Global Banking, Trade, and the International Transmission of the Great Recession

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Motivation

What made the global financial crisis a *global* crisis?

- Common view: it originated in the US ...
- ... and spilled over to many other countries
  Question: how?

Two important channels:

- *financial channel*, due to losses on US assets
- *trade channel*, as demand in US and elsewhere weakened

In this paper we analyze and quantify the role of these two channels for the transmission of the crisis

Evidence for financial channel

Theoretical models with a global banking sector:

- Ueda (2010): financial frictions contribute to business cycle synchronization
- Olivero (2010): Imperfect competitive banking sector, but no financial shocks
- Mendoza and Quadrini (2010): financial contagion via bank equity, but no business cycles
- Kollmann, Enders, Müller (2011): crisis transmission via financial channel

Empirical studies:

- Lane and Milesi-Ferretti (2011), Claessens et al. (2010): advanced economies hit harder, financial channel important
- Eickmeier et al. (2011): factor-augmented VAR, trade and financial shocks important

Evidence for trade channel

Empirical studies:

- Eickmeier et al. (2011): factor-augmented VAR, trade and financial shocks important
- Imbs (2010): Non-OECD countries affected via trade channel
- Rose and Spiegel (2011) find few consistent pre-crisis indicators for crisis intensity

$\rightarrow$ We conduct a horse race in a unified framework

Method

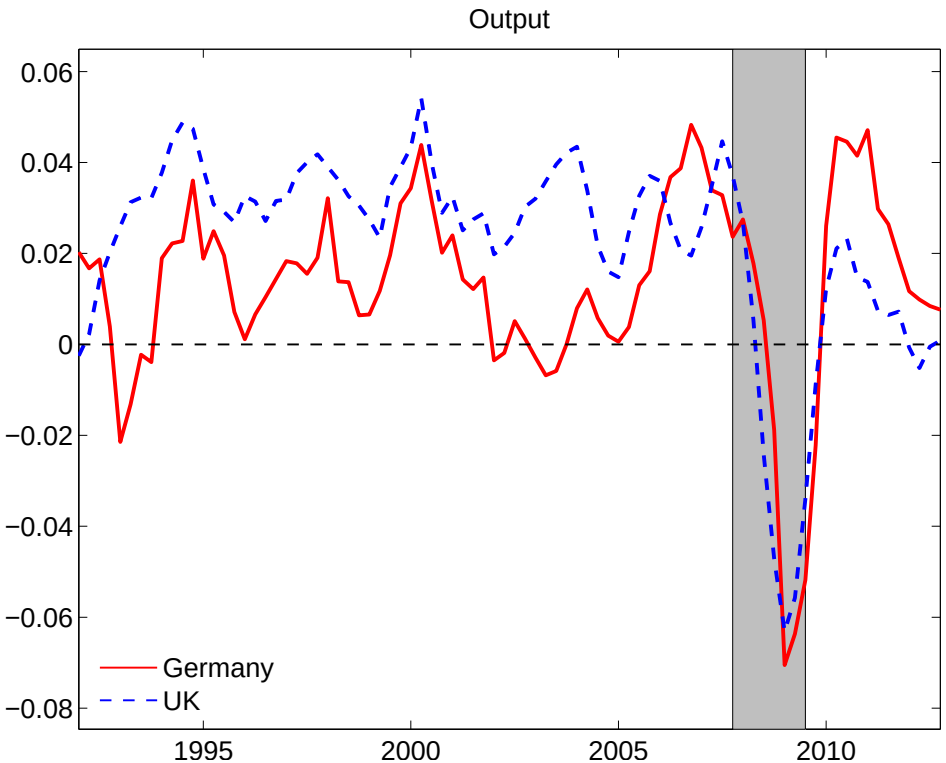
To disentangle the effects and the relative contributions of both channels, we

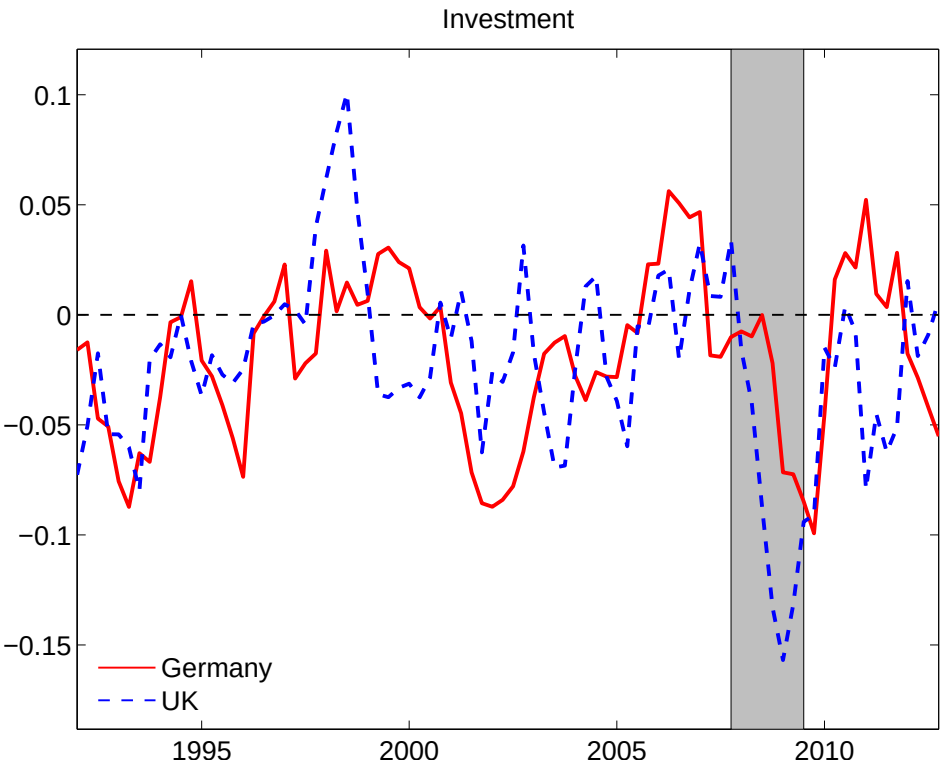
- develop a DSGE model featuring both channels (structural model needed because of interactions)
- calibrate the model to data from UK (financial center) and Germany (high trade linkages)

We find that

- for Germany, trade channel was more important
  $\rightarrow$ responsible for around 2/3 of explained GDP reduction
- for the UK, results are opposite
  $\rightarrow$ financial channel explains almost 2/3 of reduction
- for both countries, financial channel has longer-lasting effects

