EUROPEAN CENTRAL BANK

EUROSYSTEM

Capital flows, Financial Frictions and the Adjustment to Common Shocks

I. Jaccard and F. Smets, ECB

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Disclaimer

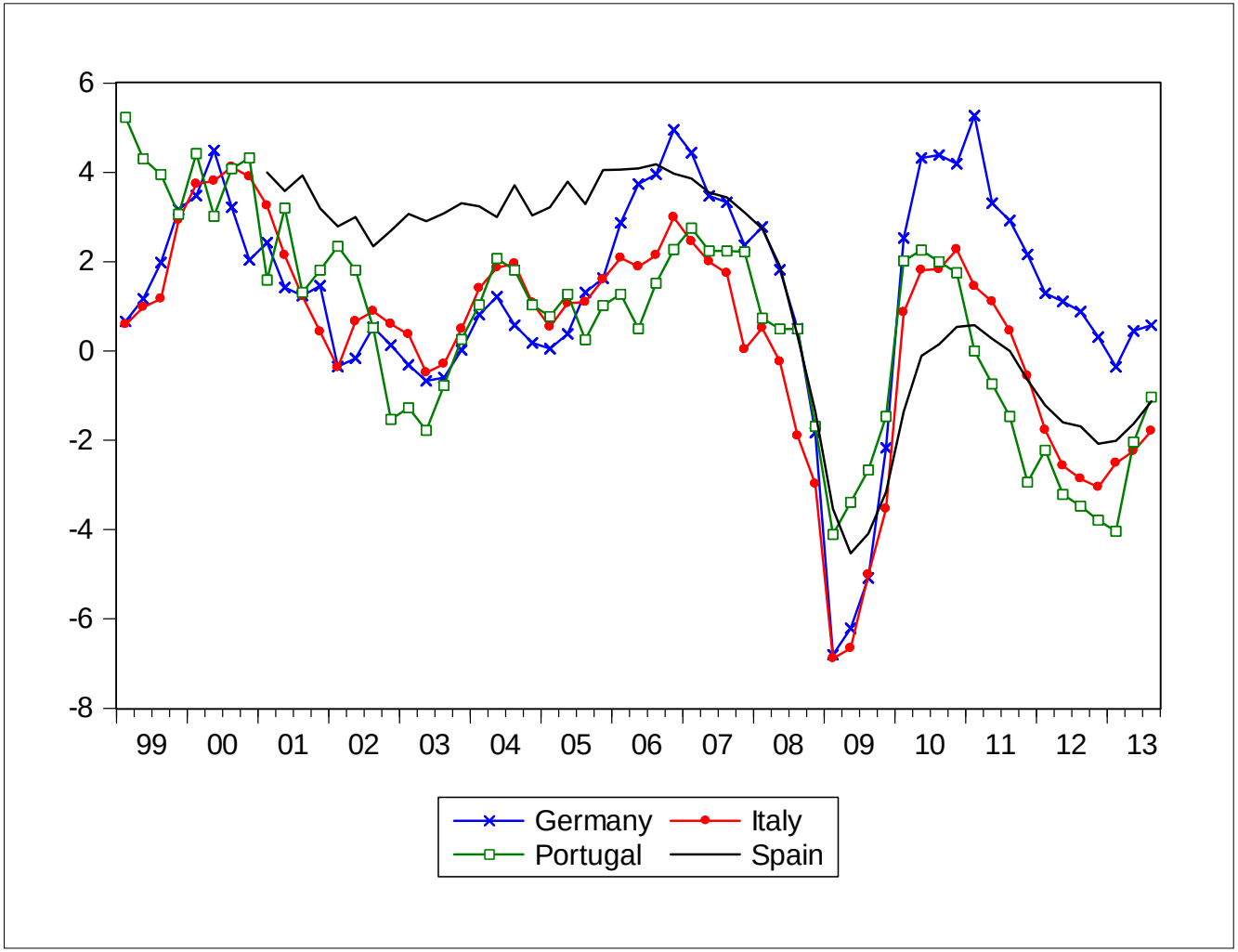
The views expressed are those of the authors and do not necessarily reflect those of the ECB.

1. Introduction

High degree of business cycle synchronization in the euro area.

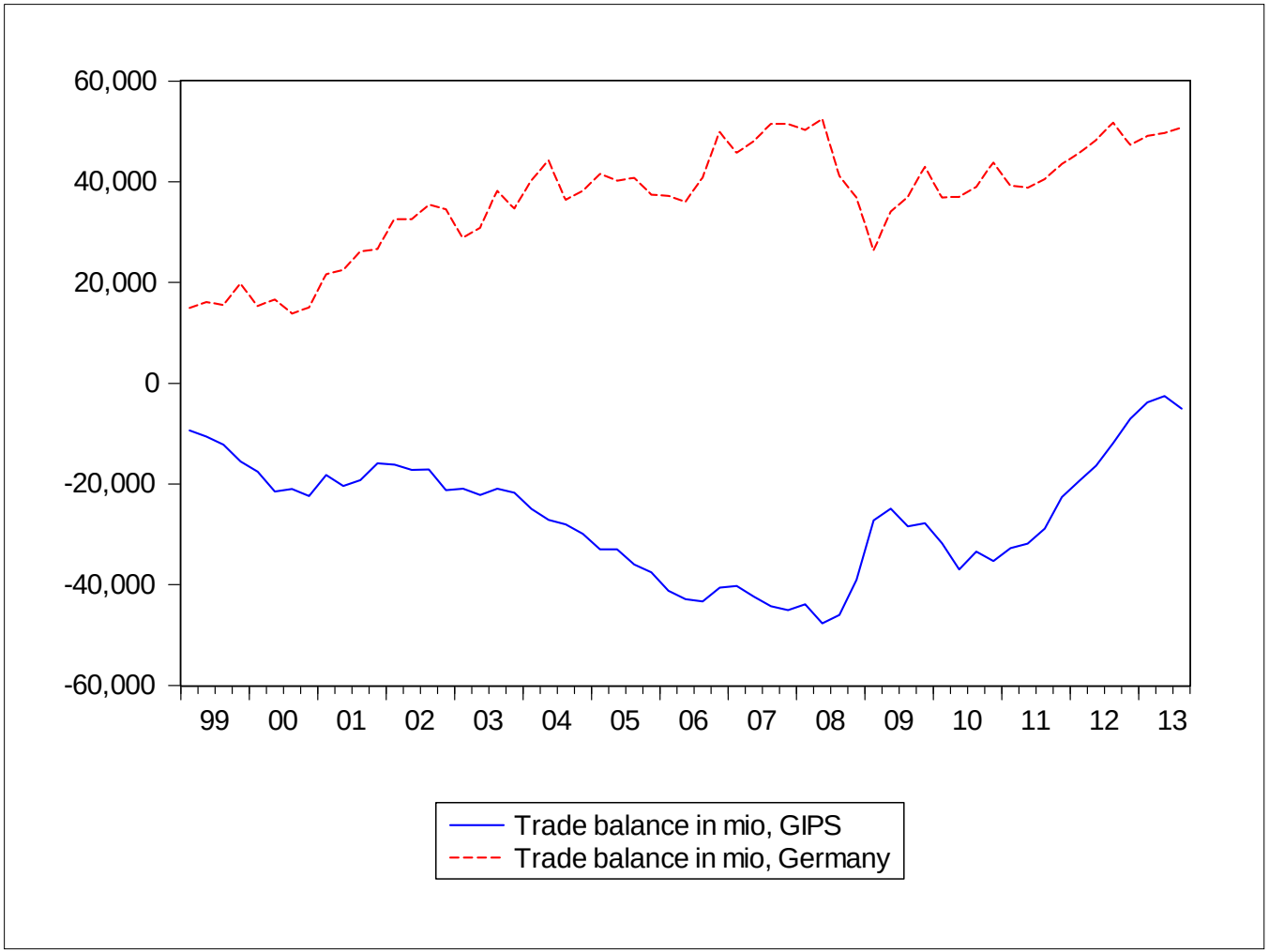
The dynamics of capital flows is a major source of cross-country heterogeneity.

