Monetary Unions and National Welfare

Cem Gorgun

Koc University

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Introduction

- Monetary regime choice: monetary union vs flexible exchange rate

  Eurozone, US, AMU, Khaleeji, etc.
- Classical approach: Countries with similar shocks should establish monetary unions (Mundell 1961)
  - Pros of monetary unions: crediblity (Giavazzi and Pagano 1988), trade (Rose 2000)
  - Cons: One-size-fits-all interest rate (Dellas and Tavlas 2009)

Introduction

Research Question

Which countries should form a monetary union when countries are large enough to have an impact on others?

Two distinctions:

1. SOE vs LOE

   (Soffritti and Zanetti 2008; Clerc, Dellas, and Loisel 2011)

2. Efficient vs Inefficient Shocks

   Efficient shocks with large economies $\Rightarrow$ Pappa 2004

   Inefficient shocks with small economies $\Rightarrow$ Clerc, Dellas, and Loisel 2011

Results

A New Criterion

- A New Criterion: Countries with close variation (mean preserving spread) in inefficient shocks should establish a monetary union.
  - efficient shocks: the classical approach prevails (Mundell 1961; Pappa 2004)
  - inefficient shocks: monetary union as cooperation
    $\Rightarrow$ Better responses to foreign inefficient shocks, worse responses to domestic inefficient shocks
    $\Rightarrow$ Monetary union if higher variation in foreign inefficient shocks
    $\Rightarrow$ Pareto Improvement if variations are close

Results (continued)

- 'Tie the hand of the others'
  - to compel others to cooperate
  - a different motivation then 'tying your own hand' (Giavazzi and Pagano 1988)
- The price rigidity and the trade elasticity
  - higher trade elasticity
    $\Rightarrow$ the terms of trade effect $\nearrow$
    $\Rightarrow$ adjustment of international relative prices $\searrow$

Methodology

- A two-country model

  price rigidity, producer's currency pricing (PCP), complete asset markets
- Two regimes: monetary union, flexible exchange rate regime
- Monetary union: the central bank maximizes overall welfare
- Flexible exchange rate regime: central banks compete to maximize national welfare
- Ex-post welfare loss differences between the two regimes

The Model

- Two countries: $\{A, B\}$
- Infinitely many agents aligned between 0 and 1
- n proportion of of agents in country A, $1 - n$ in B

  $n = \frac{1}{2}$

The Model (continued)

- A household j in country i
  - produces a differentiated good
  - consumes a bundle of domestic and foreign goods
  - trade 1-period state contingent assets
    asset markets are complete
- A producer
  - is allowed to set its price at time t with probability $1 - \alpha$
  - maximizes expected discounted profits
  - assumes that it cannot alter domestic
    price staggering mechanism à la Calvo 1983

Structural Equations

Table 1: Structural Equations

Aggregate Demand	$\hat{C}_t = \mathbb{E}_t \hat{C}_{t+1} - \rho^{-1}(i_t - \mathbb{E}_t \pi_{H,t+1} - (1-n)\mathbb{E}_t \Delta \hat{T}_{t+1})$
	$\hat{C}^*_t = \mathbb{E}_t \hat{C}^*_{t+1} - \rho^{-1}(i^*_t - \mathbb{E}_t \pi^*_{F,t+1} + n\mathbb{E}_t \Delta \hat{T}_{t+1})$
Market Clearing Condition	$\hat{Y}_{H,t} = \hat{C}_t + \theta(1-n)\hat{T}_t$
	$\hat{Y}^*_{F,t} = \hat{C}^*_t - \theta n \hat{T}_t$
Risk Sharing	$\hat{C}_t = \hat{C}^*_t$
Aggregate Supply	$\pi_{H,t} = \beta \mathbb{E}_t \pi_{H,t+1} + \kappa(\hat{Y}_{H,t} - \tilde{Y}^w_{H,t}) + (1-n)\kappa\psi(\hat{T}_t - \tilde{T}^w_t) + u_t$
	$\pi^*_{F,t} = \beta \mathbb{E}_t \pi^*_{F,t+1} + \kappa^*(\hat{Y}_{F,t} - \tilde{Y}^w_{F,t}) - n\kappa^*\psi(\hat{T}_t - \tilde{T}^w_t) + u^*_t$
Terms of Trade	$\hat{T}_t - \tilde{T}^w_t = \theta^{-1}\left[(\hat{Y}_{H,t} - \tilde{Y}^w_{H,t}) - (\hat{Y}_{F,t} - \tilde{Y}^w_{F,t})\right]$
Exchange Rate (flexible)	$\Delta \hat{S}_t = \Delta \hat{T}_t + \pi_{H,t} - \pi^*_{F,t}$
Exchange Rate (fixed)	$0 = \Delta \hat{T}_t + \pi_{H,t} - \pi^*_{F,t}$

Details

Monetary Policy

flexible exchange rate regime

- Exchange rate floats
- 2 national CBs
- CB of country i sets its interest rate in i to maximize national welfare

monetary union

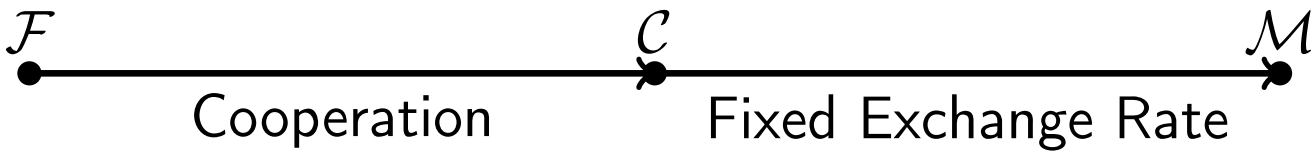
- Common currency adopted
  $\Rightarrow$ fixed exchange rate
- CB of monetary union
- CB sets a single interest rate maximizes overall welfare