Crisis Impact on GE & UK

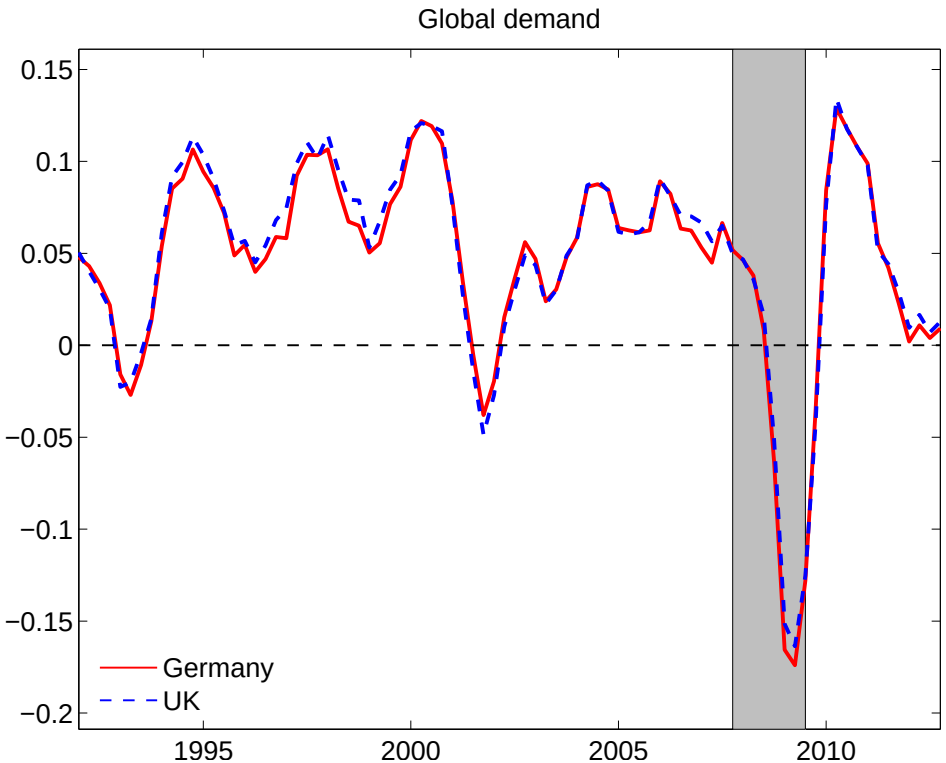


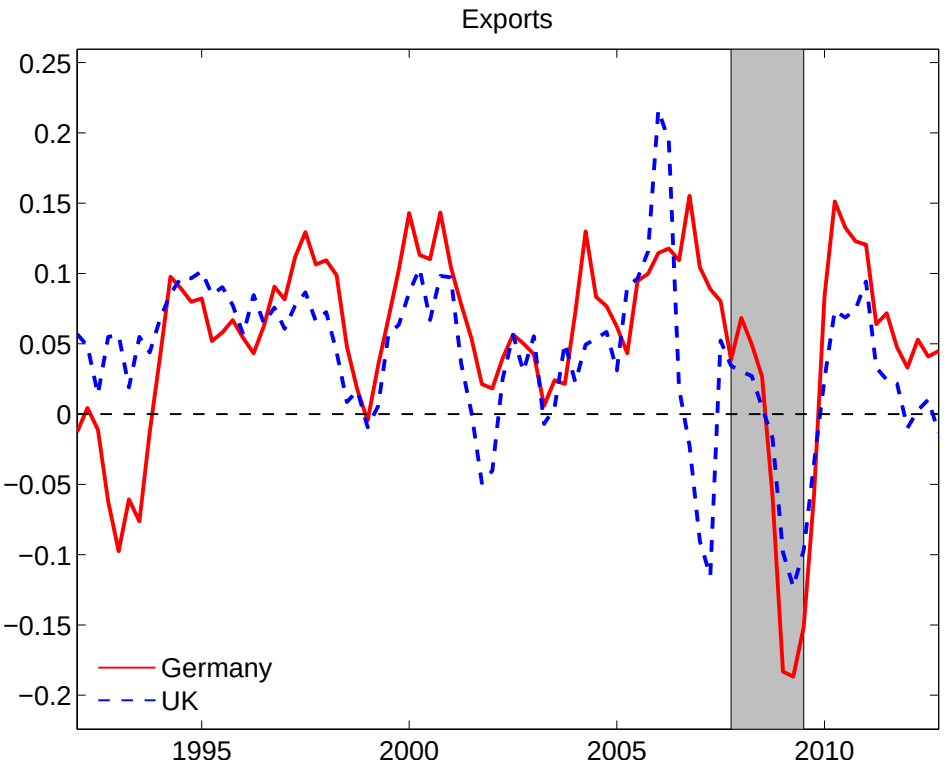


Trade Channel

- Trade and foreign demand dropped sharply in 2009Q1
- As a proxy for global demand, we construct trade-weighted imports of a broad set of trading partners of Germany and the UK
- Drop was similar for both countries, but Germany has higher trade openness

