home Bias
$\nu, \eta$	1	Price Elasticities
$\sigma$	4	Elasticity of Intertemporal Substitution
$\kappa$	$\approx 0$	Cobb-Douglas Weight on Foreign Input
$\phi_\pi$	2	Taylor Response to Inflation
$\epsilon$	6	Elasticity of substitution (NT)
$\phi_y$	0	Taylor Response to Output
$\phi$	1	Frisch Elasticity
$\xi$	28.003	Price Adjustment Cost
$\lambda$	0.3	Share of Constrained HH
$\gamma$	0.2	Tradable Weight in Consumption

## THREE FRAGMENTATION SCENARIOS

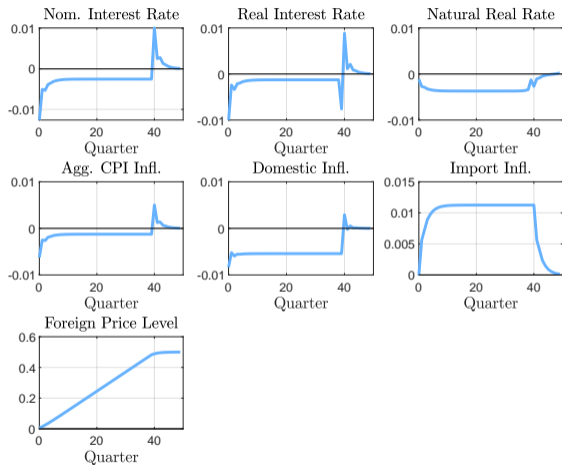
1. Gradual Fragmentation: price of imported goods increases gradually and permanently, stabilising at higher levels in the medium-to-long term
2. Front-loaded Fragmentation: price of imported goods increases permanently and immediately
3. Fall in Tradables' Productivity: TFP in the tradable sector falls persistently

# GRADUAL IMPORT PRICE INCREASE I



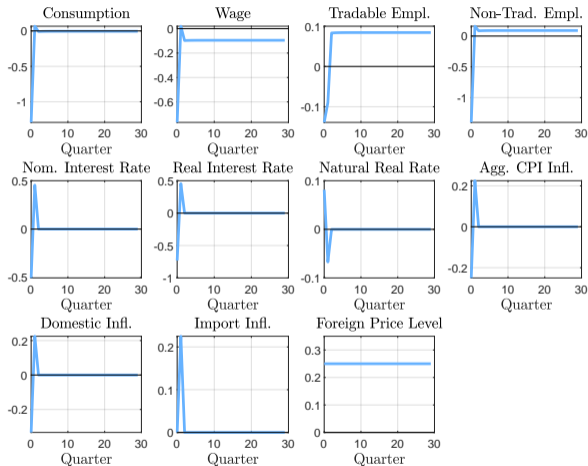
- ▶ Unconstrained households lower spending in response to lower permanent income
- ▶ Constrained households lower spending and increase labour supply in response to lower demand and higher prices
- ▶ Real wages fall

## GRADUAL IMPORT PRICE INCREASE II



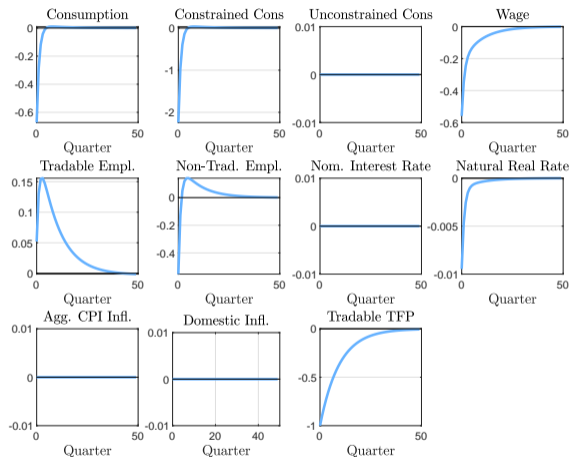
- ▶ Domestic inflation falls in response to the drop in domestic demand
- ▶ Aggregate CPI inflation is an average of lower domestic inflation and higher imported inflation
- ▶ The natural real rate of interest falls
- ▶ Monetary policy needs to loosen. Stagnation