1. Introduction



Annualized output growth: Germany, Italy, Spain and Portugal.

1. Introduction



Trade balance in mio, 1999-2013. GIPS vs. Germany. GIPS includes Greece, Italy, Portugal and Spain.

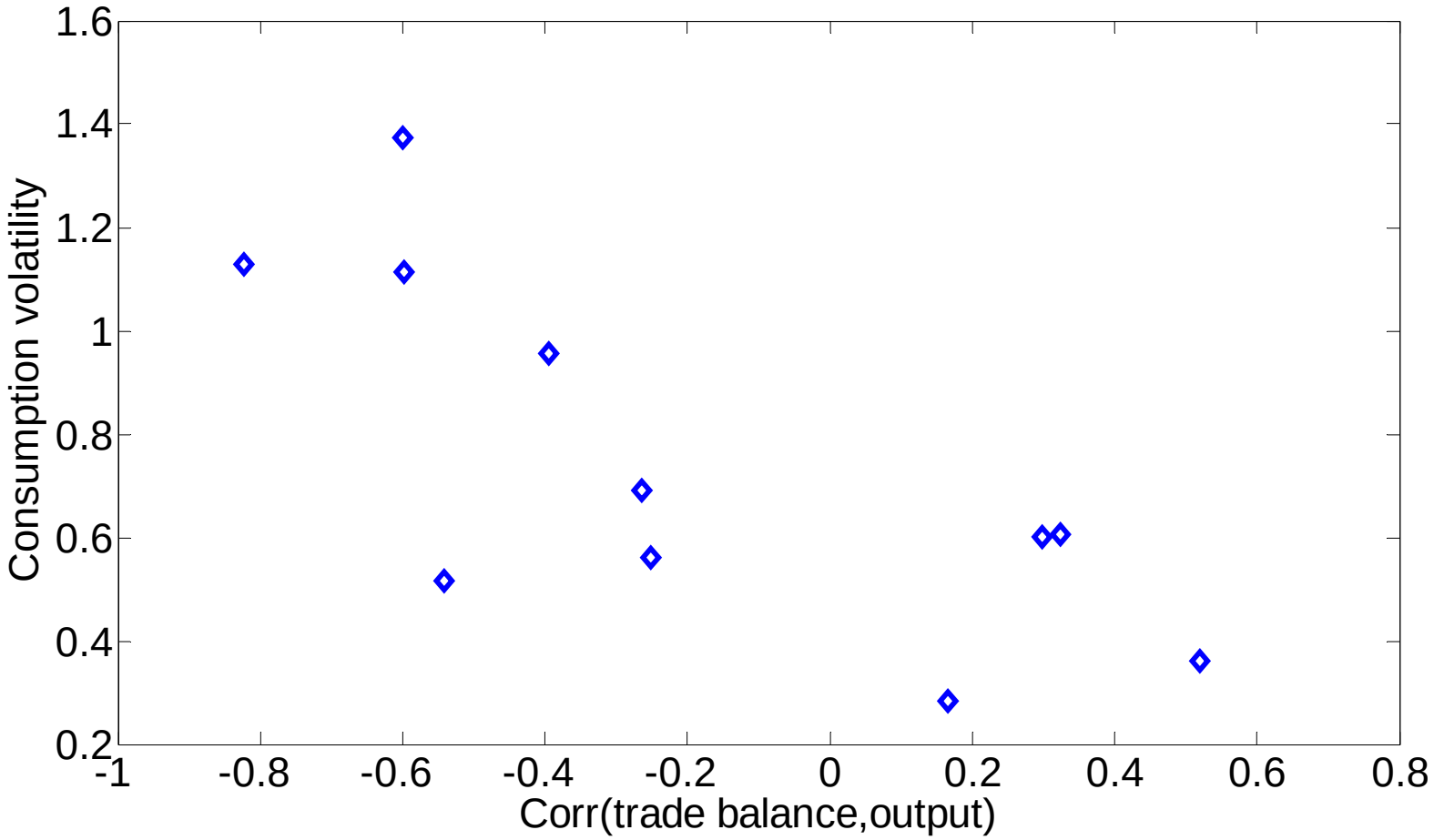
1. Introduction

Stylized facts of the euro area business cycle:

Aggregate consumption is more volatile in countries whose trade balance co-move negatively with output.

Real short-term interest rates are on average lower and bank lending rates higher in countries where aggregate consumption is more volatile.

