Financial Heterogeneity and Monetary Union

Simon Gilchrist, Boston University
Raphael Schoenle, Brandeis University
Jae Sim, Federal Reserve Board
Egon Zakrajsek, Federal Reserve Board

2015 CEPR-ESSIM, Tarragona, Spain

The Origin and Resolution of the Crisis

The Origin

- Discussions focus on the fiscal origin of the crisis.
- Nevertheless, it was a classic balance-of-payment crisis
- The mix of overvalued real exchange rates (RERs) and cheap credit supply fueled by economic optimism did it.

The Resolution

- Resolution of the crisis requires the realignment of overvalued RERs.
- In a currency union, only possible through deflation in the south and reflation in the north. Surprisingly hard to achieve. Why?

Lessons from the U.S.

- Our earlier work, Gilchrist, Schoenle, Sim and Zakrajsek [2015] shows that during the financial crisis,
  - Firms with strong balance sheet condition slashed their markup.
  - Firms with weak balance sheet condition raised their markup.
- Gilchrist, Schoenle, Sim and Zakrajsek [2015] develops a GE model that can replicate such pattern.
  - The theory emphasizes the role of the tension between market share maximization and financial friction in firms' pricing decision.

Heterogeneity as Propagation Mechanism

- In this paper, we extend the theoretical framework to two-country GE.
- Study the consequences of forming a currency union among countries with heterogeneous financial conditions.

Price War

- During the periphery's liquidity crisis, the core has a strong incentive to slash markup to gain market share both at home and abroad.
- In contrast, the periphery is forced to raise prices to secure cashflow, carnibolizaing its own future market share.

Self-Reinforcing Crisis

- Possibility of RERs to appreciate for the periphery rather than for the core, a feedback loop that reinforces the liquidity crisis of the periphery.

Policy Options

- Fiscal Union:
  - Trading state-contingent bonds among heterogeneous countries.
  - We show that the fiscal union can bring powerful stabilization effects.
  - Are the costs of fiscal union bearable by core countries?
- Fiscal Devaluation:
  - Certain mixes of fiscal instruments replicate the devaluation.
  - Adao, Correia and Teles [2009] and Farhi, Gopinath and Itskhoki [2014].
  - When can a unilateral fiscal devaluation be beneficial to core? Depends on the strength of the pecuniary externality created by financial friction.

Preferences

- A continuum of households in home $j \in N_c \equiv [0,1]$
- Two types of goods: $\begin{cases} \text{home goods } (h),\ c^j_{i,h,t},\ i \in N_h \equiv [1,2] \\ \text{foreign goods } (f),\ c^j_{i,f,t},\ i \in N_f \equiv [2,3] \end{cases}$
- CRRA in habit-adjusted consumption basket x^j_t :

$$U_t = \frac{1}{1-\gamma_c}(x^j_t - \delta_t)^{1-\gamma_c} - \frac{\zeta}{1+1/\gamma_h}(h^j_t)^{1+1/\gamma_h}$$

- U is concave in h^j, labor hours of household j.
- δ is an aggregate demand shock that perturbs marginal utility.

Deep Habit

- Armington-Raven-Schmitt-Grohe-Uribe aggregator x_t^j:
  - $x_t^j \equiv \left\{ \sum_{k=h,f} \omega_k \left[\int_{N_k} (c_{ikt}^j s_{ikt-1}^\theta)^{1-1/\eta} dk \right]^{\frac{1-1/\varepsilon}{1-1/\eta}} \right\}^{1/(1-1/\varepsilon)}$
  - η and ε : elasticities of substitution within a type, and between types.
  - $\theta > 0$ measures the strength of deep habits.

- Raw of motion for deep habit:
  - $s_{ikt} = \rho s_{ikt-1} + (1-\rho) \int_{N_c} c_{ikt}^j dj \quad \text{for } k = h, f,$
  - Hence, "Catching up with Joneses" at the good-level

Technology

- Production function (labor input, fixed operating costs):
  - $y_{it} = c_{iht} + c^*_{iht} = \left[\frac{A_t}{a_{it}} h_{it}\right]^{\alpha} - \phi \quad \text{for } i \in N_h; \quad 0 < \alpha \leq 1$
  - A_t = persistent aggregate technology shock
  - a_{it} = i.i.d. idiosyncratic shock with $\log a_{it} \sim N(-0.5\sigma^2, \sigma^2)$
- Fixed operation cost (ϕ): aggressive (low) markup strategy may create a liquidity problem.
- ϕ can be thought of servicing costs of fixed long-term debts.
- Heterogeneity in financial capacity: $\phi > \phi^* = 0$.