Cooperative flexible exchange rate regime

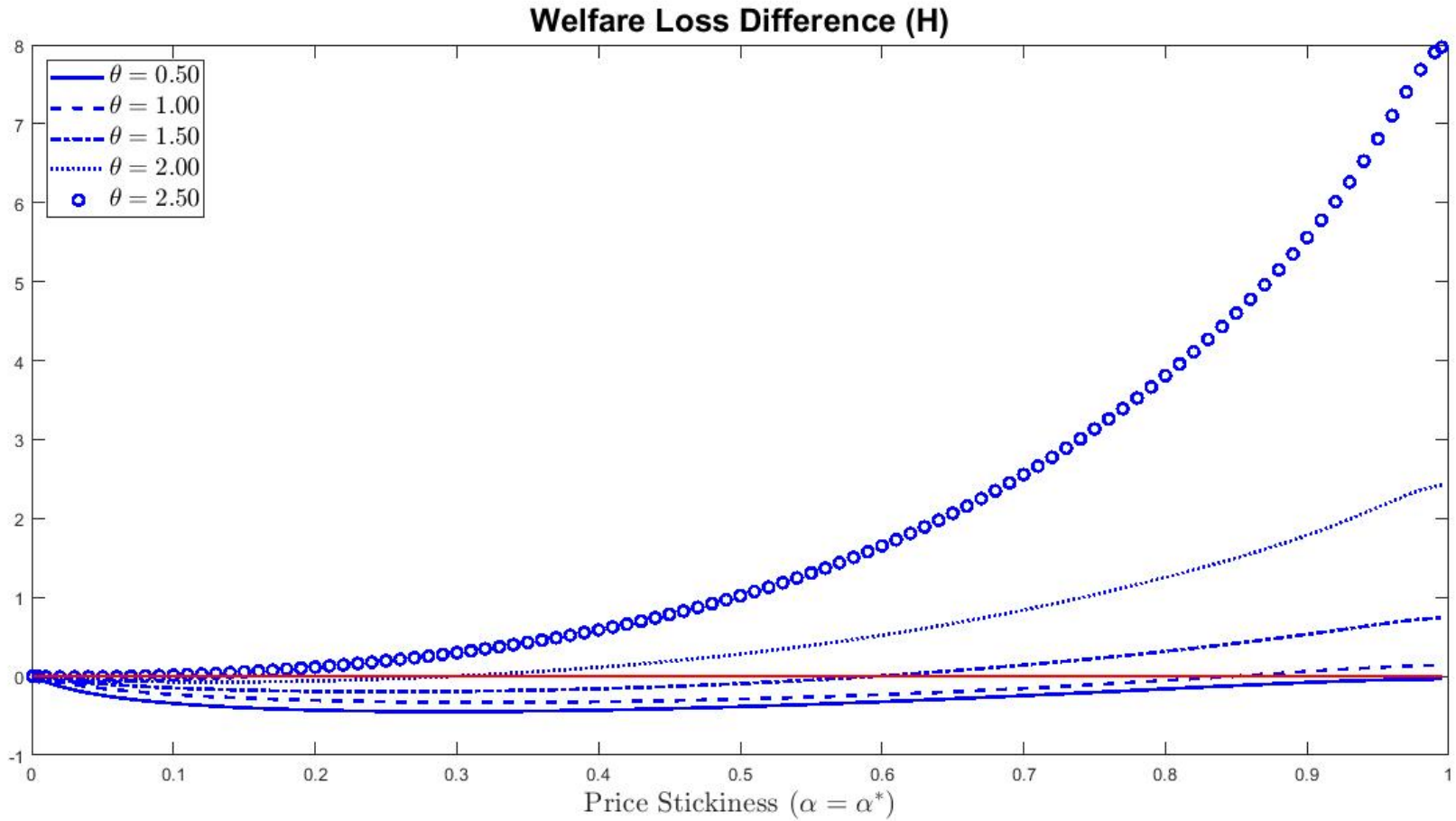
- Exchange rate floats
- A central planner maximizes overall welfare

  (2 policy rates)

  $\Leftrightarrow$ CBs cooperate
- monetary union: 'constrained cooperation' (Pappa 2004)



Monetary Regime Choice



Calibration F's Welfare

A Special Case ($\rho = \theta = 1$)

- The intertemporal elasticity = The intratemporal elasticity
- No beggar-thy-neighbor or beggar-thyself effect
- The terms of trade is eliminated from
  - Aggregate supply equations:

$$\pi_{H,t} = \beta \mathbb{E}_t \pi_{H,t+1} + \kappa \left(\hat{Y}_{H,t} - \tilde{Y}^w_{H,t} \right) + u_t$$

$$\pi^*_{F,t} = \beta \mathbb{E}_t \pi^*_{F,t+1} + \kappa^* \left(\hat{Y}_{F,t} - \tilde{Y}^w_{F,t} \right) + u^*_t$$

  - Welfare loss functions

National Welfare

H's Welfare loss function $\tilde{\tilde{W}}_H$

$$-\frac{1}{2}\mathbb{E}_0\sum_{t=1}^{\infty}\beta^t\left[\lambda_{y_h}\left(\hat{Y}_{H,t}-\tilde{\tilde{Y}}^h_{H,t}\right)^2+\lambda_{y_f}\left(\hat{Y}^*_{F,t}-\tilde{\tilde{Y}}^h_{F,t}\right)^2+\lambda_{\pi_h}{\pi_{H,t}}^2+\lambda_{\pi_f}{\pi^*_{F,t}}^2\right]$$

F's Welfare loss function $\tilde{\tilde{W}}_F$

$$-\frac{1}{2}\mathbb{E}_0\sum_{t=1}^{\infty}\beta^t\left[\lambda^*_{y_h}\left(\hat{Y}_{H,t}-\tilde{\tilde{Y}}^f_{H,t}\right)^2+\lambda^*_{y_f}\left(\hat{Y}^*_{F,t}-\tilde{\tilde{Y}}^f_{F,t}\right)^2+\lambda^*_{\pi_h}{\pi_{H,t}}^2+\lambda^*_{\pi_f}{\pi^*_{F,t}}^2\right]$$