# FRONT-LOADED INCREASE IN IMPORT PRICES



- ▶ Constrained households lower consumption and increase labour supply
- ▶ The natural real rate increases temporarily
- ▶ Short-term tradeoff: Monetary policy needs to tighten; inflation overshoot
- ▶ Consumption permanently lower (not seen in scale)

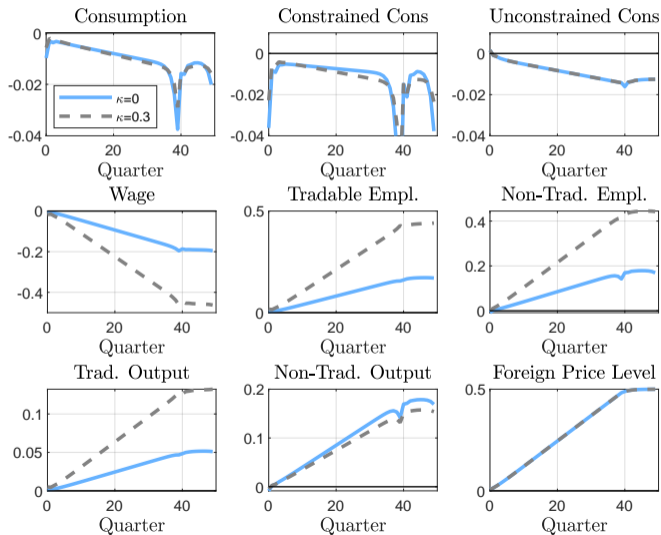
# TRADABLE TFP SHOCK



- ▶ Real wages fall
- ▶ Financially constrained consumers cut on spending and increase labour supply (negative income effect)
- ▶ Fall in demand pushes down on domestic inflation
- ▶ The natural rate of interest falls

# GRADUAL IMPORT PRICE INCREASE I

LARGER WEIGHT ON FOREIGN INPUT IN PRODUCTION ( $\kappa = 0.3$ )

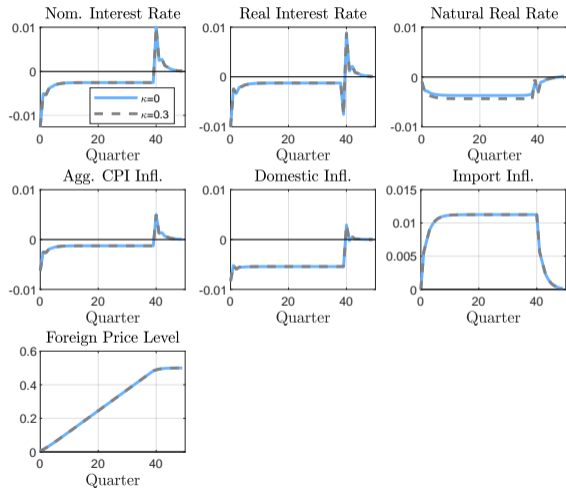


- ▶ Use of foreign imports in production exacerbates the fall in real wages and the increase in employment



# GRADUAL IMPORT PRICE INCREASE II

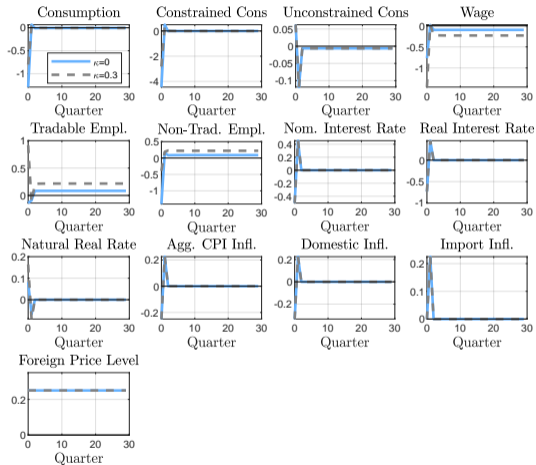
LARGER WEIGHT ON FOREIGN INPUT IN PRODUCTION ( $\kappa = 0.3$ )