Frictions

- Financial Frictions
  - Financial friction: costly equity financing (Myers and Majluf [1984])
  - New shares to be sold only at a discount due to asymmetric information
  - Issuance of €1 claims on a firm brings in only €$1 - \varphi_t$ of cashflow.
  - The "lemon premium" φ_t follows an AR(1): financial shock
  - No cross border ownership of firms (Obstfeld and Rogoff [2000]).
- Nominal Rigidity
  - Rotemberg [1982] and Erceg, Henderson and Levin [2000].
  - Local currency pricing: law of one price does not apply.

Beggar-Thy-Neighbor at the Micro-Level

- Deep habit makes investment in market share profitable.
- Investment takes the form of low markups, which exposes firms to liquidity risk. Optimal pricing strikes a balance.

- Price war: the liquidity crisis of competitors is a good chance to steal market share by undercutting their prices.

  "Mr. Marchionne and other auto executives accuse Volkswagen of exploiting the crisis to gain market share by offering aggressive discounts. "It's a bloodbath of pricing and it's a bloodbath on margins," he said."

  – *The New York Times*, *July 25, 2012*

Financial Friction and Pricing

- Assume flexible prices and no customer market for now.
- When $\alpha = 1$, optimal pricing requires

$$p_{i,h,t} = \underbrace{\underbrace{\frac{\eta}{\eta - 1}}_{\text{accounting markup}} \times \frac{\mathbb{E}_t^a[\xi_{it} a_{it}]}{\mathbb{E}_t^a[\xi_{it}]}}_{\text{economic markup}} \times \underbrace{\left[\frac{w_t / p_{h,t}}{A_t}\right]}_{\text{real marginal cost}}$$

- Financial friction implies $\dfrac{\mathbb{E}_t^a[\xi_{it} a_{it}]}{\mathbb{E}_t^a[\xi_{it}]} = 1 + \mathrm{Cov}[\xi_{it} a_{it}] \geq 1$

Financial Friction, Customer Market and Pricing

- In customer markets, optimal pricing requires

$$
\begin{aligned}
p_{i,h,t} \quad = \quad & \frac{\eta}{\eta-1}\frac{\mathbb{E}_t^a[\tilde{\zeta}_{it}a_{it}]}{\mathbb{E}_t^a[\tilde{\zeta}_{it}]}\frac{w_t/p_{h,t}}{A_t} \\
& -\frac{\chi}{\eta-1}\mathbb{E}_t\left\{\sum_{s=t+1}^{\infty}\tilde{\beta}_{t,s}\frac{\mathbb{E}_s^a[\tilde{\zeta}_{i,s}]}{\mathbb{E}_t^a[\tilde{\zeta}_{i,t}]}\left[p_{h,s}-\frac{w_s/p_{h,s}}{A_s}\right]\right\}
\end{aligned}
$$

- Price dynamics depends on two competing discounting factors:
  - A discounting factor positively depending on market share growth:

$$
\begin{aligned}
\tilde{\beta}_{t,s} \quad \equiv \quad & m_{s,s+1}\frac{s_{h,s+1}/s_{h,s}-\rho}{1-\rho} \\
& \times\prod_{j=1}^{s-t}\left[\rho+\chi\frac{s_{h,t+j}/s_{h,t+j-1}-\rho}{1-\rho}\right]m_{t+j-1,t+j}
\end{aligned}
$$

  - Liquidity discounting factor: $\mathbb{E}_s^a[\tilde{\zeta}_{i,s}]/\mathbb{E}_t^a[\tilde{\zeta}_{i,t}]$ for $s > t$.

Missing Deflation During the Eurozone Crisis

- Euro area countries experienced relatively mild disinflation:

	1992-2008		2009-2014	
	Core	GIIPS	Core	GIIPS
Avg.inflation(%)	1.67	3.73	1.30	0.33
Avg.outputgap(%)	0.04	0.87	-1.75	-4.96

- Estimated panel-version of the hybrid NK Phillips curve:

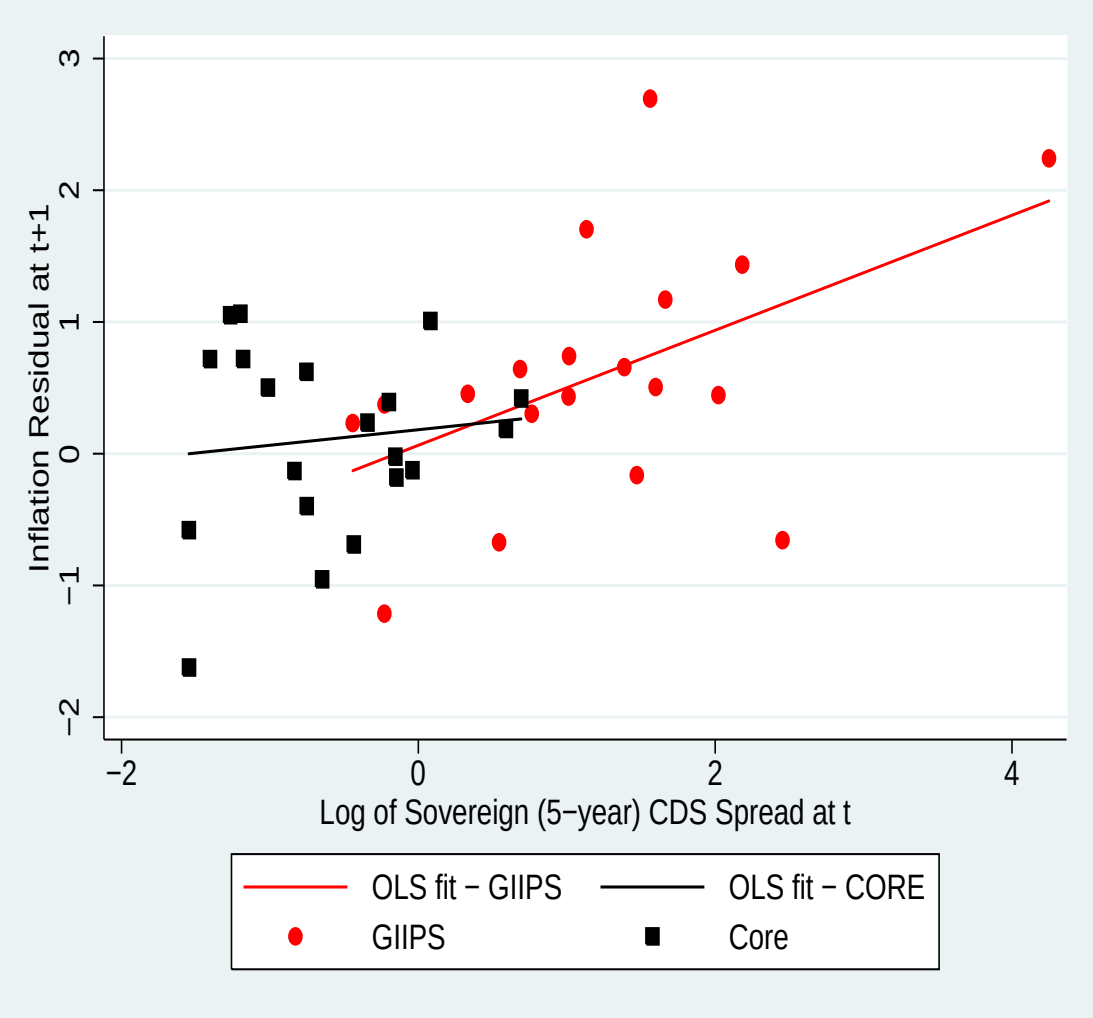
$$\pi_{it} = \underset{[0.024]}{0.457}\, \mathbb{E}_t \pi_{i,t+1} + \underset{[0.023]}{0.53}\, \pi_{i,t-1} + \underset{[0.011]}{0.132}\, (y_{it} - \bar{y}_{it}) + \eta_i + \epsilon_{i,t}$$

  - Countries: AUT, DEU, FIN, FRA, NLD, GRC, IRL, ITA, ESP, PRT
  - Annual data: 1965–2014 (unbalanced panel)

Inflation Dynamics and Financial Factors

Sample period: 2009–2014: NK Hybrid Phillips Curve

- Is the lack of deflationary pressures related to financial conditions?