Trade Channel

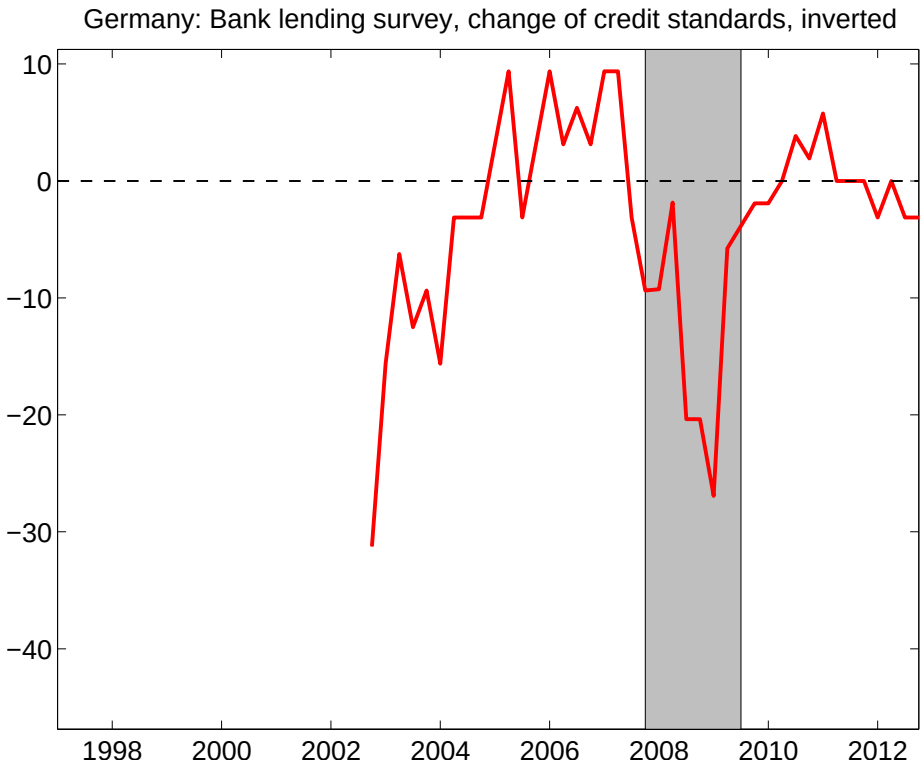


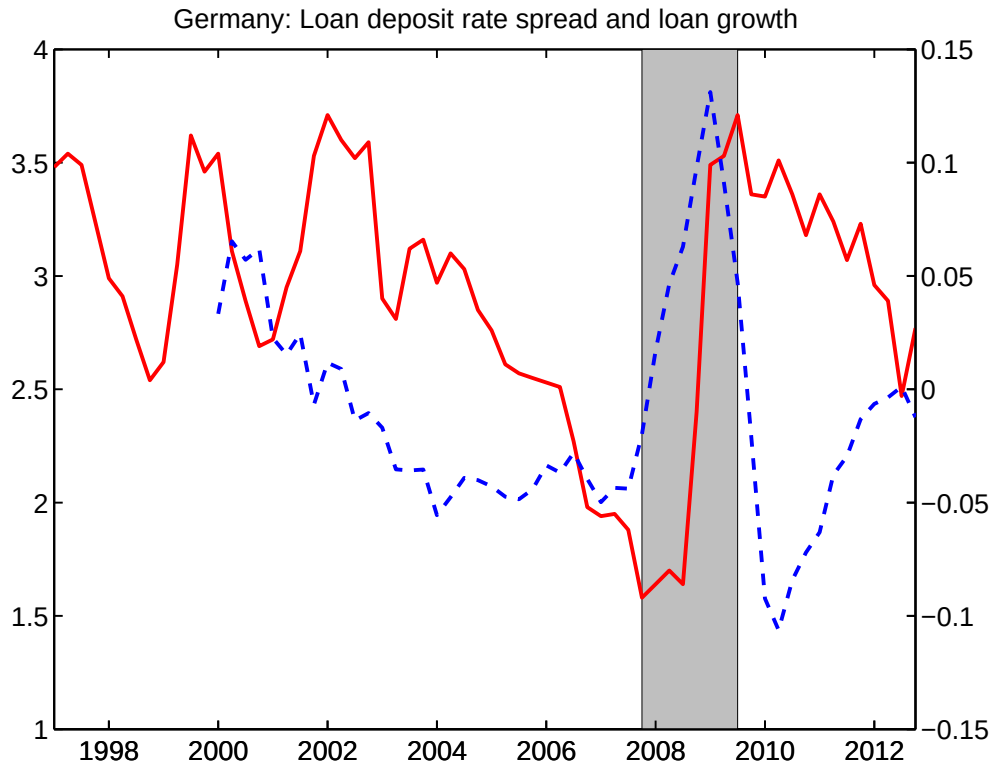


Financial Channel

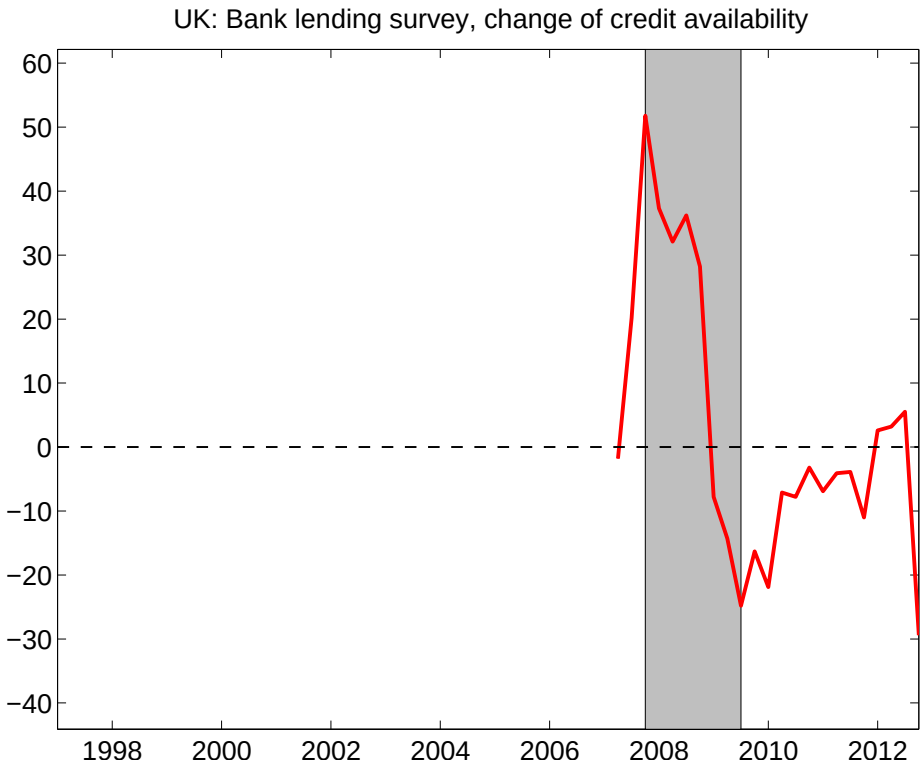
- Crisis has shown that financial sector can be important for propagation of shocks
- Writeoffs lowered capital of US and foreign banks
- Increased credit spread, negative effect on loans
- Negative effect on GDP in US and abroad