I. Stylized facts



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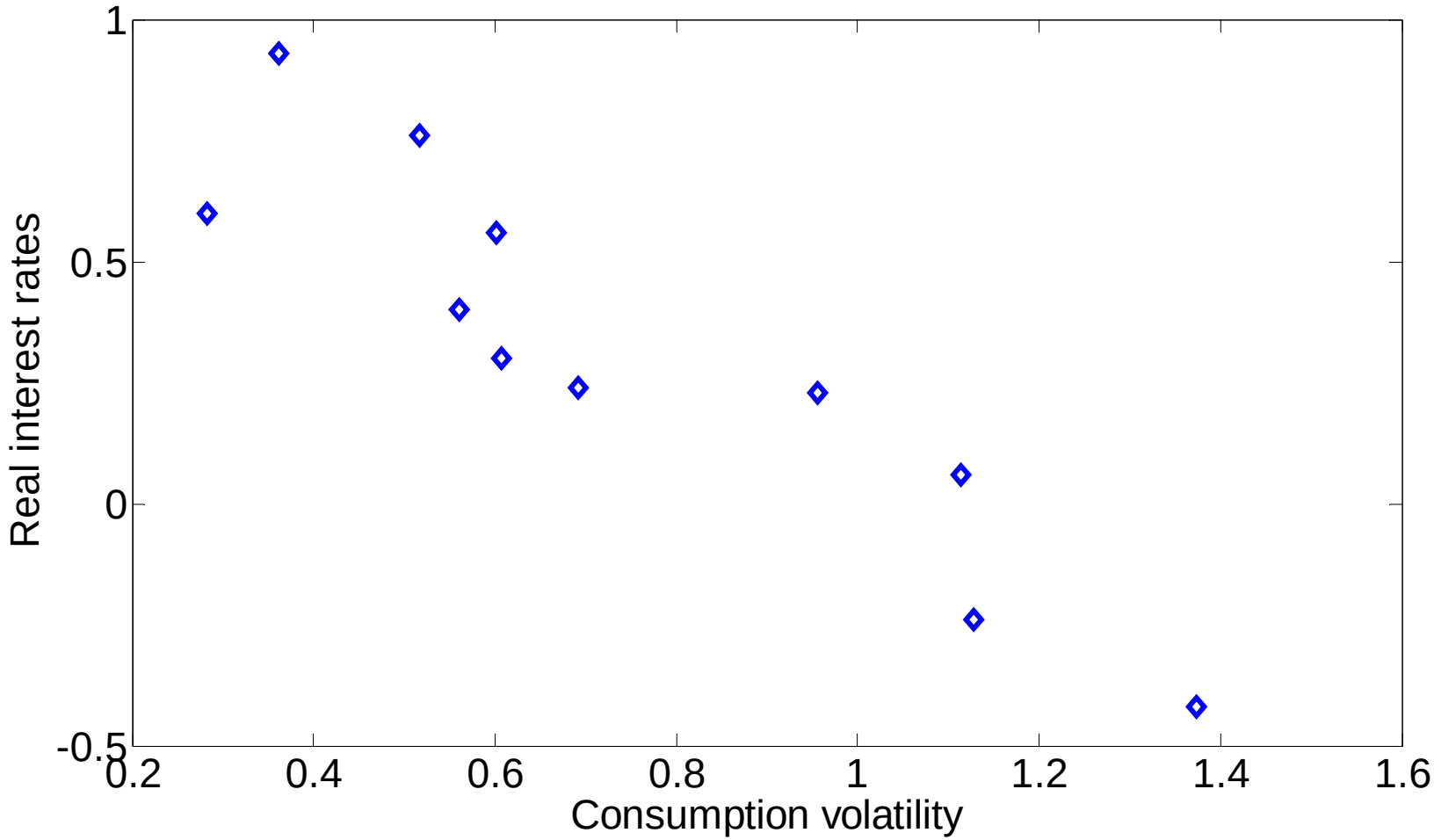

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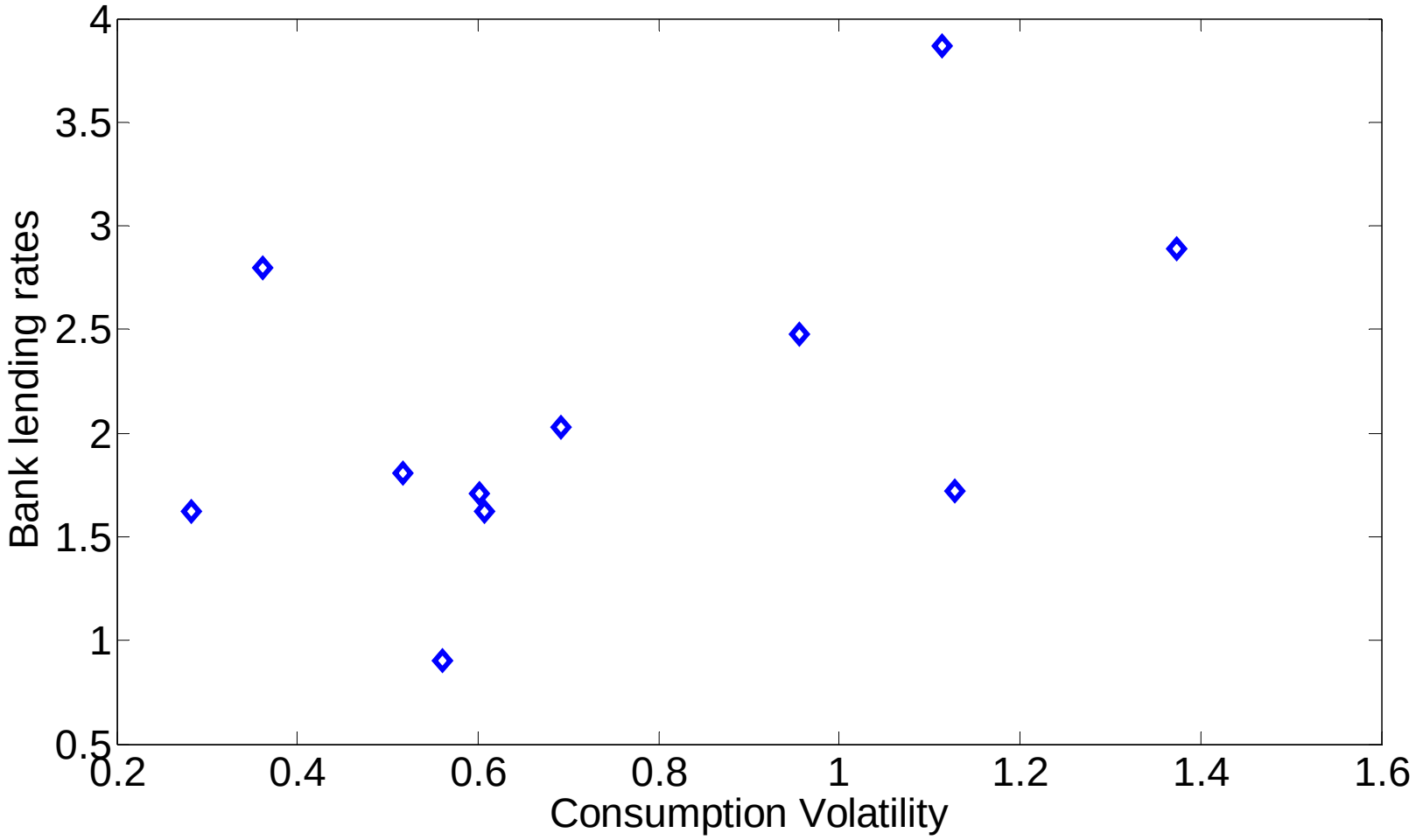


1. Questions

Is it possible to reproduce these stylized facts in a model in which common shocks are the only source of business cycle fluctuations?

What determines the direction of capital flows?

And how does the cyclicality of capital flows affect the welfare cost of business cycle fluctuations?

1. What we do

Two-country model with incomplete markets.

Identify the sources of cross-country heterogeneity using SMM.

Financial accelerator mechanism that depends on one particular asset price.

1. Literature

Two-country model with complete markets:

Backus, Kehoe and Kydland (1992, 1995).

Frictions in international asset markets:

Cole (1988), Baxter and Crucini (1995), Kollmann (1996), Arvanitis and Mikkola (1996), Heathcote and Perri (2002).