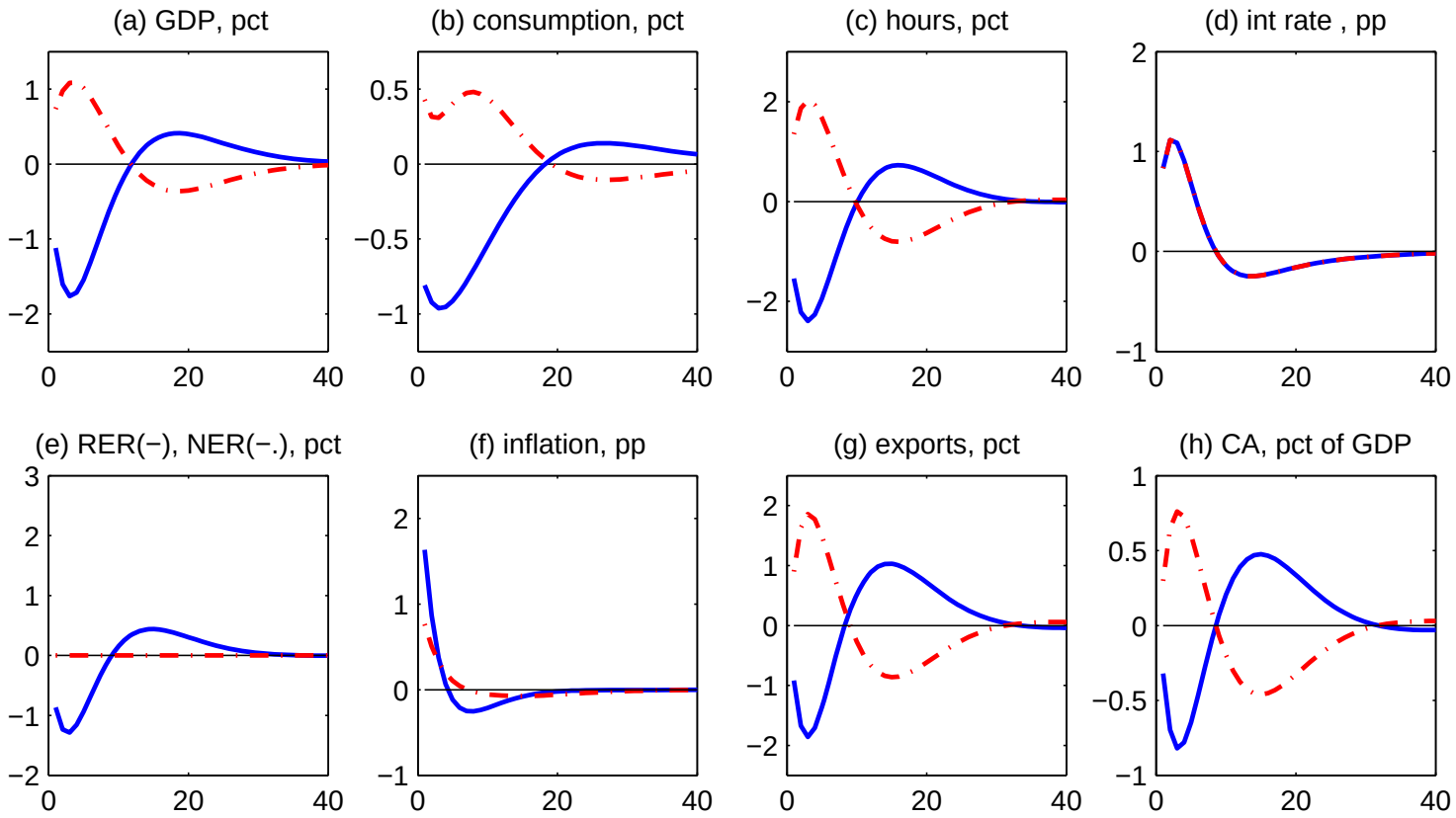
Calibration

Table: Baseline Calibration

Description	Value
Preferences and technology	
deep habit, θ	-0.90
persistence of deep habit, ρ	0.90
elasticity of subs b/w goods and type, η, ε	2.00,1.50
fixed operation cost, ϕ, ϕ^*	0.08, 0.00
Nominal rigidity	
price adjustment cost, γ_p	10.0
wage adjustment cost, γ_w	30.0
Financial Frictions	
equity issuance cost, φ	0.30
idiosyncratic volatility (a.r.), σ	0.10