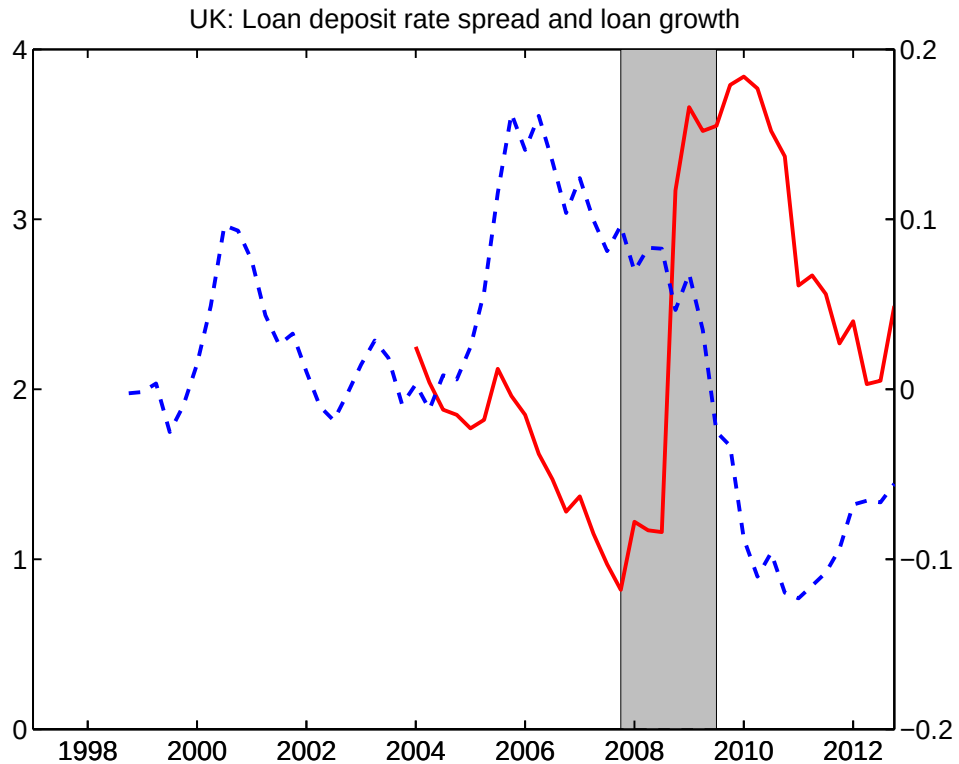
Financial Channel: GE



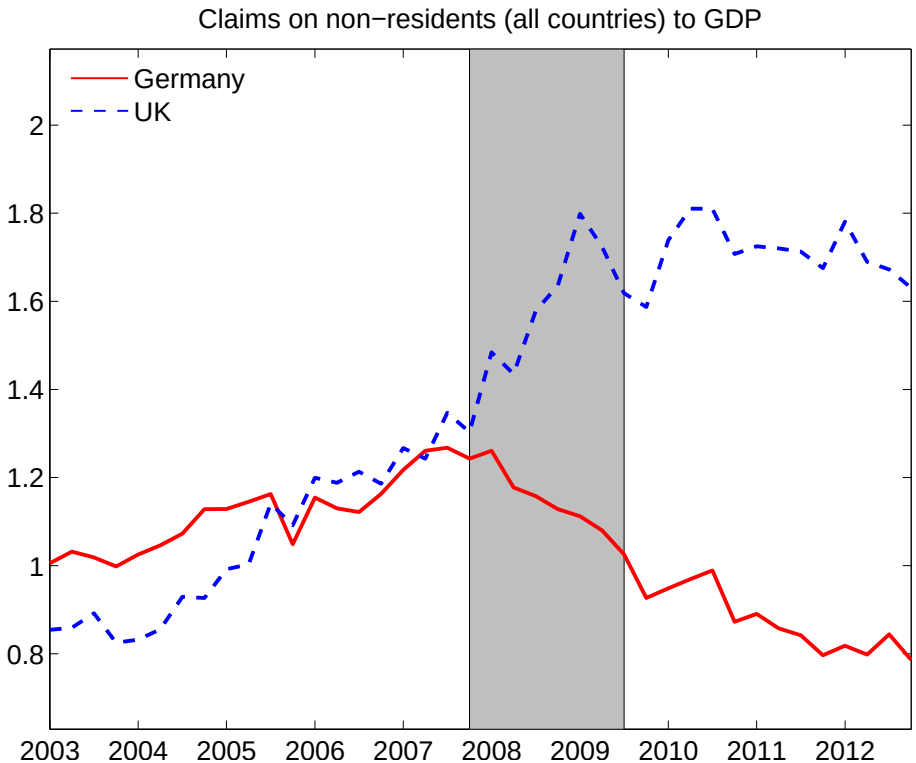


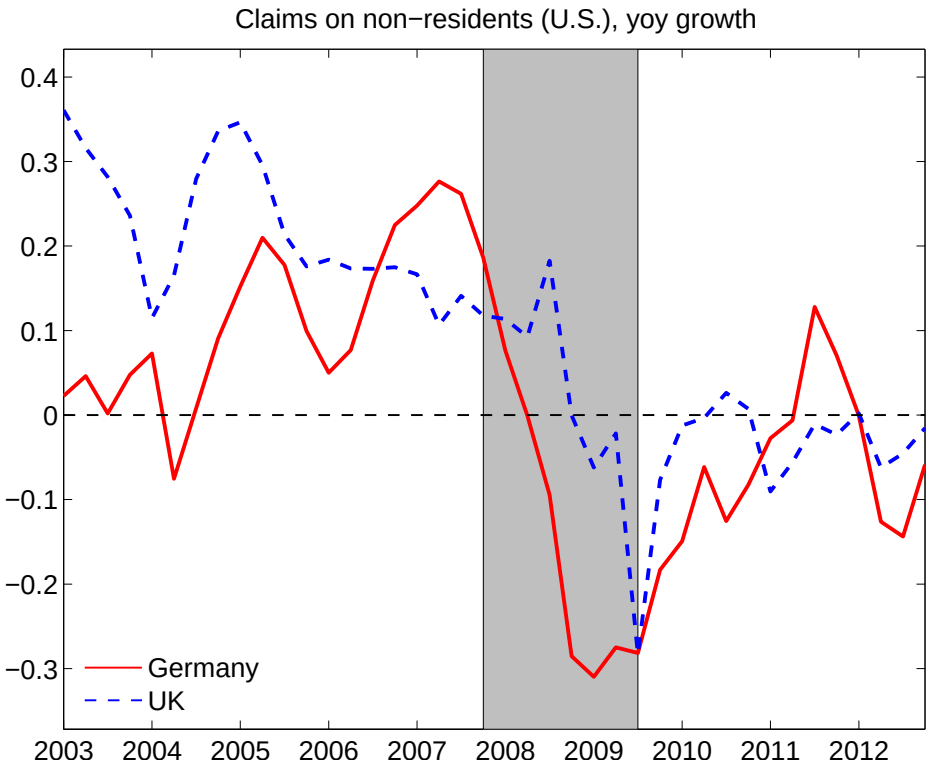
Financial Channel: UK





Financial Channel: Cross-border Claims





Model

The Model

Extension of Kollmann, Enders, and Müller (2011): includes both channels in a tractable way

Focus on receiving side of transmission: small open economy $\rightarrow$ no need to specify/model exact reason for crisis abroad

Furthermore, role for terms of trade because two-good model

Features internationally operating bank, allowing for foreign asset writeoffs

Calibrated in turn to German and UK data

Overview

Small open economy consisting of

Household works, saves via bank deposits

Liquidity services from deposits

Bank takes deposits, gives loans to entrepeneurs

Operates globally $\rightarrow$ invests in foreign assets
Faces regulatory capital requirement
$\rightarrow$ Loan rate exceeds deposit rate

Entrepreneur produces intermediate good, owns capital

Combined with imports, good can be used for C and I

All agents have same discount factor

Household

Life-time utility

$$E_t \sum_{s=0}^{\infty} \beta^s \left[u(C_{t+s}) + \Psi^D \frac{(D_{t+1+s})^{1-\sigma_w} - 1}{1-\sigma_w} - \Psi^N N_{t+s} \right]$$

Budget Constraint

$$C_t + p_t^a D_{t+1} = p_t^a W_t N_t + p_t^a D_t R_{t-1}^D$$

Instantaneous utility

$$u(C) = \frac{(C_{t+s} - \psi_w C_{t+s-1})^{1-\sigma_w} - 1}{1-\sigma_w}$$

Bank

Life-time utility

$$E_t \sum_{s=0}^{\infty} \beta^s \left[\frac{\left(d_{t+s}^B\right)^{1-\sigma_B} - 1}{1-\sigma_B} \right]$$

Budget constraint

$$p_t^a \Big(L_{t+1} + D_t R_{t-1}^D + \Gamma_D D_{t+1} + \Gamma_L L_{t+1} + \Gamma_A A_{t+1} + \phi(x_t) + \frac{\chi_A}{2} \left(A_{t+1} - \bar{A}\right)^2 \Big) + p_t^b A_{t+1} + d_t^B = p_t^a \left(L_t R_{t-1}^L + D_{t+1}\right) + p_t^b A_t R_t^A Q_t$$

Capital requirement

$$\phi'(x_t) < 0 \qquad \phi''(x_t) > 0$$

with

$$x_t = (1-\gamma)(L_{t+1} + p_t^b A_{t+1}) - D_{t+1}$$

Entrepreneur

Life-time utility

$$E_t \sum_{s=0}^{\infty} \beta^s \left[\frac{\left(d^E_{t+s} - \psi_E d^E_{t+s-1} \right)^{1-\sigma_E} - 1}{1-\sigma_E} \right]$$

Budget constraint

$$p^a_t L_t R^L_{t-1} + \xi(I_t) + p^a_t W_t N_t + d^E_t = p^a_t L_{t+1} + p^a_t Y_t$$

Capital adjustment costs

$$\xi(I_t) = I_t + 0.5\Xi \left(\frac{I_t}{\bar{I}} - 1 \right)^2$$

Production functions

$$Y_t = z_t K^{\alpha}_t N^{1-\alpha}_t$$

$$F_t = \left(\omega^{\frac{1}{\theta}} (a_t)^{\frac{\theta-1}{\theta}} + (1-\omega)^{\frac{1}{\theta}} (b_t)^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}}$$

Exogenous Shock Processes

Foreign demand

$$a_t^* = (1-\omega)\left(p_t^{*a}\right)^{-\theta} Y_t^*$$

with

$$\log(Y_t^*) = \rho_Y \log(Y_{t-1}^*) + \varepsilon_{Y,t}$$

Technology

$$\log(z_t) = \rho_z \log(z_{t-1}) + \varepsilon_{z,t}$$

Foreign return

$$\log(R_t^A) = (1-\rho_R)\log(\bar{R}^A) + \rho_R \log(R_{t-1}^A) + \varepsilon_{R,t}$$