- ▶ Natural real rate falls a bit more
- ▶ Monetary policy still needs to loosen

# FRONT-LOADED INCREASE IN IMPORT PRICES

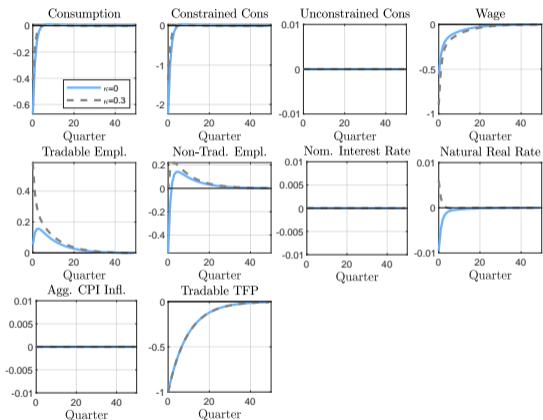
LARGER WEIGHT ON FOREIGN INPUT IN PRODUCTION ( $\kappa = 0.3$ )



- ▶ Use of imported input in production exacerbates the fall in wages and the increase in employment
- ▶ Consumption falls less, output expands by more
- ▶ Short term natural real rate increases more

# TRADABLE TFP SHOCK

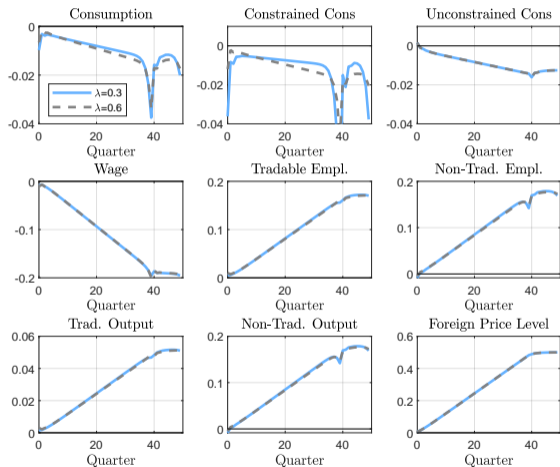
LARGER WEIGHT ON FOREIGN INPUT IN PRODUCTION ( $\kappa = 0.3$ )



- ▶ Additional margin of substitution: adjust imported input and employment
- ▶ Economy that can import from abroad can respond better to a domestic shock
- ▶ Constrained consumption falls by less
- ▶ The natural real rate increases

# GRADUAL IMPORT PRICE INCREASE I

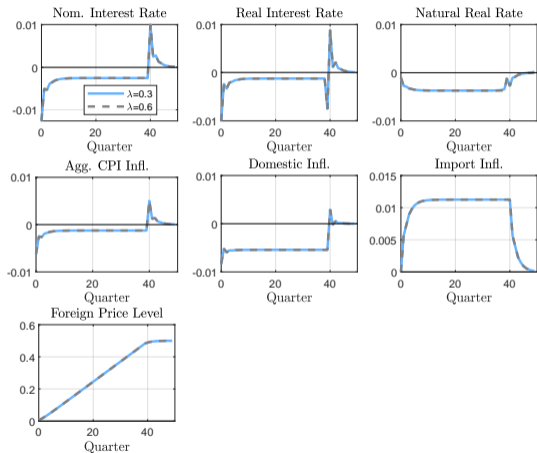
LARGER SHARE OF HAND-TO-MOUTH ( $\lambda = 0.6$ )



- ▶ More hand-to-mouth consumers means consumption falls by less on impact (less anticipation)

# GRADUAL IMPORT PRICE INCREASE II

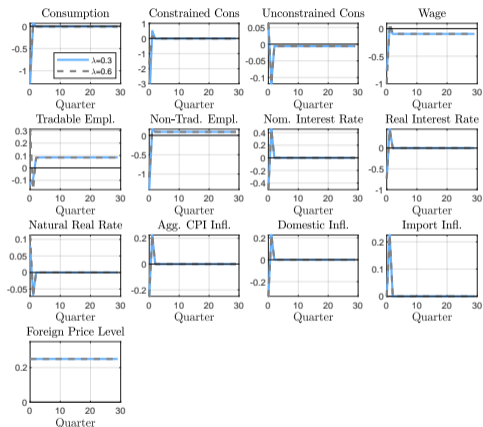
LARGER SHARE OF HAND-TO-MOUTH ( $\lambda = 0.6$ )