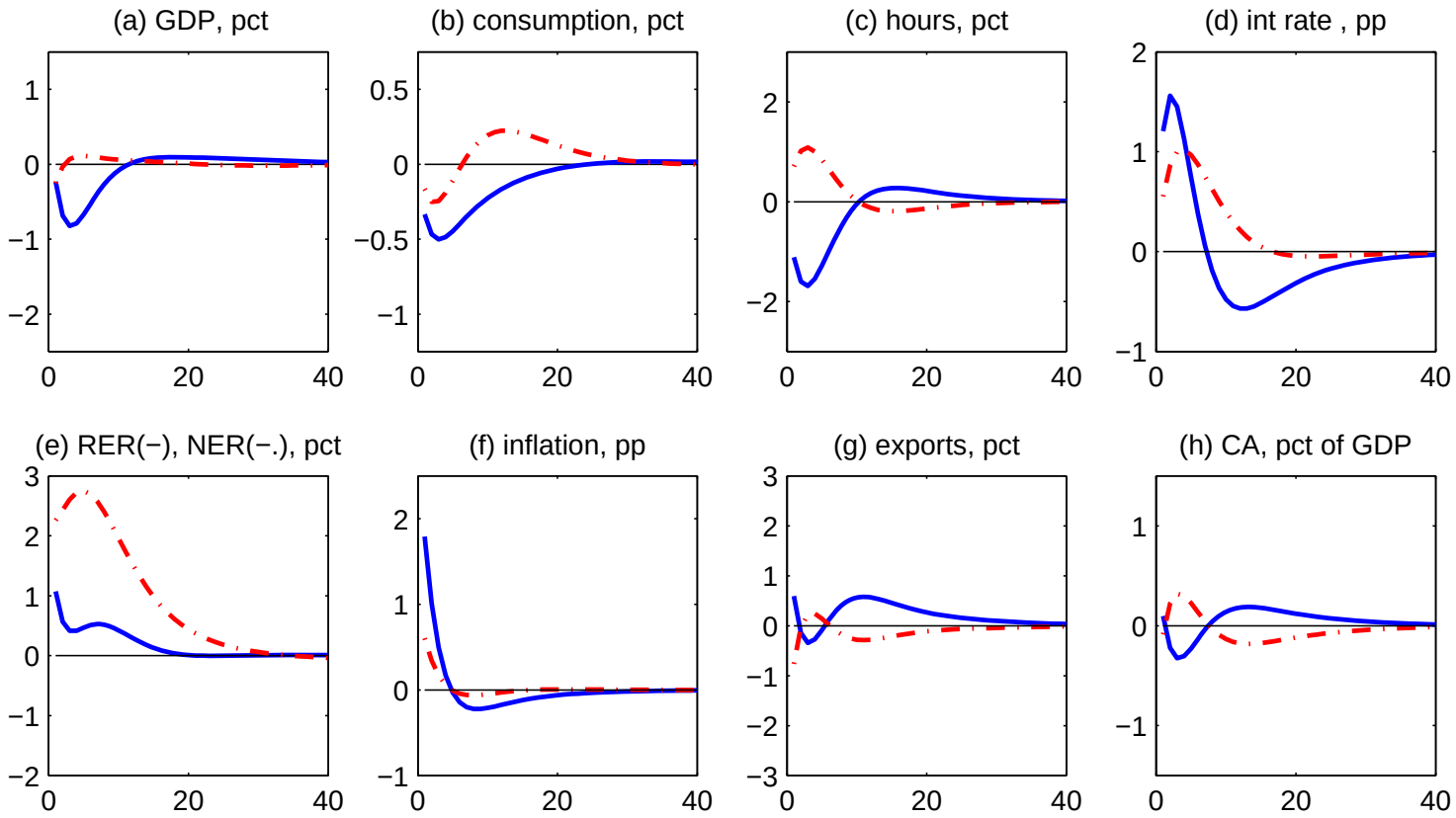
Financial Shock: Monetary Union

Figure: Financial Shock to Periphery under Monetary Union



Financial Shock: Floating

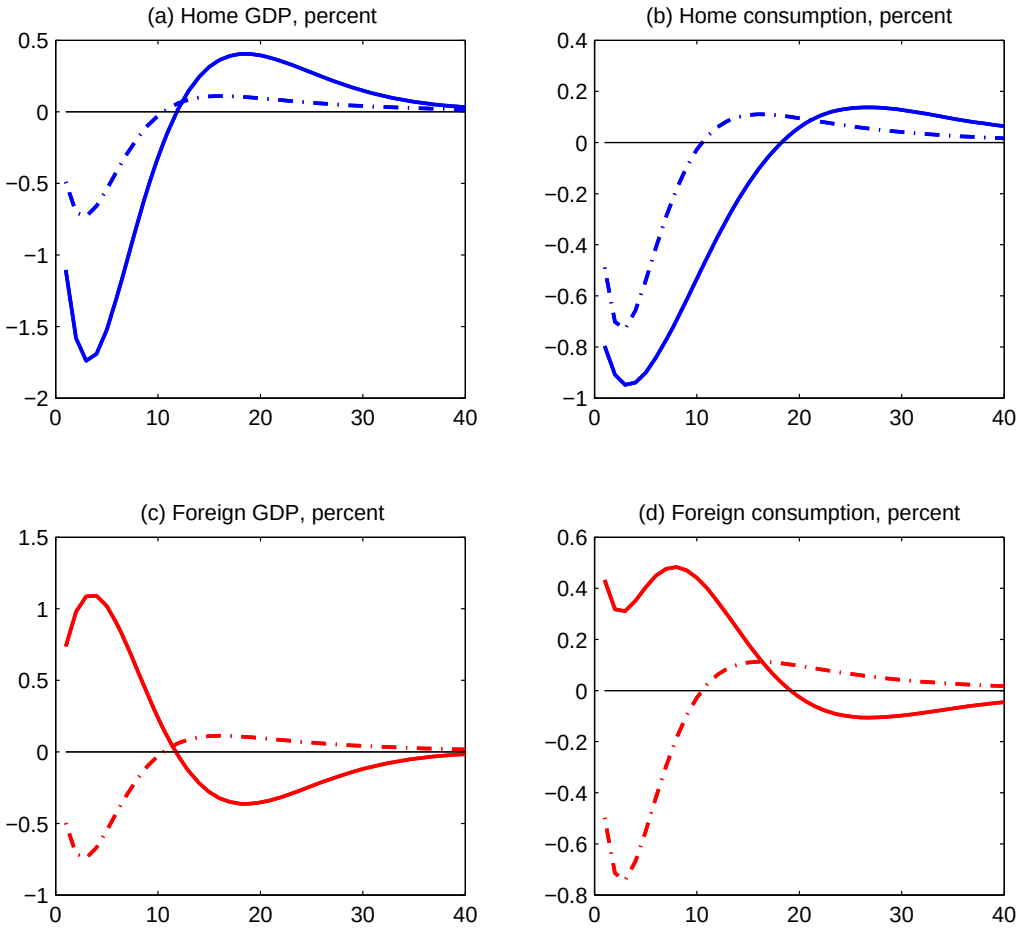