1. Literature

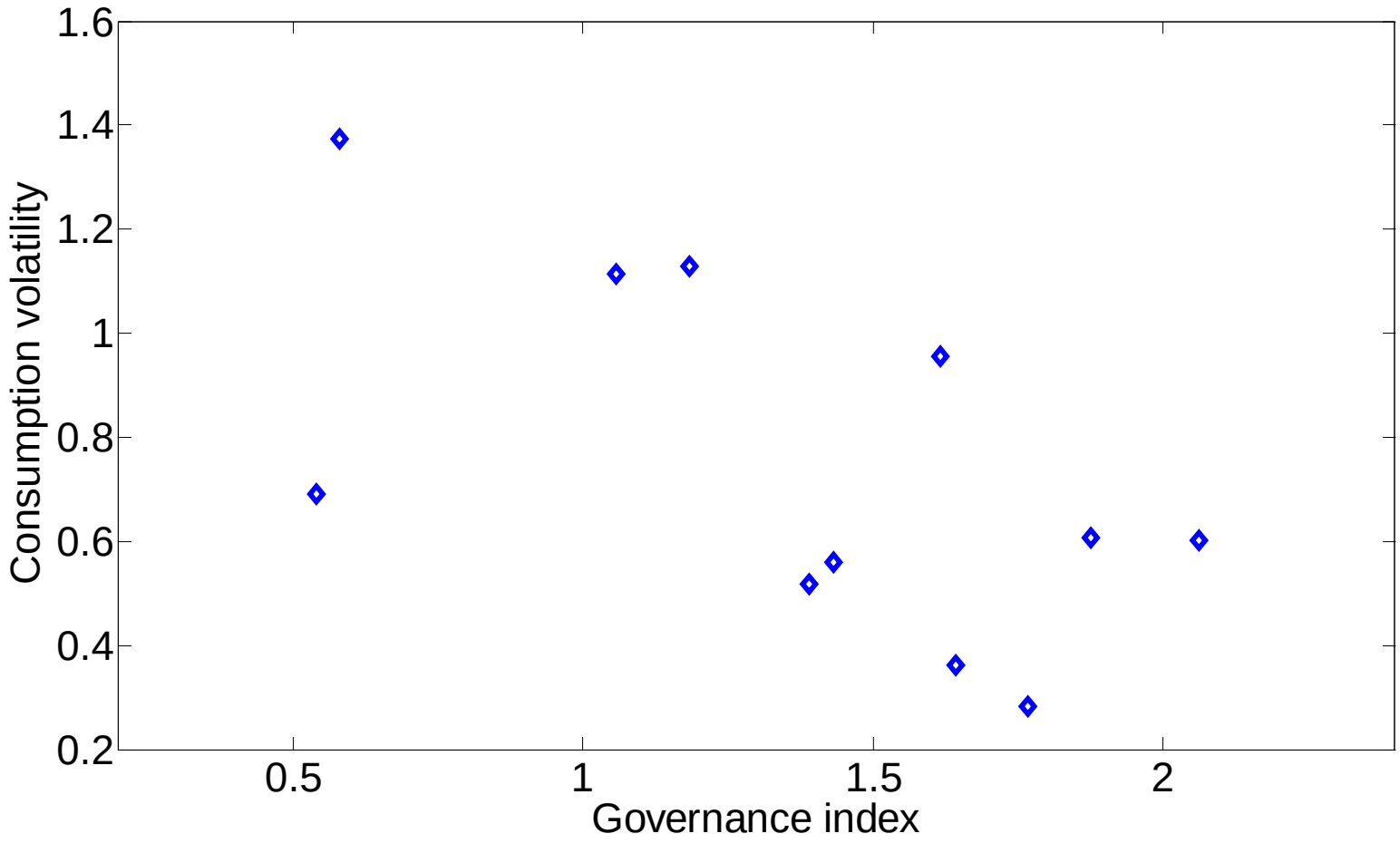
Financial frictions:

BGG (1999), Jermann and Quadrini (2012), CMR (2014).

Heterogeneity in the euro area:

Cecchetti (1999), LaPorta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998), Danthine, Giavazzi, Vives and von Thadden (1999).

2. Potential source of heterogeneity



2. Stylized facts by country

TABLE 1: EURO AREA CYCLE 1999-2013

	σ_y	σ_c/σ_y	σ_N/σ_y	σ_x/σ_y	$\rho(tb,y)$
	(1)	(2)	(3)	(4)	(5)
Austria	1.43	0.28	0.59	1.84	0.17
Belgium	1.13	0.56	0.83	2.97	-0.25
Finland	2.35	0.60	0.51	1.82	0.30
France	1.14	0.52	0.68	2.74	-0.54
Germany	1.74	0.36	0.55	2.31	0.52
Greece	1.82	1.38	n.a.	5.66	-0.60
Ireland	2.45	0.96	1.14	3.70	-0.40
Italy	1.45	0.69	0.63	1.90	-0.26
Netherlands	1.40	0.61	0.74	3.13	0.32
Portugal	1.24	1.11	0.94	2.82	-0.60
Spain	1.18	1.13	1.20	3.49	-0.83

2. Stylized facts by country

TABLE 2

	$E(r_L)$	$E(r_D)$	$E(r_F)$	$E(WGI)$
	(6)	(7)	(8)	(9)
Austria	1.62	0.12	0.6	1.77
Belgium	0.9	-0.32	0.4	1.43
Finland	1.71	-0.15	0.56	2.06
France	1.81	0.38	0.76	1.39
Germany	2.8	0.33	0.93	1.64
Greece	2.89	0.31	-0.42	0.58
Ireland	2.48	-0.11	0.23	1.62
Italy	2.03	-0.13	0.24	0.54
Netherlands	1.62	-0.22	0.3	1.88
Portugal	3.87	0.08	0.06	1.06
Spain	1.72	-0.22	-0.24	1.18

2. Aggregate statistics

TABLE 3

	σ_y	σ_c/σ_y	σ_x/σ_y	σ_N/σ_y	$\rho(nco,y)$	$E(nco/y)$
	(1)	(2)	(4)	(3)	(4)	(5)
Periphery	1.29	0.81	2.53	0.81	-0.74	-2.27
Core	1.43	0.35	2.4	0.57	0.20	3.02

	$E(r_L)$	$E(r_D)$	$E(rr)$	$E(WGI)$
	(6)	(7)	(8)	(9)
Periphery	2.60	-0.01	-0.03	1.0
Core	1.74	0.02	0.59	1.70

2. Main findings

A model with common shocks reproduces mean short-term rates and investment volatilities by attributing this cross-country heterogeneity to differences in financial structure.

This model can explain the magnitude of financial imbalances and the direction of capital flows observed in the data.

The welfare cost of business cycle fluctuations is higher in the region that experiences procyclical net capital inflows.