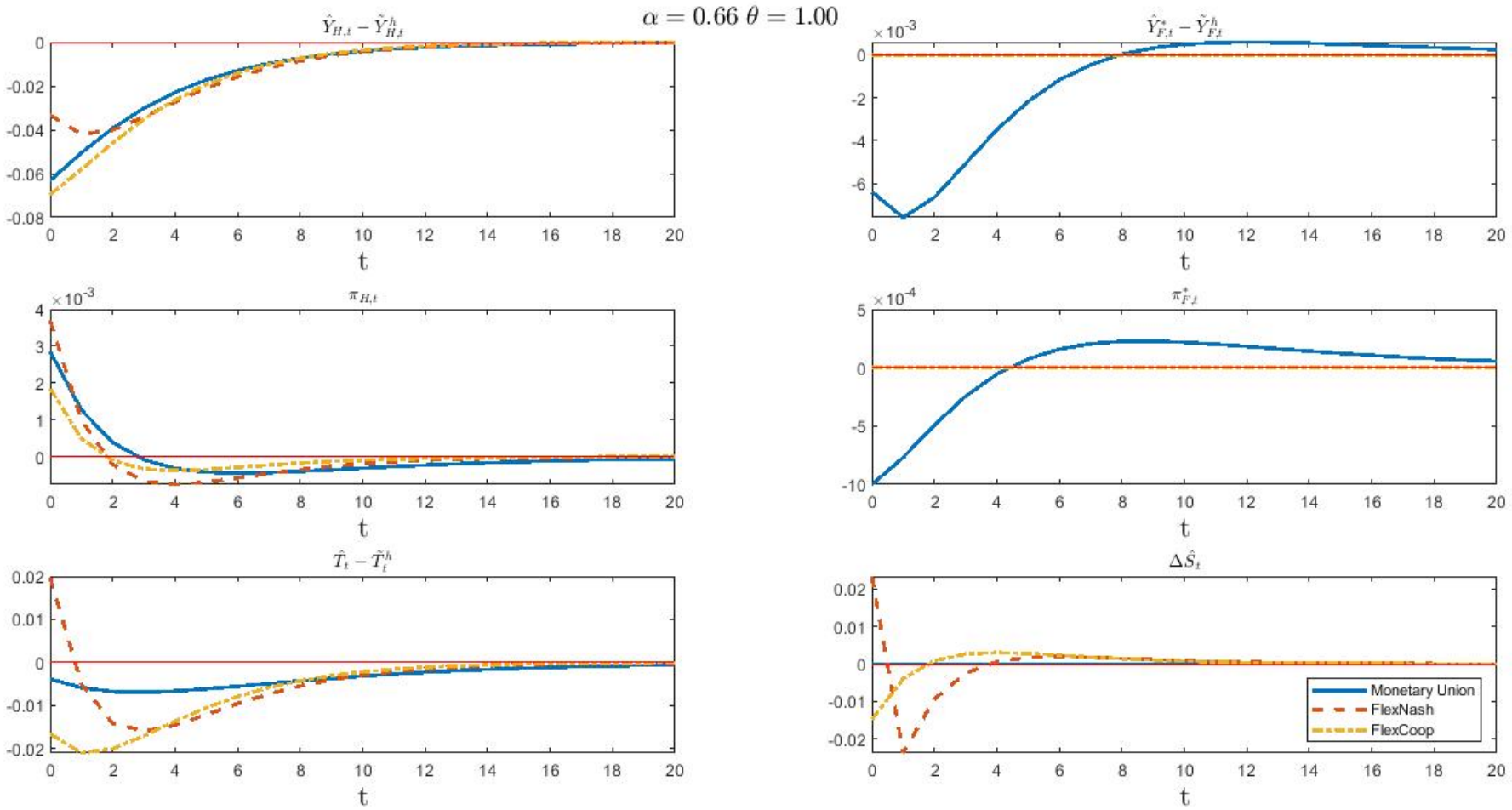
Welfare in the Union

Welfare in the union $\tilde{\tilde{W}} = n\tilde{\tilde{W}}_H + (1-n)\tilde{\tilde{W}}_F$

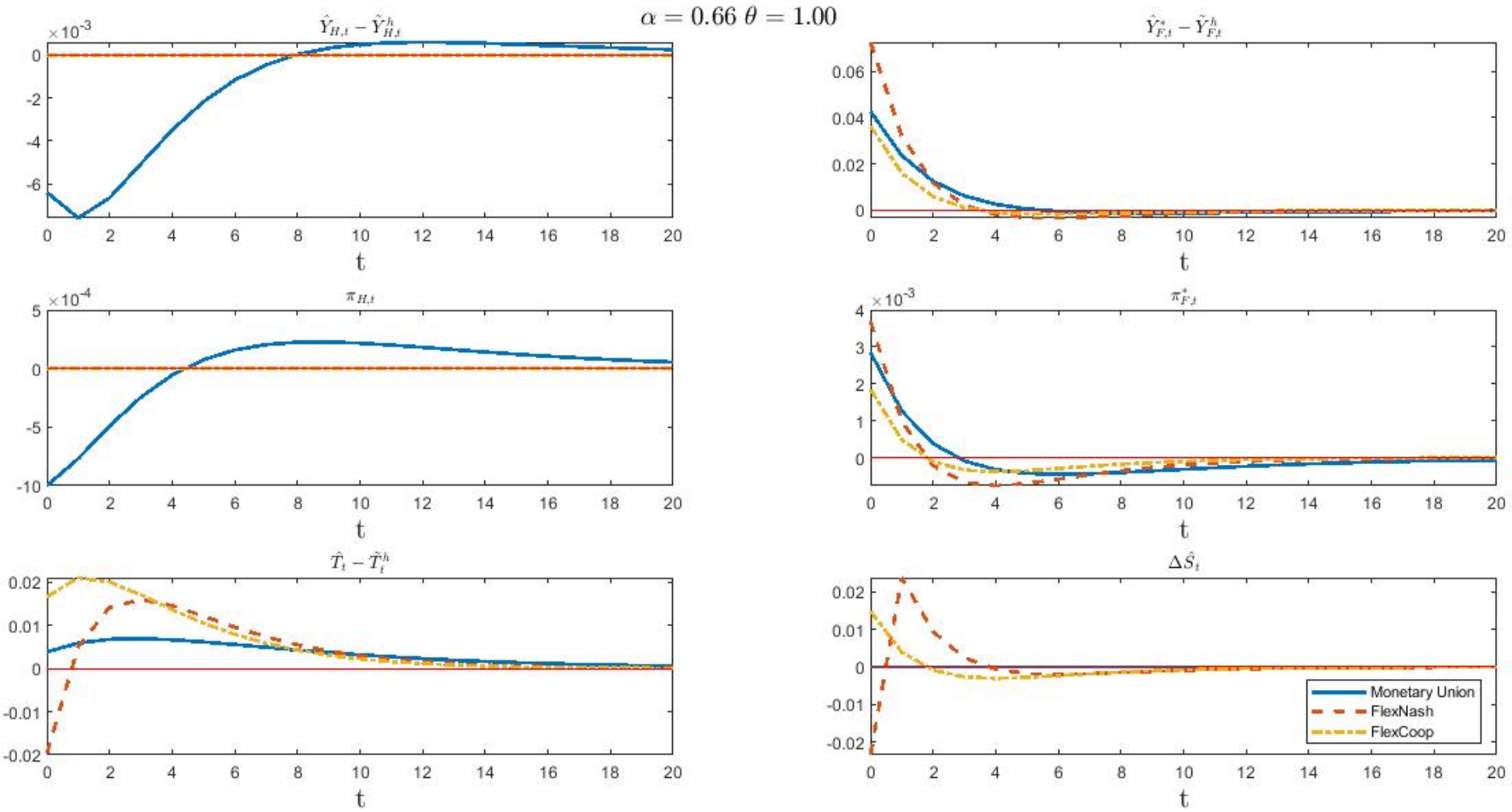
$$-\frac{\lambda_y^w}{2}\mathbb{E}_0\sum_{t=1}^{\infty}\beta^t\left[n\left(\hat{Y}_{H,t}-\tilde{\tilde{Y}}_{H,t}^w\right)^2+(1-n)\left(\hat{Y}_{F,t}-\tilde{\tilde{Y}}_{F,t}^w\right)^2+\frac{\sigma n}{\kappa}{\pi_{H,t}}^2+\frac{\sigma(1-n)}{\kappa^*}{\pi_{F,t}^*}^2\right]$$