Calibration

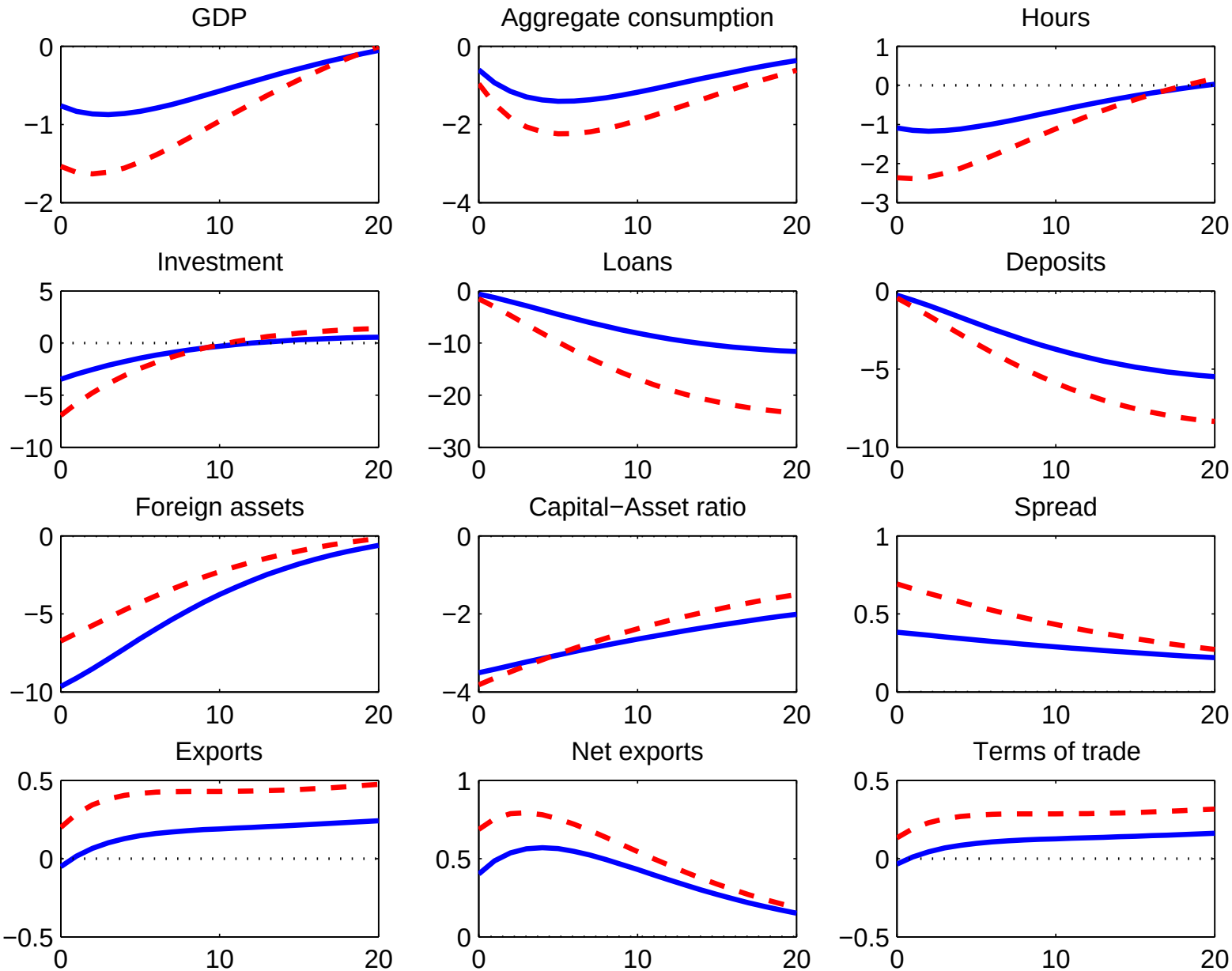
Parameter		GE	UK	Target
St. st. bank capital	γ	0.0435	0.065	GE/UK Data
Convexity of costs	$\phi''(0)$	0.25/Y	0.25/Y	Kollmann et al. (2011)
St. st. A/L	A/L	0.58	1.37	GE/UK Data
Crisis shocks				
Financial shock	ε_Q	-10%	-7.3%	For. writeoffs
Trade shock	ε_{Y^*}	-10.8%	-10.4%	For. demand
Autocorr. trade shock	ρ_{Y^*}	0.53	0.53	yoy ΔY^*

Calibration of shock processes in 'normal' times: SUR estimation

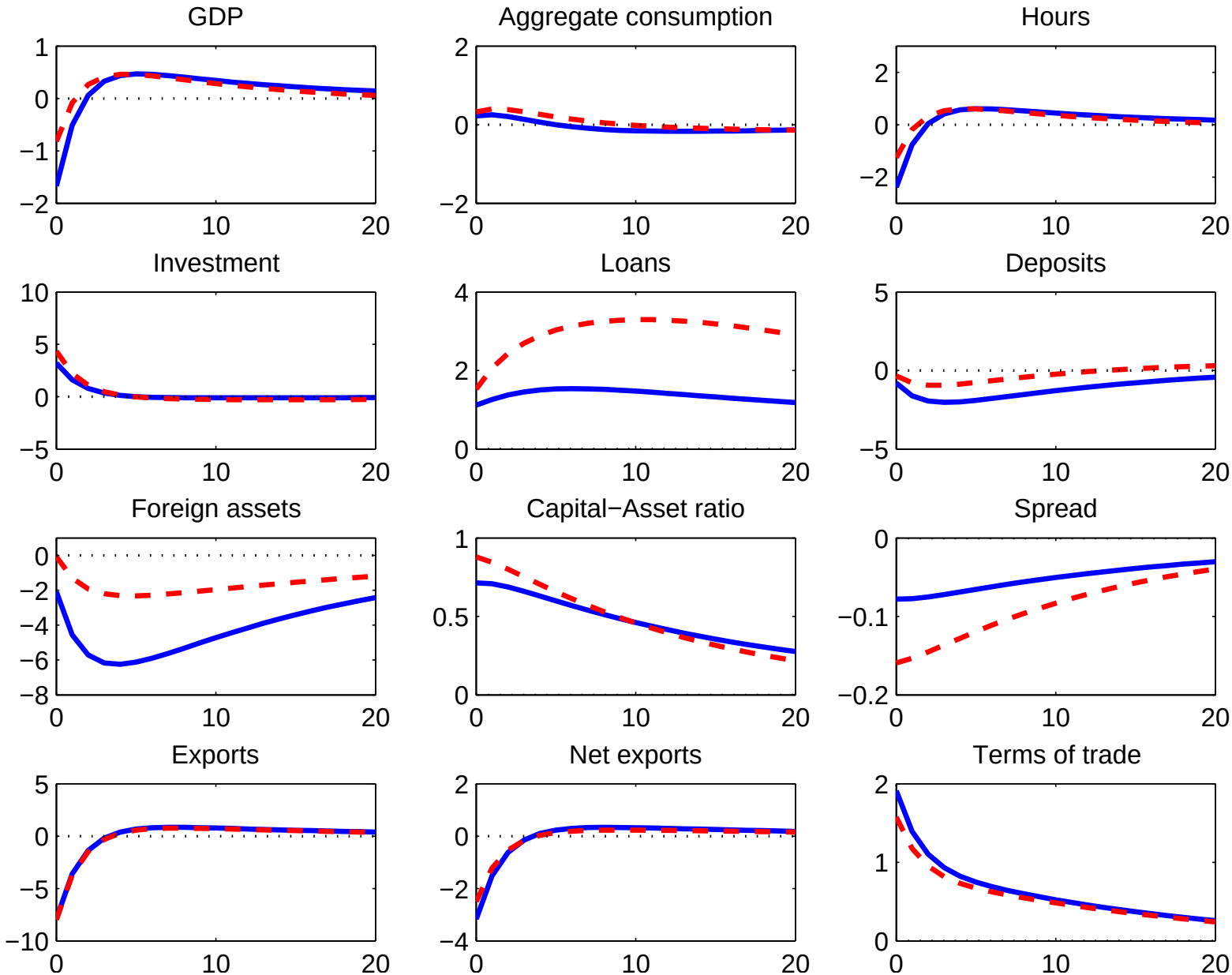
$\Rightarrow$ Predicted business cycle statistics match empirical moments well

Model Predictions

IRFs to Financial Shock



IRFs to Trade Shock



Mechanism

Unexpected bank asset reduction

- Bank capital falls
- Capital ratio partly kept up with lower deposits
- Bank has less resources, reduces loan supply
- Interest spread increases