3. The environment

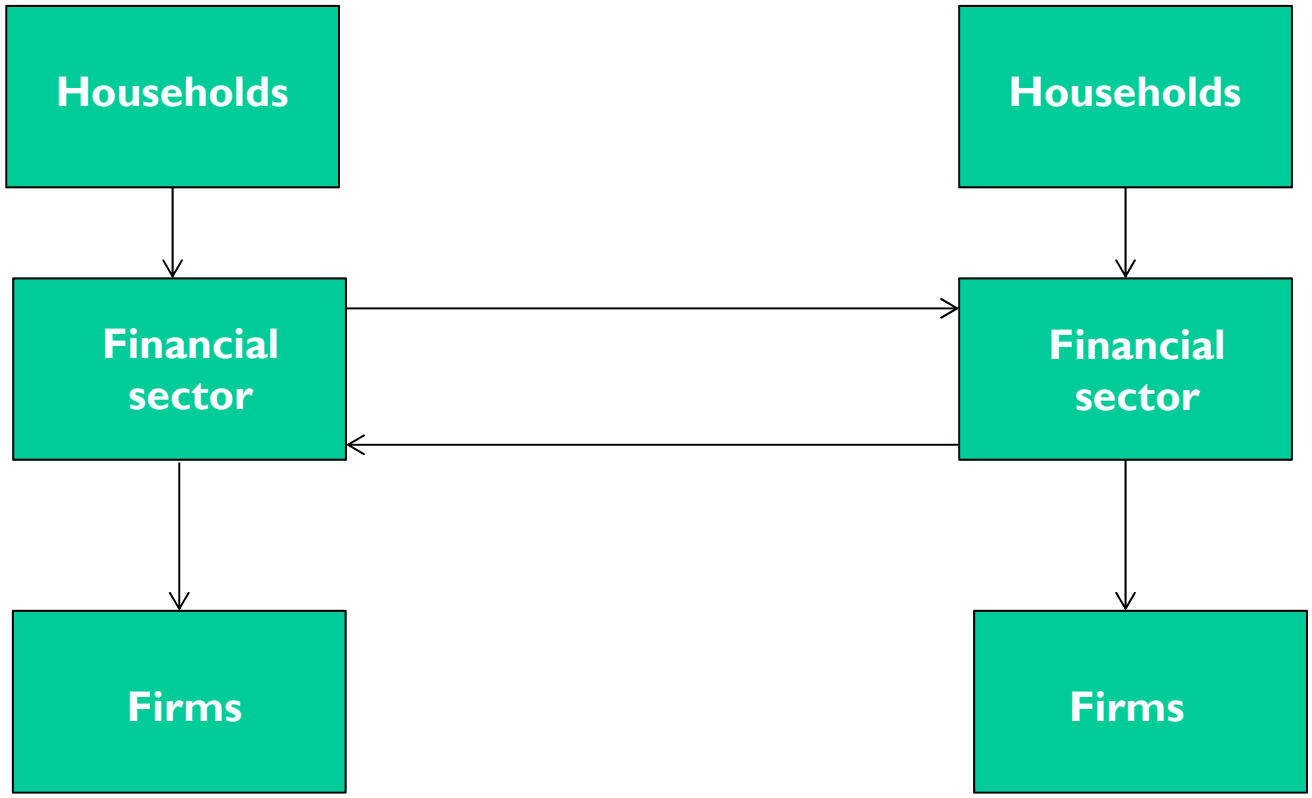
Each economy is composed of a representative agent, a financial intermediary and a firm.

The financial intermediary allocates capital to the final goods producing sector.

The production of bank loans/financial services is subject to financial frictions.

Lending and borrowing between the two financial sectors is the only source of international trade.

3. Market structure



3. The final-goods producing sector

Maximize profits:

$$\max_{N_{Ft},y_{Lt},k_t} \pi_{Ft} = y_t - w_t N_{Ft} - r_{Lt} y_{Lt}$$

subject to:

$$y_t = A_t y_{Lt}^{\alpha} N_{Ft}^{1-\alpha}$$

3. Households

Budget constraint:

$$\pi_{Tt} + w_t N_{Bt} + w_t N_{Ft} + r_{Dt} d_t = c_t + x_t$$

Time allocation constraint:

$$L_t = 1 - N_{Bt} - N_{Ft}$$

Adjustment costs:

$$\gamma d_{t+1} = d_t + \left(\frac{\theta_1}{1-\epsilon} \left(\frac{x_t}{d_t} \right)^{1-\epsilon} + \theta_2 \right) d_t$$

3. Households

Habit accumulation:

$$\gamma h_{t+1} = m h_t + (1-m) c_t (\psi + L_t^v)$$

Habits in the composite good (Jaccard 2013):

$$\max_{c_t, N_{Bt}, N_{Ft}, x_t, d_{t+1}, h_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t \log(c_t(\psi + L_t^v) - h_t)$$

Needed to match the very low mean risk-free rate observed in the data (Weil 1989, Jermann 1998)

3. The financial intermediary

Financial frictions:

$$\gamma y_{Lt+1} - (1 - \delta_L) y_{Lt} \leq \mu_t k_t$$

Capital stock:

$$k_t = (d_t - b_t)^{\xi} \tilde{b}_t^{1-\xi}$$

Financial multiplier:

$$\mu_t = \left(\frac{N_{Bt}}{k_t} \right)^{1-\phi}$$

3. The financial intermediary

Profits:

$$\pi_{Bt} = r_{Lt} y_{Lt} + p_{Bt} b_t - w_t N_{Bt} - r_{Dt} d_t - \tilde{p}_{Bt} \tilde{b}_t$$

Profit maximization:

$$\max_{y_{Lt+1}, d_t, b_t, \tilde{b}_t, N_{Bt}} \; E_0 \sum_{t=0}^{\infty} \beta^t \frac{\lambda_t}{\lambda_0} \pi_{Bt}$$

3. Market equilibrium

A competitive equilibrium in the economy is a sequence of prices:

$$w, \tilde{w}, r_L, \tilde{r}_L, p_B, \tilde{p}_B, r_D, \tilde{r}_D, \lambda, \tilde{\lambda}, q_D, \tilde{q}_D, q_L, \tilde{q}_L, \varphi, \tilde{\varphi}$$

And quantities

$$y, \tilde{y}, c, \tilde{c}, h, \tilde{h}, x, \tilde{x}, d, \tilde{d}, b, \tilde{b}, N_B, \tilde{N}_B, N_F, \tilde{N}_F$$

that satisfy households and firms efficiency conditions as well as the two resource constraints:

$$A_t y_{Lt}^{\alpha} N_{Ft}^{1-\alpha} + p_{Bt} b_t = c_t + x_t + \tilde{p}_{Bt} \tilde{b}_t$$

$$A_t \tilde{y}_{Lt}^{\alpha} \tilde{N}_{Ft}^{1-\alpha} + \tilde{p}_{Bt} \tilde{b}_t = \tilde{c}_t + \tilde{x}_t + p_{Bt} b_t$$

3. Additional implications

Risk-free rates:

$$\frac{1}{1+r_{Ft}} = \beta E_t \frac{\lambda_{t+1}}{\lambda_t}$$

$$\frac{1}{1+\tilde{r}_{Ft}} = \tilde{\beta} E_t \frac{\tilde{\lambda}_{t+1}}{\tilde{\lambda}_t}$$

3. Calibration and results

To simplify the quantitative analysis, we focus on three sources of cross-country heterogeneity and calibrate the remaining parameters.