This is the objective function of monetary policymakers in cooperative flexible exchange rate regime and in monetary union.

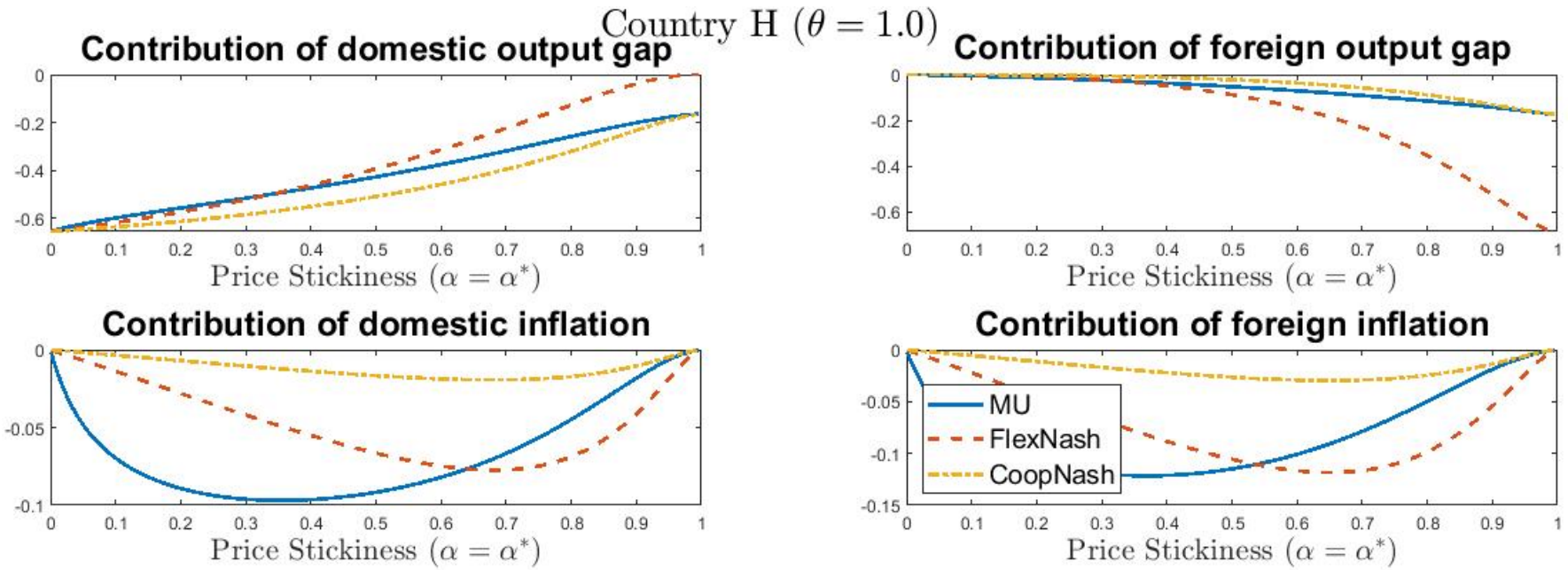
Domestic Markup Shock



Foreign Markup Shock



Contributions



Why?

flexible	**cooperative**	**first best for H**
$-\sigma\pi_{H,t} = \Delta\left(\hat{Y}_{H,t} - \tilde{\tilde{Y}}^{h}_{H,t}\right)$	$-\sigma\pi_{H,t} = \Delta\left(\hat{Y}_{H,t} - \tilde{\tilde{Y}}^{w}_{H,t}\right)$	$-\sigma\pi_{H,t} = \Delta\left(\hat{Y}_{H,t} - \tilde{\tilde{Y}}^{h}_{H,t}\right)$
$-\sigma\pi_{F,t} = \Delta\left(\hat{Y}_{F,t} - \tilde{\tilde{Y}}^{f}_{F,t}\right)$	$-\sigma\pi_{F,t} = \Delta\left(\hat{Y}_{F,t} - \tilde{\tilde{Y}}^{w}_{F,t}\right)$	$-\sigma\pi_{F,t} = \Delta\left(\hat{Y}_{F,t} - \tilde{\tilde{Y}}^{h}_{F,t}\right)$

monetary union

$$-\sigma\left(n\pi_{H,t} + (1-n)\pi_{F,t}\right) = n\Delta\left(\hat{Y}_{H,t} - \tilde{\tilde{Y}}^{w}_{H,t}\right) + (1-n)\Delta\left(\hat{Y}_{F,t} - \tilde{\tilde{Y}}^{w}_{F,t}\right)$$