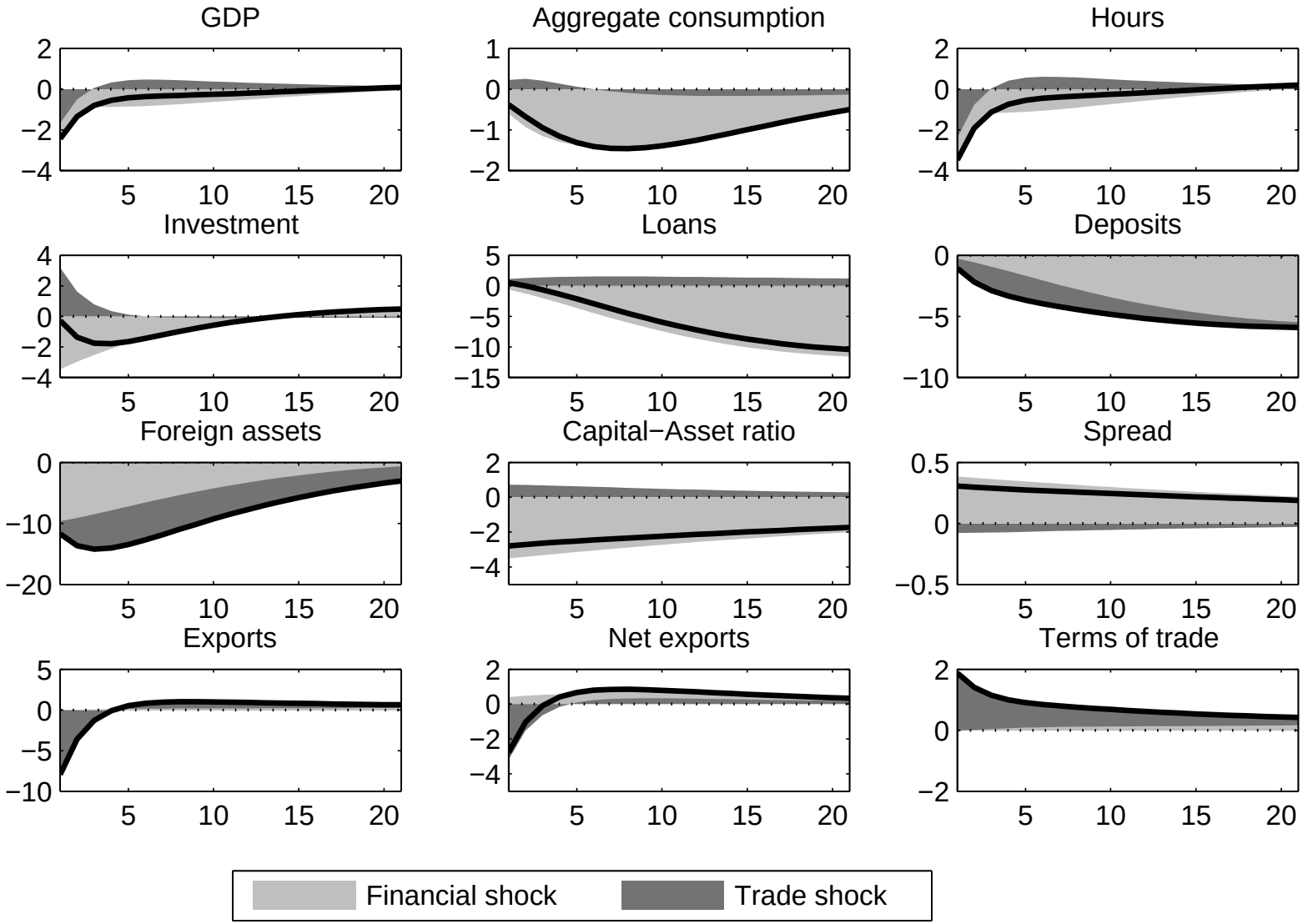
$\Rightarrow$ Unexpected writeoffs reduce economic activity

Unexpected trade shock

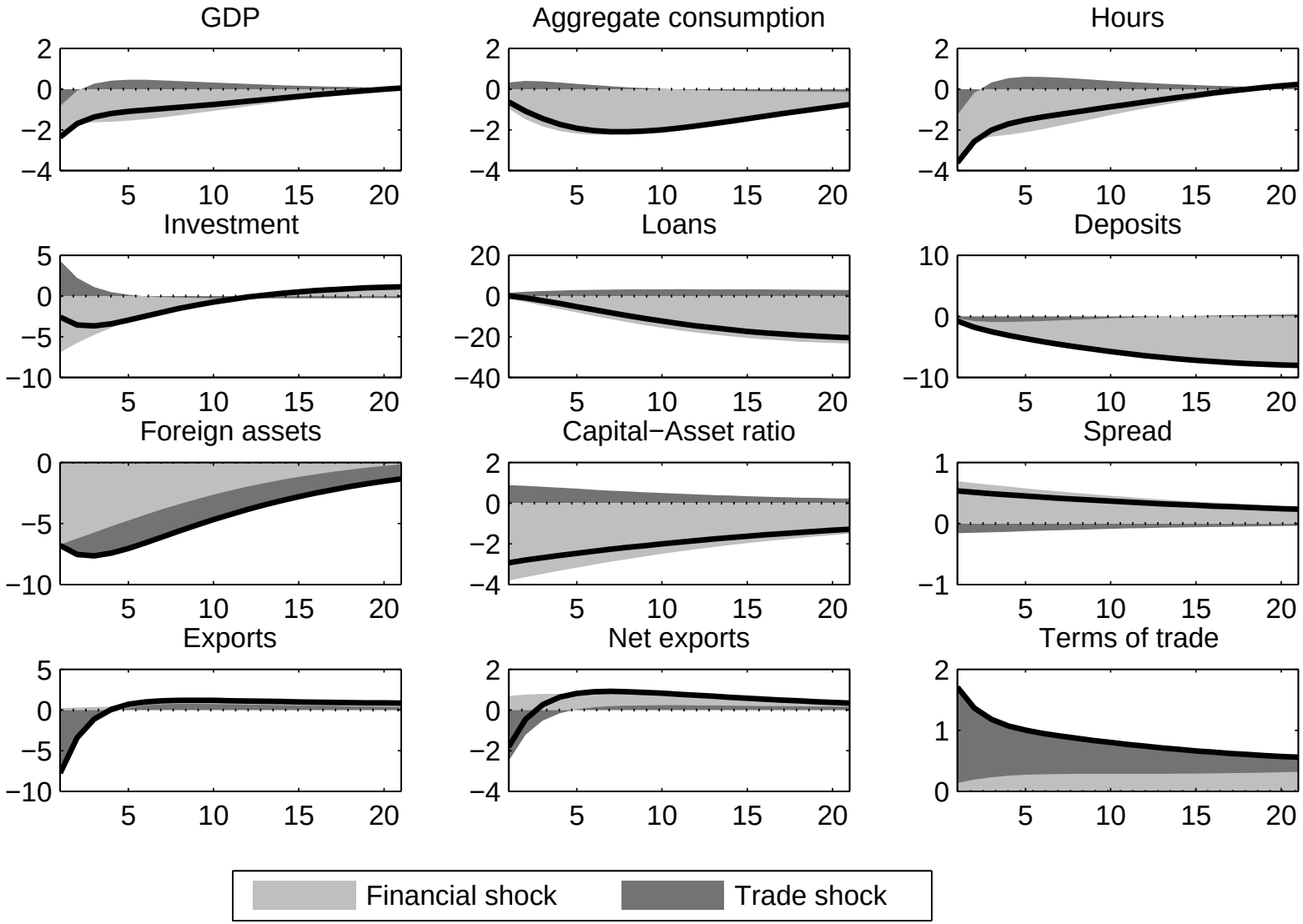
- External demand drops
- Terms of trade depreciate, leading to a quicker recovery
- Loans and bank capital increase, also speeding up recovery