Figure: Financial Shock to Periphery under Floating



Heterogeneity in Financial Conditions

- Alternative: $\phi = \phi^* = 0.08$. Shocks to both.

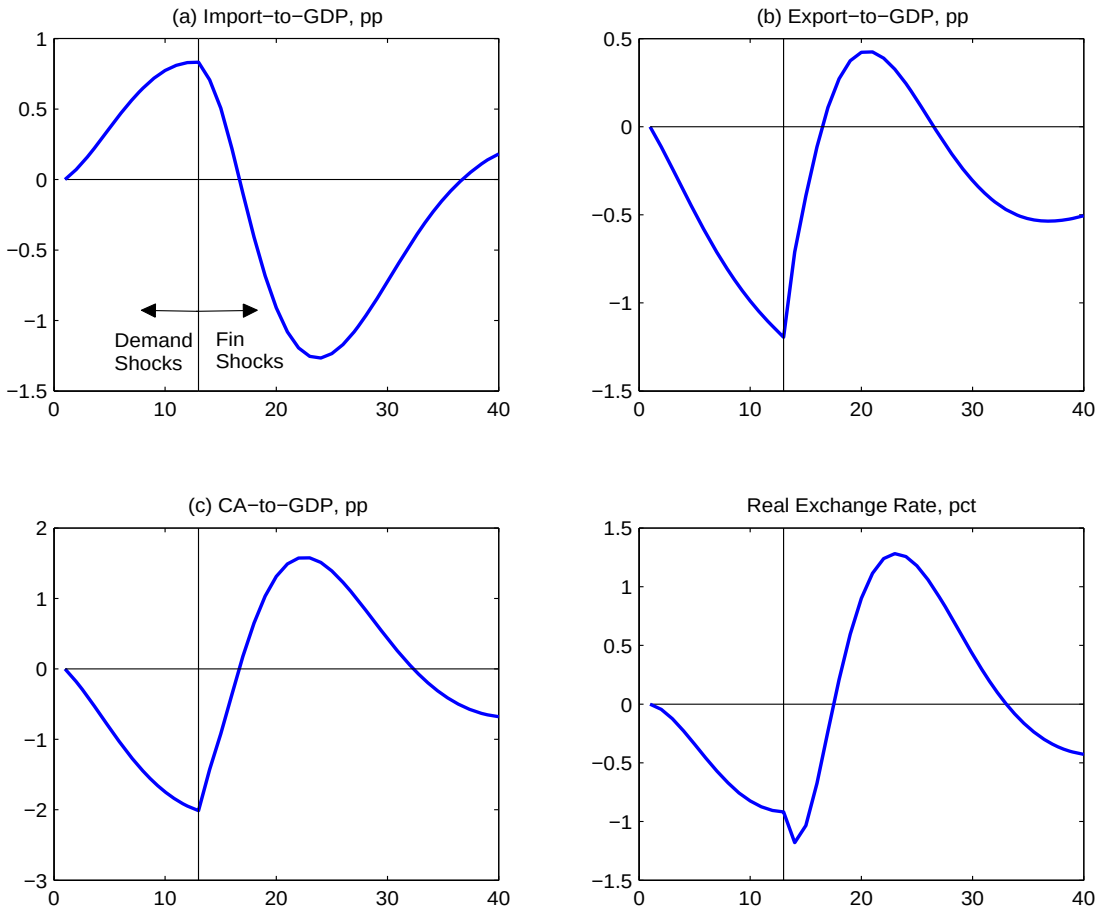
Figure: Heterogeneity as a Propagation Channel