Note that

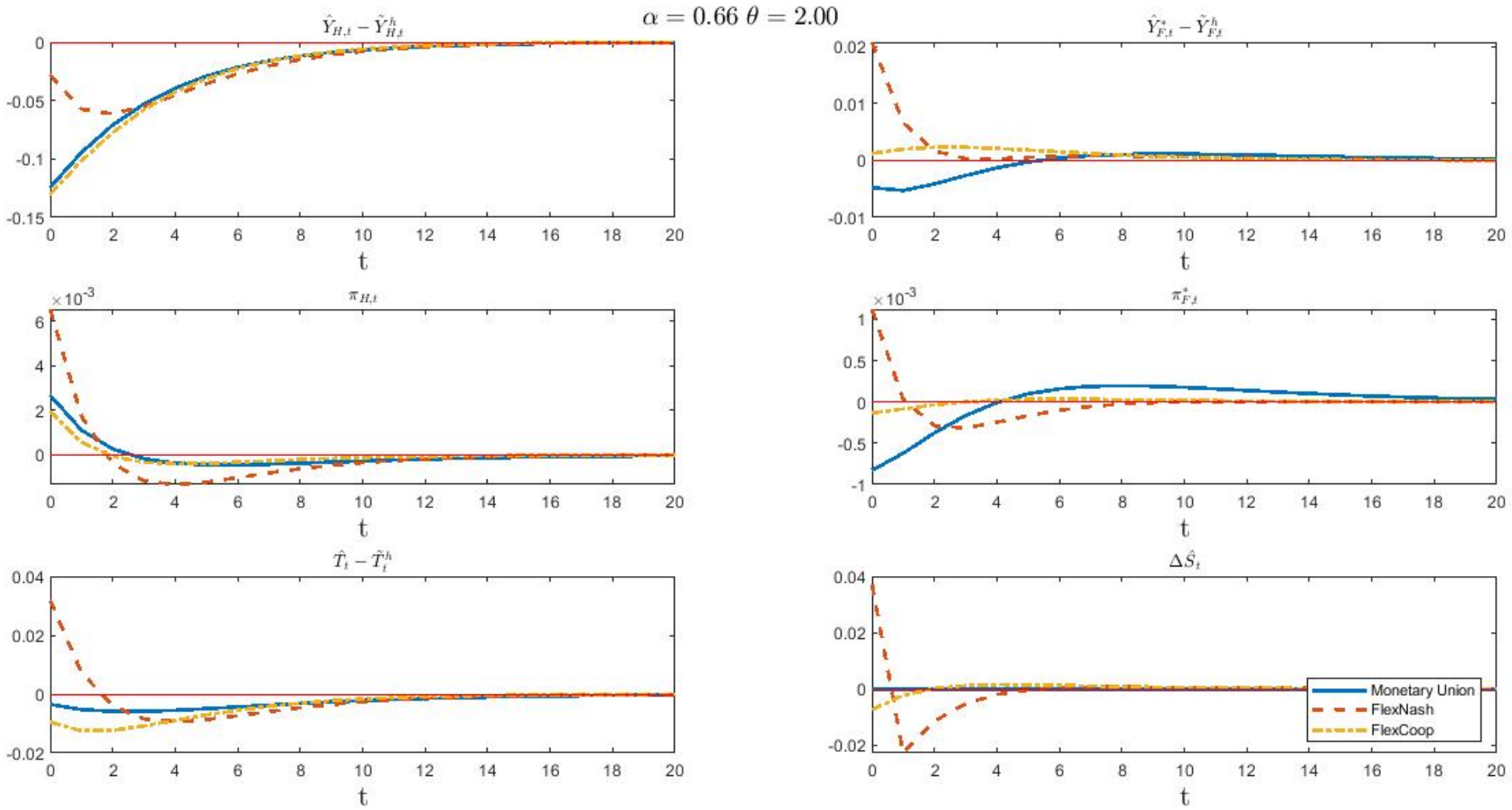
$$\tilde{\tilde{Y}}^{w}_{H,t} = n\tilde{\tilde{Y}}^{h}_{H,t} + (1-n)\tilde{\tilde{Y}}^{f}_{H,t}$$

$$\tilde{\tilde{Y}}^{w}_{F,t} = n\tilde{\tilde{Y}}^{h}_{F,t} + (1-n)\tilde{\tilde{Y}}^{f}_{F,t}$$