$\Rightarrow$ Trade shock reduces output, but quicker recovery

Shock decomposition: GE



Shock decomposition: UK



Contributions to GDP reduction

GDP	Data	Model		
		Both shocks	Trade shock	Financial shock
Germany	-5.59	-2.43	-1.67	-0.88
UK	-2.70	-2.36	-0.82	-1.63

Conclusion

Model explains approximately half of GDP drop in Germany and almost 90% in the UK

Germany: trade channel responsible for 2/3 of explained reduction

UK: opposite result, financial channel more important

Financial shock leads to longer-lasting recession

Appendix

Market Clearing

Market clearing intermediate goods

$$Y_t = a_t + a_t^* + \phi(x_t) + \Gamma_D D_{t+1} + \Gamma_L L_{t+1} + \Gamma_A A_{t+1} + \frac{\chi_A}{2}\left(A_{t+1} - \bar{A}\right)^2$$

Market clearing final goods

$$F_t = C_t + d_t^E + d_t^B + \xi(I_t)$$

Calibration: parameters

Parameter		GE	UK	Target
Trade price elast.	θ	1.5	1.5	BKK (1994)
Depreciation rate	δ	0.025	0.025	Annual δ
Portfolio adj. cost	χ_A	0.005	0.005	Davis (2010)
Home bias	ω	0.63	0.71	GE/UK data
Capital share	α	0.30	0.35	"
Inv. adj. costs	Ξ	0.031	0.026	$\sigma_I/\sigma_Y = 2.48$ (GE), 3.22 (UK)
Operation costs	Γ	0.004	0.003	Spread $= 2.91\%$ (GE), 2.18% (UK)
St. st. slope costs	$\phi'(0)$	-0.004	-0.003	$r_D = 2.69\%$ (GE), 3.73% (UK)
Labor Supply	Ψ^N	2.5/Y	3.2/Y	L/Y$=34\%$ (GE), 27% (UK)
Pref. for deposits	Ψ^D	0.022	0.021	$x = 0$
Discount factor	β	0.986	0.985	$r_L = 5.6\%$ (GE), 5.91% (UK)
IEOS	$\sigma_B = \sigma_w$	1	1	Log utility
Entrep. IEOS	σ_E	0.01	0.01	Risk neutral
Utility parameter	$\psi_w = \psi_E$	0.85	0.85	Gerali et al. (2010)

Calibration shock processes in 'normal' times

Parameter		DE	UK	Ziel
Autocorr. trade	ρ_{Y^*}	0.95	0.96	SUR estimation
Std. dev. trade		1.53%	1.51%	"
Autocorr. TFP	ρ_z	0.76	0.93	"
Std. dev. TFP		1.05%	0.64%	"
Autocorr. for. returns	ρ_R	0.1	0.08	"
Std. dev. for. returns		4.37%	4.46%	"
Corr. TFP & trade	Corr(ε_z,ε_{Y^*})	0.39	0.46	"
Corr. TFP & for. ret.	Corr(ε_z,ε_R)	0	0.28	"
Corr. trade & for. ret.	Corr(ε_{Y^*},ε_R)	0.28	0.27	"

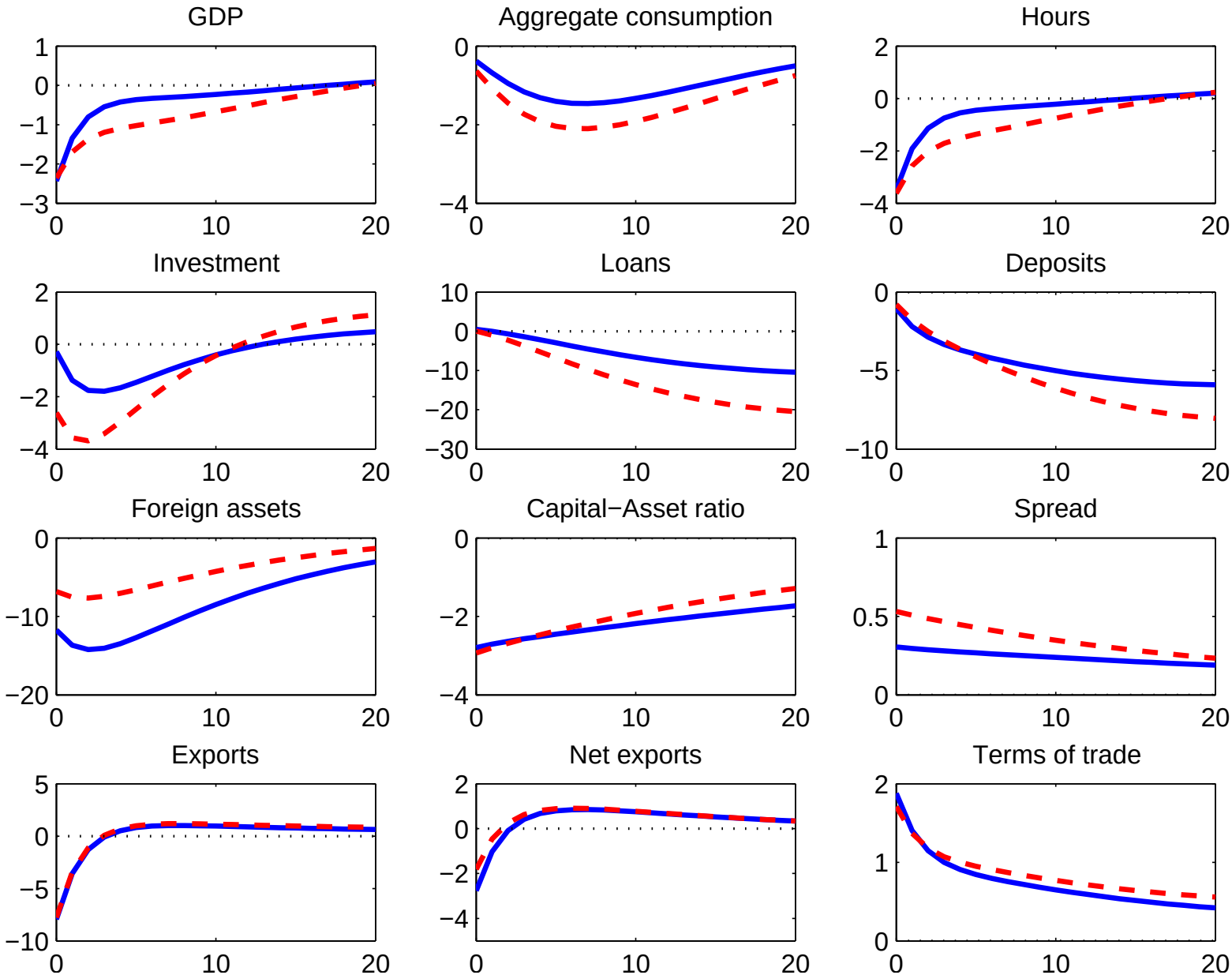
Business cycle statistics: Germany

	Data	Model with shocks:				
		All	TFP	Trade	For. returns	No fin. fric.
	(1)	(2)	(3)	(4)	(5)	(6)
Std. dev. GDP	1.48	1.88	1.78	0.04	0.63	1.73
Rel. std. dev.						
Consumption	0.49	0.69	0.56	2.50	1.34	0.55
Investment	2.48	2.48	2.33	7.97	2.98	2.48
Employment	0.40	0.63	0.45	1.52	1.41	0.42
Deposits	1.01	0.78	0.42	6.79	1.76	0.52
Loans	1.65	1.53	0.94	8.29	3.93	0.88
Spread	0.40	0.12	0.02	0.84	0.37	0.00
Net exports	0.52	0.29	0.12	6.68	0.71	0.19
Corr. with GDP						
Consumption	0.42	0.70	0.77	0.34	0.78	0.74
Investment	0.88	0.92	0.95	-0.79	0.76	0.95
Employment	0.44	0.86	0.97	0.97	1.00	0.97
Deposits	0.04	0.17	0.32	-0.88	-0.02	0.32
Loans	-0.02	-0.01	0.04	0.29	-0.15	0.10
Spread	-0.40	-0.44	-0.95	-0.74	-0.98	-0.61
Net exports	0.30	0.16	0.21	-0.59	-0.49	0.44