- ▶ But overall negligible difference in the natural rate or inflation

# FRONT-LOADED INCREASE IN IMPORT PRICES

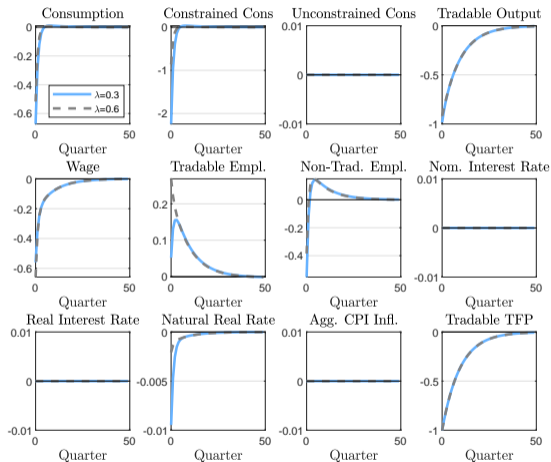
LARGER SHARE OF HAND-TO-MOUTH ( $\lambda = 0.6$ )



- ▶ No big difference when there are more hand-to-mouth households and the shock is frontloaded

# TRADABLE TFP SHOCK

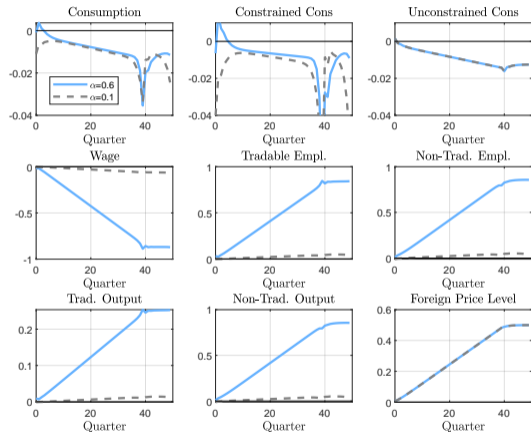
LARGER SHARE OF HAND-TO-MOUTH ( $\lambda = 0.6$ )



- ▶ Less anticipation, lower fall in consumption, higher increase in employment
- ▶ On balance, lower fall in  $r^*$
- ▶ Negligible change in CPI inflation

# GRADUAL IMPORT PRICE INCREASE I

GREATER DEGREE OF OPENNESS ( $\alpha = 0.6$ )

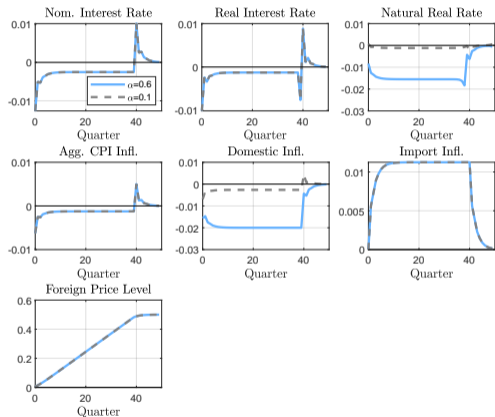


- ▶ Less home-bias (more trade openness) leads to bigger fall in wages, bigger increase in employment and output



# GRADUAL IMPORT PRICE INCREASE II

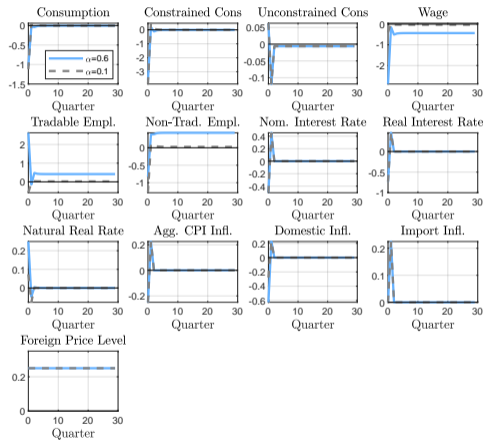
GREATER DEGREE OF OPENNESS ( $\alpha = 0.6$ )