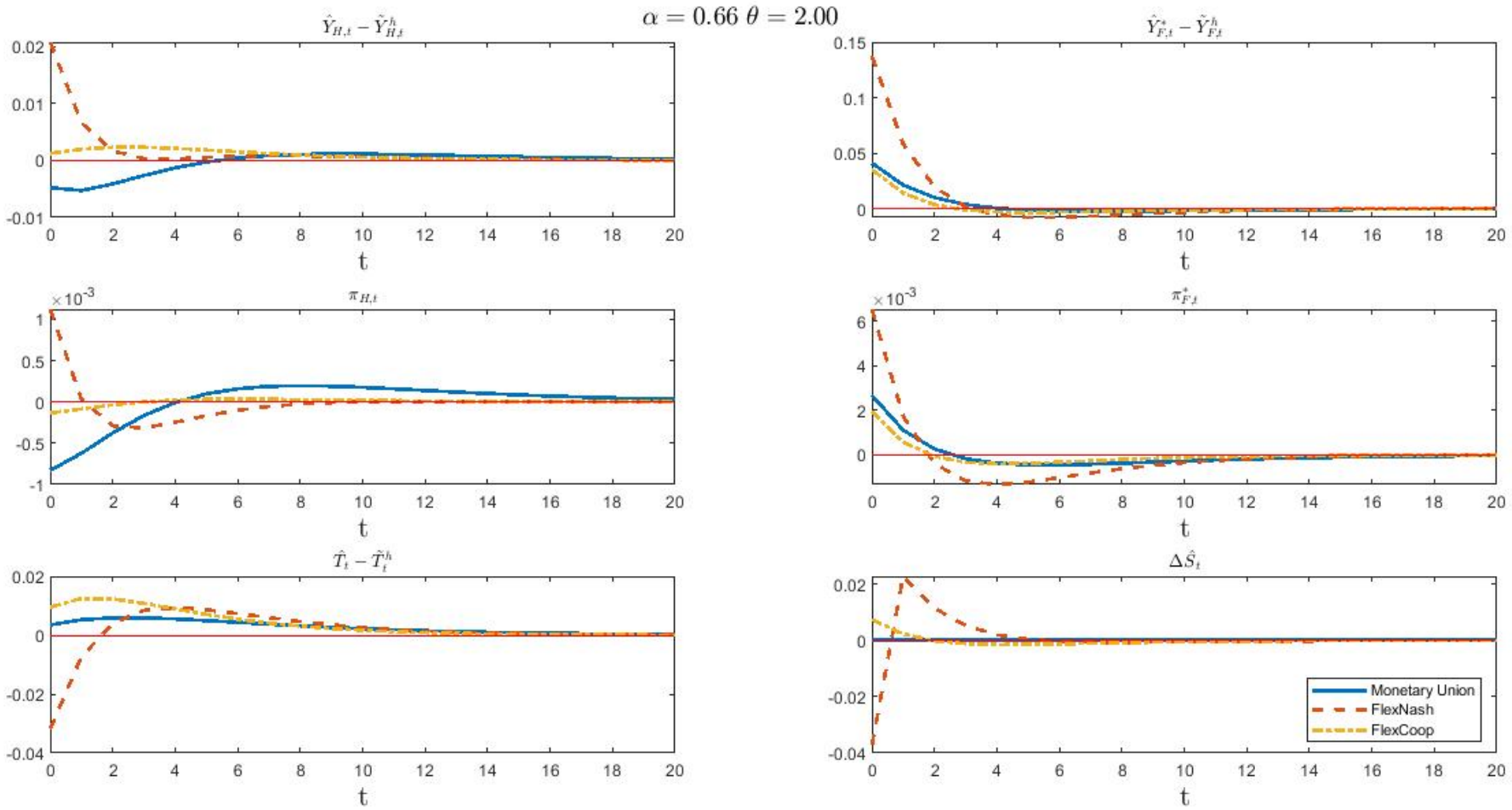
Genaral Case

- The intertemporal elasticity = The intratemporal elasticity
- Beggar-thy-neighbor or beggar-thyself effect exists

Domestic Markup Shock



Foreign Markup Shock



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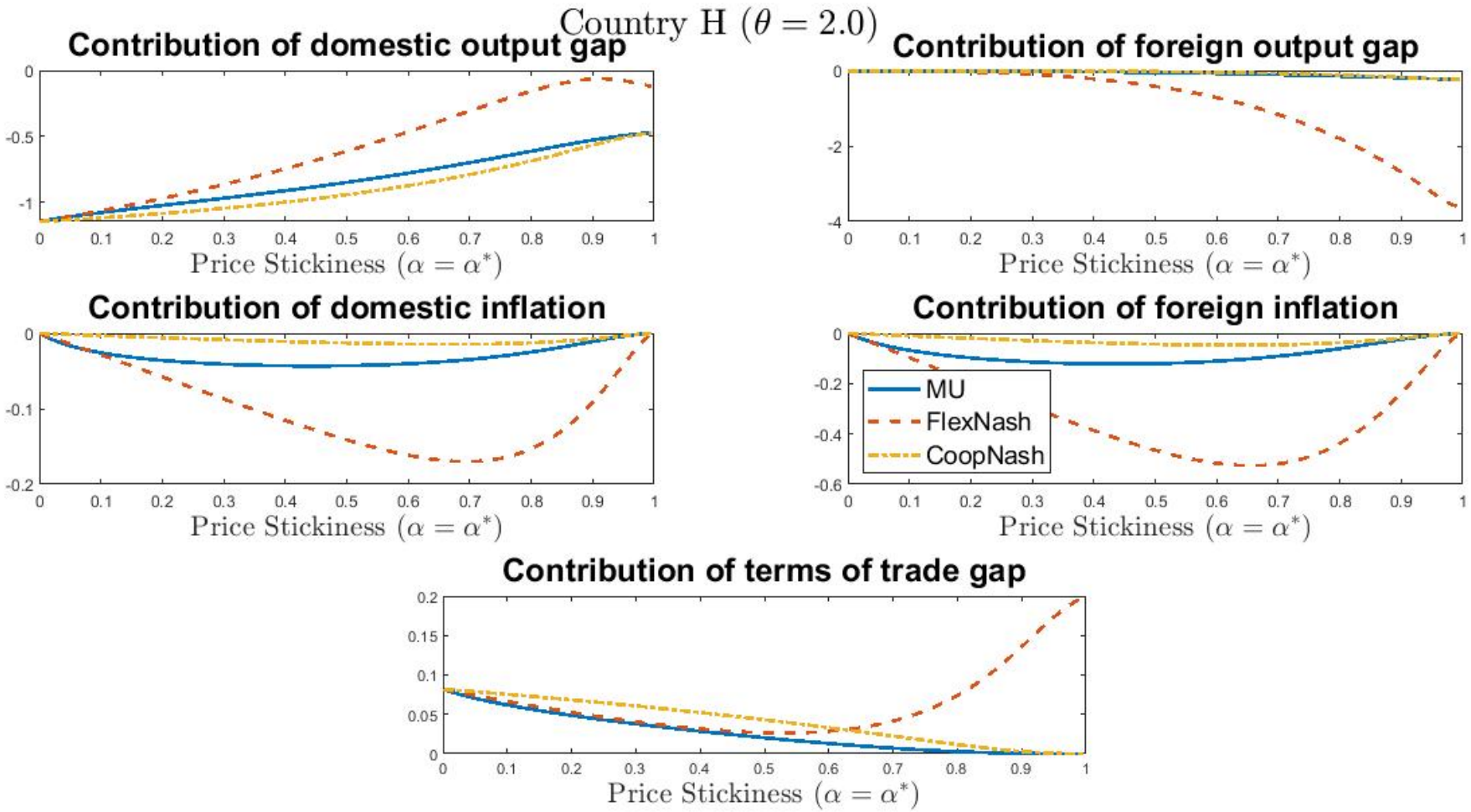
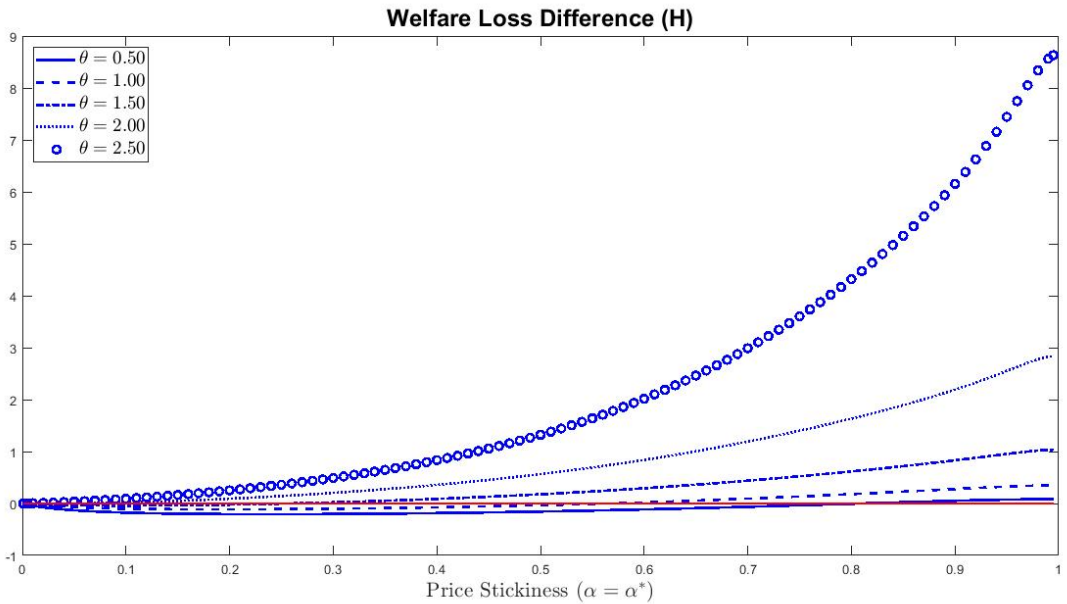