Replicating the Current Account Reversal

- Sequence of positive demand shocks followed by financial shock

Figure: Boom/Bust Cycle and Current Account



Gains vs Losses of Fiscal Union

Table: Costs and Benefits of Complete Risk Sharing

	Welfare		Con Equiv
	MU (A)	Risk Sharing (B)	Percent
Home country	−274.86	−253.21	10.28
Foreign country	−217.86	−236.96	−9.13
Joint welfare	−492.82	−490.17	–

Note: The consumption equivalent is the required minimum increase in average consumption per period holding labor hours constant to make the representative agent living in the economy under the floating exchange rate regime no worse off by transitioning to the currency union.

Implementing Fiscal Devaluation

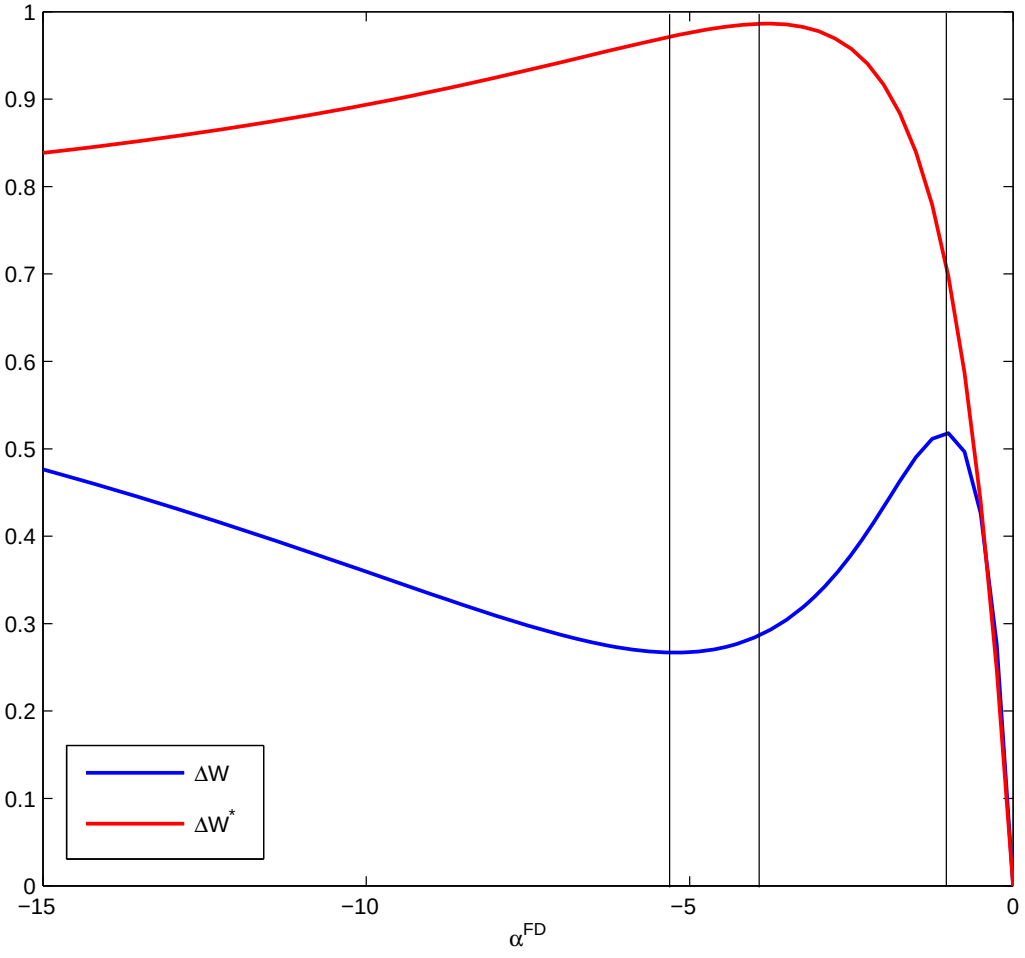
- Consider a simple, revenue-neutral VAT-payroll subsidy swap rule.
- FD rules that are linear in the resource gap of the periphery,