In the data, average deposit rates across country blocks are almost similar.

Differences in subjective discount factors cannot be a major source of heterogeneity (calibrated to match the investment share).

3. Calibration and results

Common technology shock in the only source of fluctuations.

Three sources of cross-country heterogeneity:

(i) Differences in attitudes towards risk.

(ii) Differences in adjustment costs.

(iii) Differences in financial structure.

3. SMM estimation

TABLE 4

ϵ	$\widetilde{\epsilon}$	ϕ	$\widetilde{\phi}$	m	$\widetilde{m}$
3.77	4.48	0.70	0.62	0.81	0.64

TABLE 5

	Data	Model
$E(r_F)$	0.59	0.58
$E(\widetilde{r}_F)$	-0.03	0.0
$E(r_L)$	1.74	1.73
$E(\widetilde{r}_L)$	2.60	2.61
$std(x)/std(y)$	2.40	2.40
$std(\widetilde{x})/std(\widetilde{y})$	2.53	2.52

3. Financial frictions

The case $\tilde{\phi} < \phi$ corresponds to a situation in which the financial multiplier is on average smaller in the periphery than in the core:

$$E(\tilde{\mu}) = 0.09,\ E(\mu) = 0.12$$

A higher degree of financial frictions also affects the size of the economy.

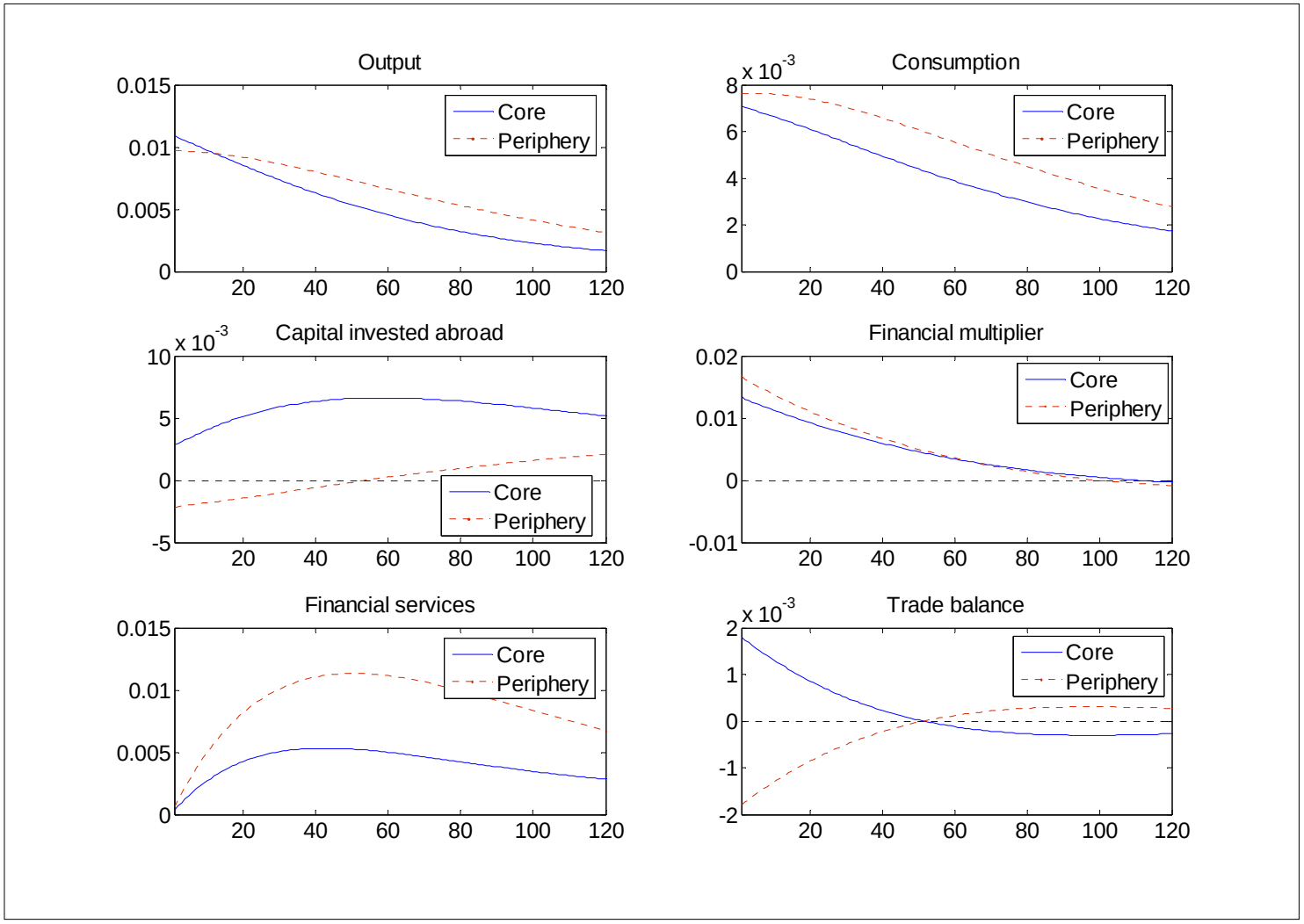
3. Additional implications

TABLE 6

	Output volatility		Consumption volatility		Hours volatility	
	Data	Model	Data	Model	Data	Model
Periphery	1.29	1.28	0.81	0.76	0.81	0.78
Core	1.43	1.44	0.35	0.64	0.57	0.63

	Cyclicality trade balance		Mean trade balance	
	Data	Model	Data	Model
Periphery	-0.74	-0.99	-2.27	-3.5
Core	0.20	0.99	3.02	2.87

4. The adjustment to common shocks



5. A financial accelerator mechanism

New loans:

$$\gamma y_{Lt+1} - (1 - \delta_L) y_{Lt} \leq \mu_t k_t$$

Financial multiplier:

$$\mu_t = \left(\frac{N_{Bt}}{k_t} \right)^{1-\phi}$$

5. A financial accelerator mechanism

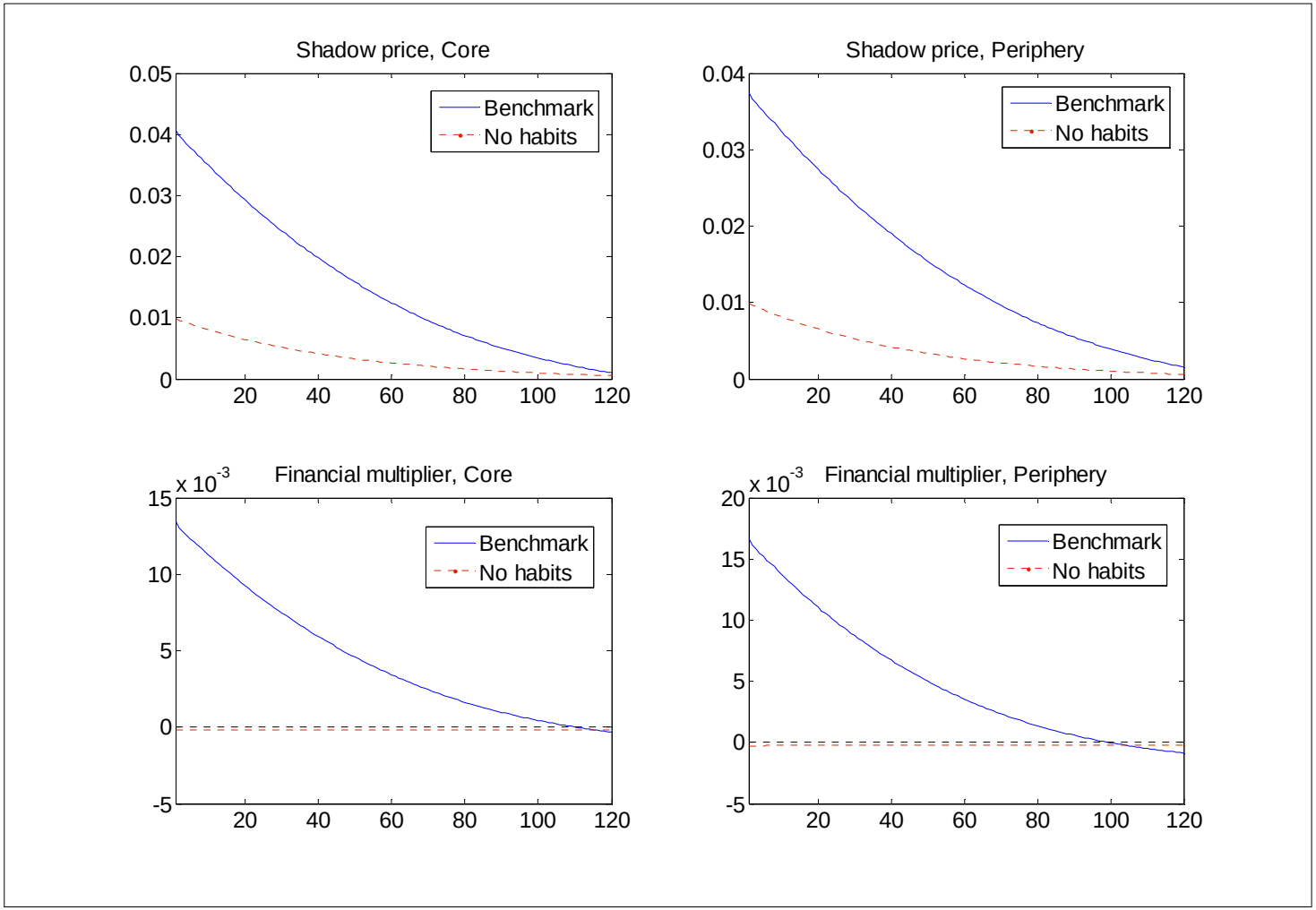
Financial frictions:

$$\frac{N_B}{k} = \left(\frac{(1-\phi) q_{Lt}}{w_{Bt}} \right)^{1/\phi}$$

Shadow price of bank loans/financial services:

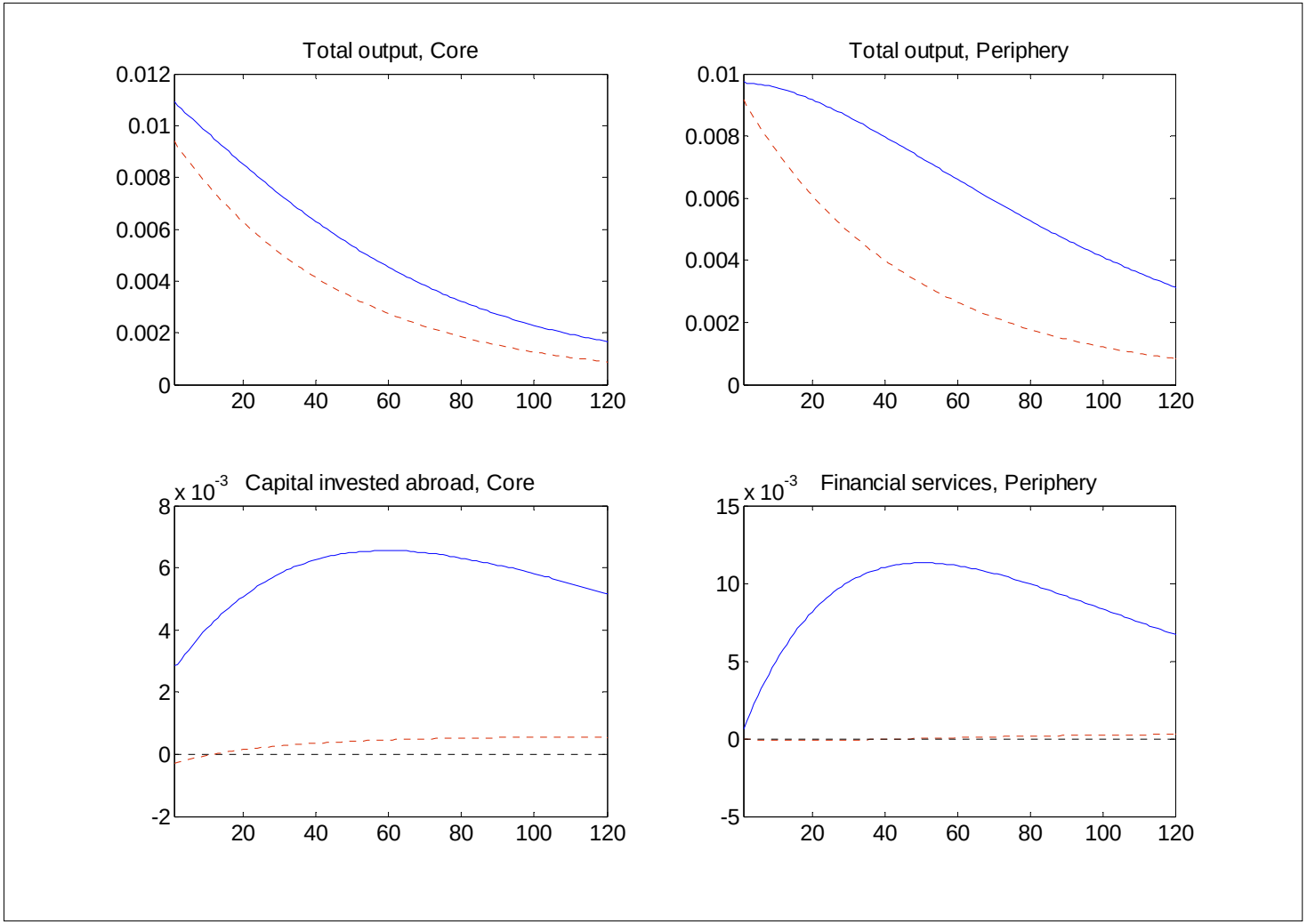
$$q_{Lt} = \beta E_t \frac{\lambda_{t+1}}{\lambda_t} [(1 - \delta_L) q_{Lt+1} + r_{Lt+1}]$$

5. A financial accelerator mechanism



Benchmark vs. model without habits

5. A financial accelerator mechanism



Benchmark vs. model without habits

5. A financial accelerator mechanism

This accelerator mechanism depends on the shadow price of financial services/bank loans.