- ▶ Higher exposure causes larger domestic adjustment
- ▶ Bigger fall in domestic inflation (CPI inflation is the same)

# FRONT-LOADED INCREASE IN IMPORT PRICES

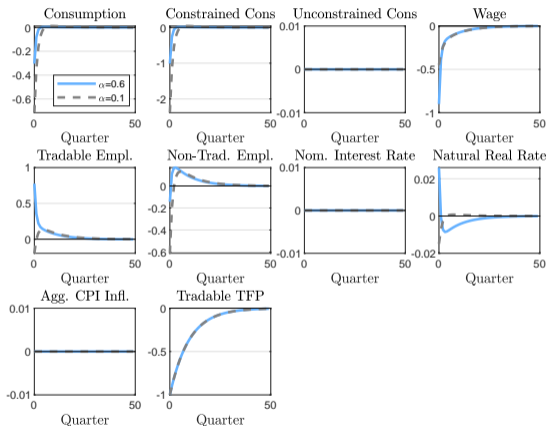
GREATER DEGREE OF OPENNESS ( $\alpha = 0.6$ )



- Higher exposure leads to lower wages and higher employment response

# TRADABLE TFP SHOCK

GREATER DEGREE OF OPENNESS ( $\alpha = 0.6$ )



- ▶ Higher openness mitigates the impact of the domestic shock
- ▶ Consumption falls by less

## TENTATIVE CONCLUSIONS

- ▶ Fragmentation causes higher import prices and restricts supply potential, lowering real incomes
- ▶ The impact on domestic and aggregate CPI inflationary pressures depends on how demand adjusts to lower incomes, which in turn depends on the shape of the fragmentation process
  - ▶ Gradual fragmentation (gradual, anticipated, permanent increase in import prices) may lead to stagnation, with lower real incomes and low inflationary pressures  
Central banks might need to loosen
  - ▶ Frontloaded fragmentation (sharp permanent increase in import prices) may create a short-term tradeoff or temporary stagflation, calling for tightening.
  - ▶ Persistent falls in tradable sector productivity might end up being neutral for inflation (shape of the adjustment should matter)
- ▶ How monetary policy should respond depends on the balance of demand and supply. The policy direction is a priori ambiguous

# RESPONSE OF SHORT-TERM $R^*$ AND MONETARY POLICY TO DIFFERENT FRAGMENTATION SHOCKS

	Gradual $P_F$ Increase	Frontloaded $P_F$ Increase	Tradable TFP Fall
$R^*$	Fall	Increase	Increase/decrease
Monetary Policy	Loosen	Tighten	neutral?

## NEXT STEPS

- ▶ Study optimal monetary policy, rather than suboptimal Taylor rules
- ▶ Other shapes of fragmentation: unanticipated, sustained increases in import prices
- ▶ Big omissions:
  - ▶ wage and relative price catch-up effects
  - ▶ lags in policy transmission
  - ▶ fiscal policy response; non-rational inflation expectations?
- ▶ Taylor rule, change in remit/higher tolerance for inflation when facing tradeoff? Inflation is very **unpopular**; unlikely to be used by populists right after the recent experience. In stagnation scenario, pressures are disinflationary

## OUTSIDE OF THE MODEL

- ▶ Other policies suitable to tackle geopolitical trends and shocks
- ▶ Need for a “real-side” policy strategy to prevent, mitigate and/or cope with the economic impact of geopolitical developments
  1. Investment on technological diversification, focused on low-substitutability inputs or technologies ([Koren and Tenreyro, 2010](#))
  2. Deeper trade integration with low geopolitical-risk countries to lower exposure to shocks to specific suppliers/buyers (whether domestic or foreign), reducing volatility ([Caselli, Koren, Lisicky, and Tenreyro, 2020](#)). Reshoring increases risk exposure and volatility, reducing resilience
  3. Inventory base to prepare for shortages in critical inputs (energy, water, etc.)