The Price Rigidity and The Terms of Trade Elasticity



↗ Trade elasticity

$\Rightarrow$ the effect of cooperation ↗

$\Rightarrow$ the effect of common currency ↘

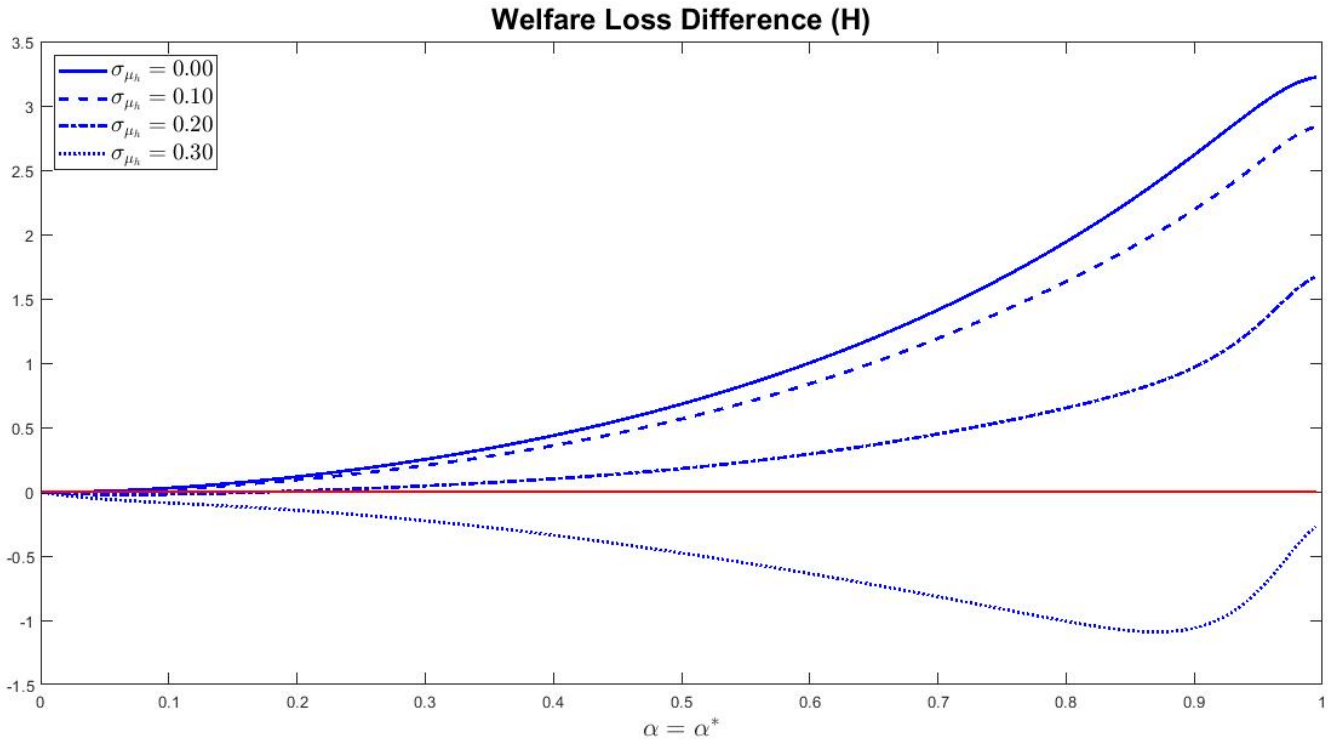
Efficient vs Inefficient Shocks

- Efficient shocks (e.g productivity)
  - Similar shocks (covariance) $\Rightarrow$ monetary union
  - if shocks are identical $\Rightarrow$ monetary union $=$ flexible exchange rate regime
- Inefficient shocks (e.g markups)
  - Monetary union $\Rightarrow$ cooperation $\Rightarrow \nearrow$ responses to inefficient foreign shocks (e.g markup)

  $\Rightarrow$ larger foreign inefficient shocks are more advantageous monetary union is

  $\Rightarrow$ A monetary union is Pareto Efficient is countries have similar size of variation in inefficient shocks

Efficient vs Inefficient Shocks



Conclusion

- The classical approach fails with large countries and inefficient shocks
- With inefficient shocks
  - Cooperation: $\nearrow$ responses to foreign shocks, $\searrow$ to domestic shocks
  - a country prefers monetary union if foreign shocks are close to or larger than domestic shocks (mean preserving spread)

  $\Rightarrow$ 'Tie the other's hand'
- A monetary union is Pareto Improvement if inefficient shocks across countries have similar mean preserving spread

Conclusion

Thank you!