$$\tau_t^v = \varsigma_t^p = \alpha^{FD} \times \log\left(\frac{y_t}{\bar{y}}\right)$$

- Is there a parameter region that is mutually beneficial both to the core and to the periphery?

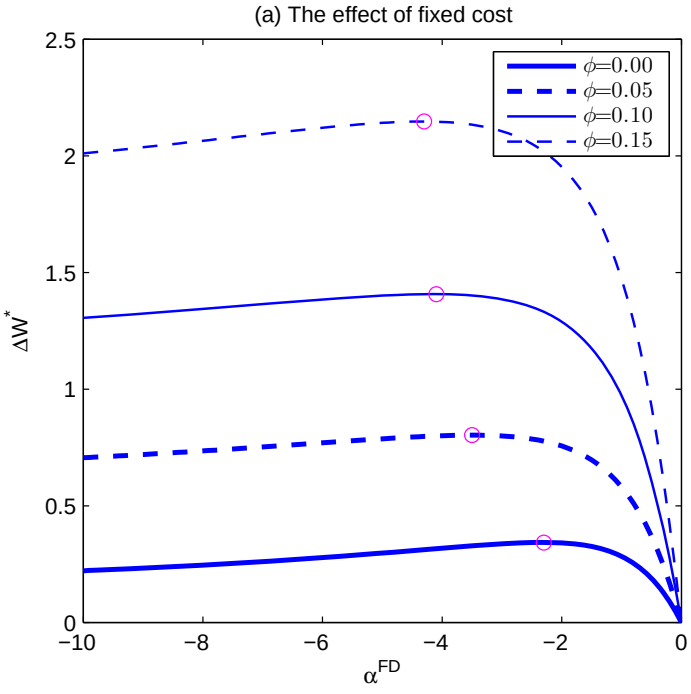
Welfare (2nd order)

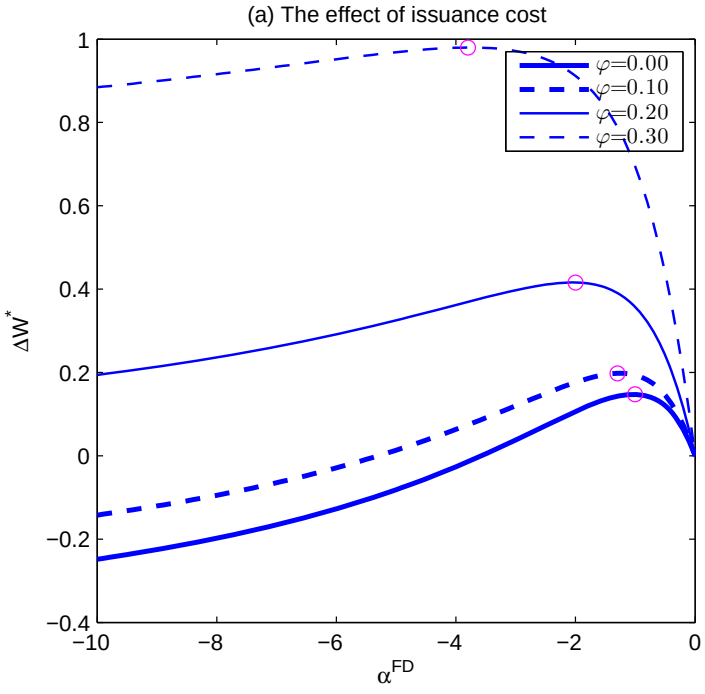
Figure: Welfare Difference from Baseline w/o FD



Financial Friction, Externality and Fiscal Devaluation

Figure: Financial Friction and Benefit of Fiscal Devaluation to Core





Conclusion

- Heterogeneous financial frictions in customer markets model implies strong amplification mechanism through “price war” in export markets.
- Monetary union distorts adjustment of real exchange rates and exacerbates the downturn.
- Unilateral fiscal devaluation by periphery may be welfare improving for both periphery and core.