The volatility of asset prices can be amplified by combining habit formation with capital adjustment costs (Jermann 1998).

Without habits, asset prices are much less volatile and common shocks cannot generate business cycle asymmetries.

6. Identifying the sources of heterogeneity

Use the symmetric case to identify the sources of heterogeneity:

$$\epsilon = \widetilde{\epsilon} = 3.77,\ \phi = \widetilde{\phi} = 0.7,\ m = \widetilde{m} = 0.81$$

Without asymmetries, the trade balance is constant and always equal to zero for all t.

6. Identifying the sources of heterogeneity

Identify the effects of:

(i) Differences in adjustment costs,

(ii) Differences in financial structures,

(iii) Differences in attitudes towards risk.

on the level and on the cyclicality of the trade balance.

6. Identifying the sources of heterogeneity

TABLE 7

	Data	Symmetric case	Model 1 $\phi > \widetilde{\phi}$	Model 2 $m > \widetilde{m}$	Model 3 $\epsilon < \widetilde{\epsilon}$
	(1)	(2)	(3)	(5)	(6)
$\rho(nco, y)$	0.20	0	0.99	-0.99	-0.99
$\rho(\widetilde{nco}, \widetilde{y})$	-0.74	0	-0.99	0.99	0.99
$E(nco/y)$	3.03	0	3.16	-0.06	-0.2
$E(\widetilde{nco}/\widetilde{y})$	-2.25	0	-3.90	0.06	0.2

6. Identifying the sources of heterogeneity

Everything else equal, a higher degree of adjustment costs or an increase in the intensity of habits increases precautionary motives.

This increases aggregate savings and generates a steady state surplus in the region in which marginal utility is most volatile.

Differences in habits or adjustment costs cannot explain the level or the cyclicality of financial imbalances observed in the data.

6. Financial structure and steady state imbalances

TABLE 8: STEADY STATE EFFECTS

	Symmetric Case	Diff. Fin. Structure
	$\phi = \widetilde{\phi} = 0.7$	$\phi = 0.7,\ \widetilde{\phi} = 0.62$
$E(\mu)/E(\widetilde{\mu})$	1	1.33
$E(y)/E(\widetilde{y})$	1	1.24
$E(y_L)/E(\widetilde{y}_L)$	1	1.92
$E(b)/E(\widetilde{b})$	1	0.74
$E(\lambda)/E(\widetilde{\lambda})$	1	0.83

6. Financial structure and steady state imbalances

A higher degree of financial frictions increases the marginal utility of consumption in the more financially constrained economy.

Reduction in relative "hunger" makes the core consumers more patient.

Steady state surplus in the core because relatively more patient consumers trade current consumption for future income.

6. What explains the cyclicality of financial imbalances

Trade balance in the core countries:

$$nco_t = \tilde{p}_{Bt}\tilde{b}_t - p_{Bt}b_t$$

Assume no differences in prices and linearize this condition around the model's steady state:

$$\widehat{nco}_t = \frac{p_B\tilde{b}}{nco}\hat{\tilde{b}}_t - \frac{p_B b}{nco}\hat{b}_t + \frac{\left(\tilde{b}-b\right)p_B}{nco}\hat{p}_{Bt}$$

6. What explains the cyclicality of financial imbalances

An increase in the degree of financial frictions reduces the potential for intertemporal smoothing and raises the volatility of the marginal utility of consumption.

In response to a positive shock, in relative terms, the marginal utility of consumption in the core increases.

6. What explains the cyclicality of financial imbalances

In response to a positive shock, consumers in the core satisfy this desire for present consumption by selling a larger fraction of their capital abroad or by reducing their purchase of foreign capital.

This quantity effect leads to a trade deficit in the core and a trade surplus in the periphery.

6. What explains the cyclicality of financial imbalances

Valuation effect when $\tilde{b} > b$:

$$\widehat{nco}_t = \frac{p_B \tilde{b}}{nco} \hat{\tilde{b}}_t - \frac{p_B b}{nco} \hat{b}_t + \frac{\left(\tilde{b} - b\right) p_B}{nco} \hat{p}_{Bt}$$

The price of traded capital is procyclical.

A country with a trade surplus in the steady state is a net buyer of capital.

6. What explains the cyclicality of financial imbalances

In the core, this valuation effect improves the countries´ trade balance during periods of economic booms.

In the periphery, the valuation effect worsens the countries´ trade deficit during periods of expansion.

This effect dominates.

7. Welfare cost

How does the cyclicality of net capital flows affect the welfare cost of business cycle fluctuations?

Consumers in the periphery increase savings when marginal utility is high.

Countercyclical net capital inflows in the core provides an insurance against unexpected shocks.

7. Welfare cost

	(1) Data		(4) Benchmark	
	Periph.	Core	Periph.	Core
$corr(tb,y)$	-0.74	0.20	-0.99	0.99
σ_c/σ_y	0.81	0.35	0.76	0.64
$E(r_L)$	2.60	1.74	2.61	1.73
$E(rr)$	-0.03	0.59	0	0.58
$E(\frac{c_t-c}{c})$	-	-	7.7	0.63
$E(\frac{w_t-w}{w})$	-	-	11.1	2.7

7. Welfare cost

	(1) Data		(3) $\widetilde{\phi} < \phi$	
	Periph.	Core	Periph.	Core
$corr(tb, y)$	-0.74	0.20	-0.99	0.99
σ_c/σ_y	0.81	0.35	0.74	0.63
$E(r_L)$	2.60	1.74	2.52	1.73
$E(rr)$	-0.03	0.59	0.37	0.63
$E(\frac{c_t - c}{c})$	-	-	5.6	1.62
$E(\frac{w_t - w}{w})$	-	-	8.43	3.76

7. Without structural asymmetries

	(1) Data		(2) Symmetric	
	Periph.	Core	Periph.	Core
$corr(tb,y)$	-0.74	0.20	0	0
σ_c/σ_y	0.81	0.35	0.66	0.66
$E(r_L)$	2.60	1.74	1.71	1.71
$E(rr)$	-0.03	0.59	0.42	0.42
$E(\frac{c_t-c}{c})$	-	-	3.13	3.13
$E(\frac{w_t-w}{w})$	-	-	5.56	5.56

8. Conclusion

Differences in financial structure are needed to reproduce some of the most salient features of the cross-country heterogeneity observed in the data.

Consistent with the early literature on heterogeneity in the euro area (Cechetti 1999, Danthine et al. 1999).

In our environment, these differences generate procyclical net capital inflows in the periphery.

8. Conclusion

Procyclical capital inflows increase the welfare cost of business cycle fluctuations.

Pursuing structural reforms in the financial sector could reduce these asymmetries.

Our results suggest that it could attenuate the procyclicality of net capital inflows and reduce the magnitude of these financial imbalances.