Appendix for Structural Equations

Table 2: Details of Structural Equations

$\kappa \equiv (\rho+\eta)\frac{(1-\alpha)(1-\alpha\beta)}{\alpha(1+\sigma\eta)}$	$\kappa^* \equiv (\rho+\eta)\frac{(1-\alpha^*)(1-\alpha^*\beta)}{\alpha^*(1+\sigma\eta)}$	$\psi \equiv \frac{1-\rho\theta}{\rho+\eta}$
$u_t \equiv \kappa\frac{\hat{\mu}_{H,t}}{\eta+\rho}$	$u_t^* \equiv \kappa^*\frac{\hat{\mu}_{F,t}}{\eta+\rho}$	$\hat{\mu}_t^W \equiv n\hat{\mu}_{H,t} + (1-n)\hat{\mu}_{F,t}$
$\hat{\mu}_t^R \equiv \hat{\mu}_{H,t} - \hat{\mu}_{F,t}$	$\hat{a}_t^W \equiv n\hat{a}_{H,t} + (1-n)\hat{a}_{F,t}$	$\hat{a}_t^R \equiv \hat{a}_{H,t} - \hat{a}_{F,t}$
$\tilde{C}_t \equiv \frac{\eta}{(\eta+\rho)}(\hat{a}_{W,t})$	$\tilde{T}_t^w = \frac{\eta}{(1+\theta\eta)}[\hat{a}_{R,t}]$	$\tilde{Y}_{H,t}^w \equiv \tilde{C}_t + (1-n)\theta\tilde{T}_t^w$
$\tilde{Y}_{F,t}^w \equiv \tilde{C}_t + -n\theta\tilde{T}_t^w$		

Structural Equations

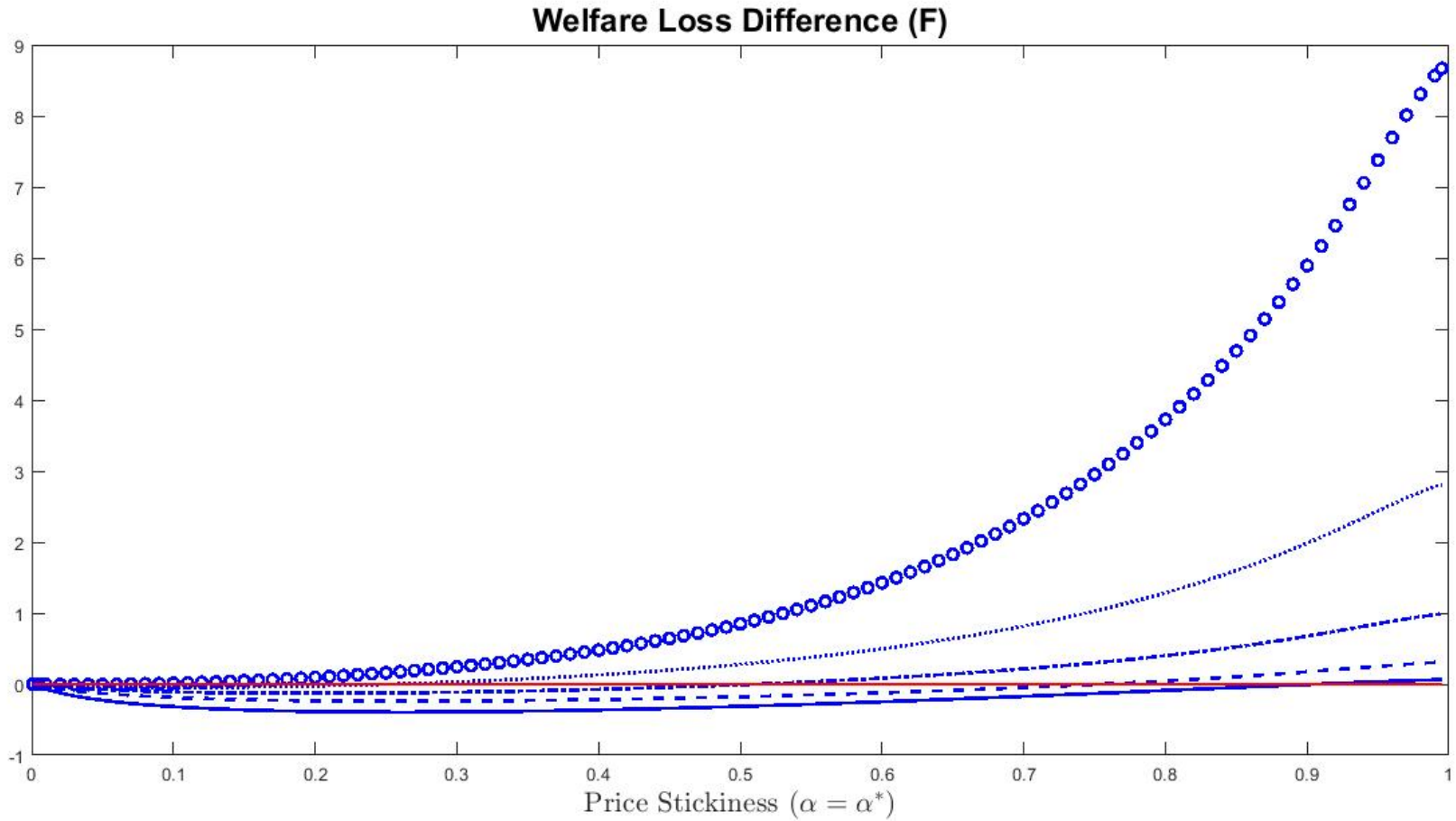
Calibration

Table 3: Calibration

Parameter	Variable name	Value
β	Discount factor	0.99
ρ	Inverse elasticity of intertemporal substitution	1.00
η	Inverse elasticity of goods production	0.89
σ	Elasticity of substitution between goods produced in a country	9.00
θ	Elasticity of substitution between H and F goods	2.00
α	Calvo parameter for $i = \{H, F\}$	0.66
n	Relative size of domestic country	0.50
ρ_i	Persistence of shocks $\rho_{\mu_h} = \rho_{\mu_f} = \rho_{a_h} = \rho_{a_f}$	0.70
$\sigma^2_{\mu_h}$	Variance of shocks $\sigma^2_{\mu_h} = \sigma^2_{\mu_f} = \sigma^2_{a_h} = \sigma^2_{a_f}$	0.10

H's Welfare

Monetary Regime Choice of *F*



H's Welfare