Business cycle statistics: UK

	Data	Model with shocks:				
		All	TFP	Trade	For. returns	No fin. fric.
	(1)	(2)	(3)	(4)	(5)	(6)
Std. dev. GDP	1.16	2.24	1.28	0.19	1.61	1.24
Rel. std. dev.						
Consumption	0.90	0.97	0.66	1.16	1.16	0.59
Investment	3.22	3.22	2.66	1.61	3.46	3.22
Employment	0.45	1.14	0.51	1.46	1.48	0.48
Deposits	2.19	1.26	0.73	0.80	1.53	0.80
Loans	3.86	3.51	2.04	4.68	4.38	1.98
Spread	0.45	0.27	0.05	0.46	0.37	0.00
Net exports	0.42	0.33	0.09	1.18	0.46	0.15
Corr. with GDP						
Consumption	0.77	0.82	0.81	0.95	0.86	0.72
investment	0.77	0.90	0.91	0.17	0.90	0.92
Employment	0.54	0.94	0.99	1.00	0.99	0.99
Deposits	-0.14	0.06	0.23	-0.67	-0.01	0.29
Loans	0.40	0.03	0.17	-0.06	-0.01	0.23
Spread	-0.61	-0.86	-0.98	-0.97	-0.98	-0.18
Net exports	-0.20	-0.76	-0.73	-0.98	-0.93	-0.02

IRFs to both Shocks



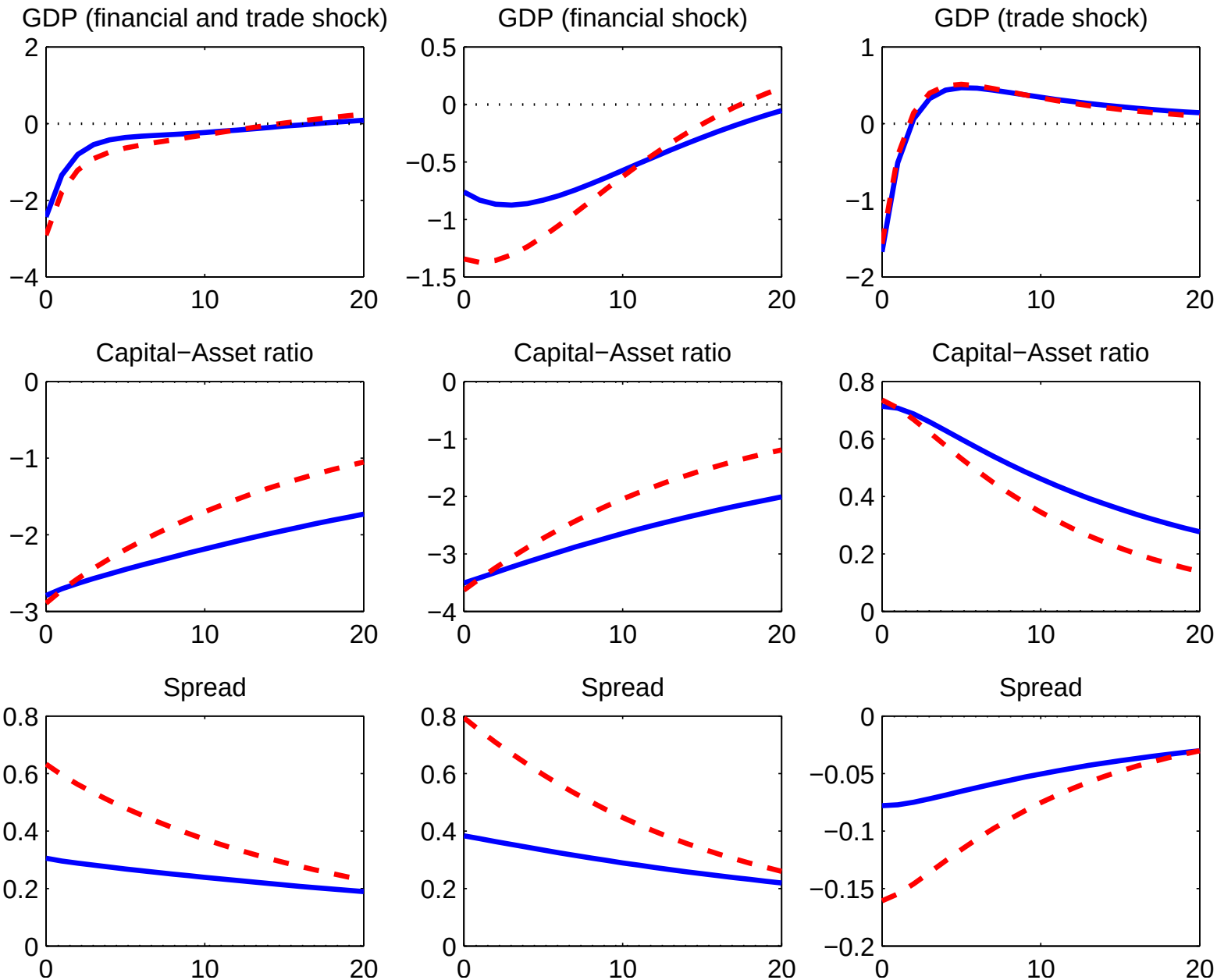
Model Responses: Germany

	Data	Model					
		Maximum response			Cumulative response		
		Both shocks	Trade	Financial	Both shocks	Trade	Financial
Output	-5.59	-2.43	-1.67	-0.88	-5.13	-1.79	-3.34
Consumption	-0.81	-1.16	0.25	-1.30	-3.18	0.81	-3.99
Investment	-12.71	-1.79	3.19	-3.47	-5.21	5.91	-11.12
Employment	-0.26	-3.48	-2.39	-1.17	-7.27	-2.71	-4.57
Deposits	-4.40	-3.34	-2.03	-1.31	-9.49	-6.40	-3.09
Loans	-6.06	-1.38	1.45	-2.83	-1.55	5.21	-6.76
Spread	1.50	0.31	-0.08	0.38	1.17	-0.30	1.47
Net exports	-2.27	-2.77	-3.17	0.56	-3.48	-5.47	1.99

Model Responses: UK

	Data	Model					
		Maximum response			Cumulative response		
		Both shocks	Trade	Financial	Both shocks	Trade	Financial
Output	-2.70	-2.36	-0.82	-1.63	-6.62	-0.23	-6.39
Consumption	-2.25	-1.73	0.40	-2.06	-4.90	1.44	-6.34
Investment	-9.26	-3.69	4.35	-6.96	-13.29	8.13	-21.42
Employment	-0.29	-3.62	-1.26	-2.39	-9.93	-0.59	-9.34
Deposits	-4.11	-3.12	-0.94	-2.18	-8.21	-3.01	-5.20
Loans	-18.11	-3.72	2.70	-6.42	-6.95	8.72	-15.67
Spread	1.37	0.53	-0.16	0.69	1.99	-0.59	2.59
Net exports	-0.79	-1.81	-2.50	0.79	-1.40	-4.42	3.02

Stricter capital regulation: Germany



Stricter capital regulation: UK