Interest Premium, Sudden Stop, and Adjustment in a Small Open Economy

Péter Benczúr István Kónya

European Commission, Joint Research Centre (JRC); MNB and CEU

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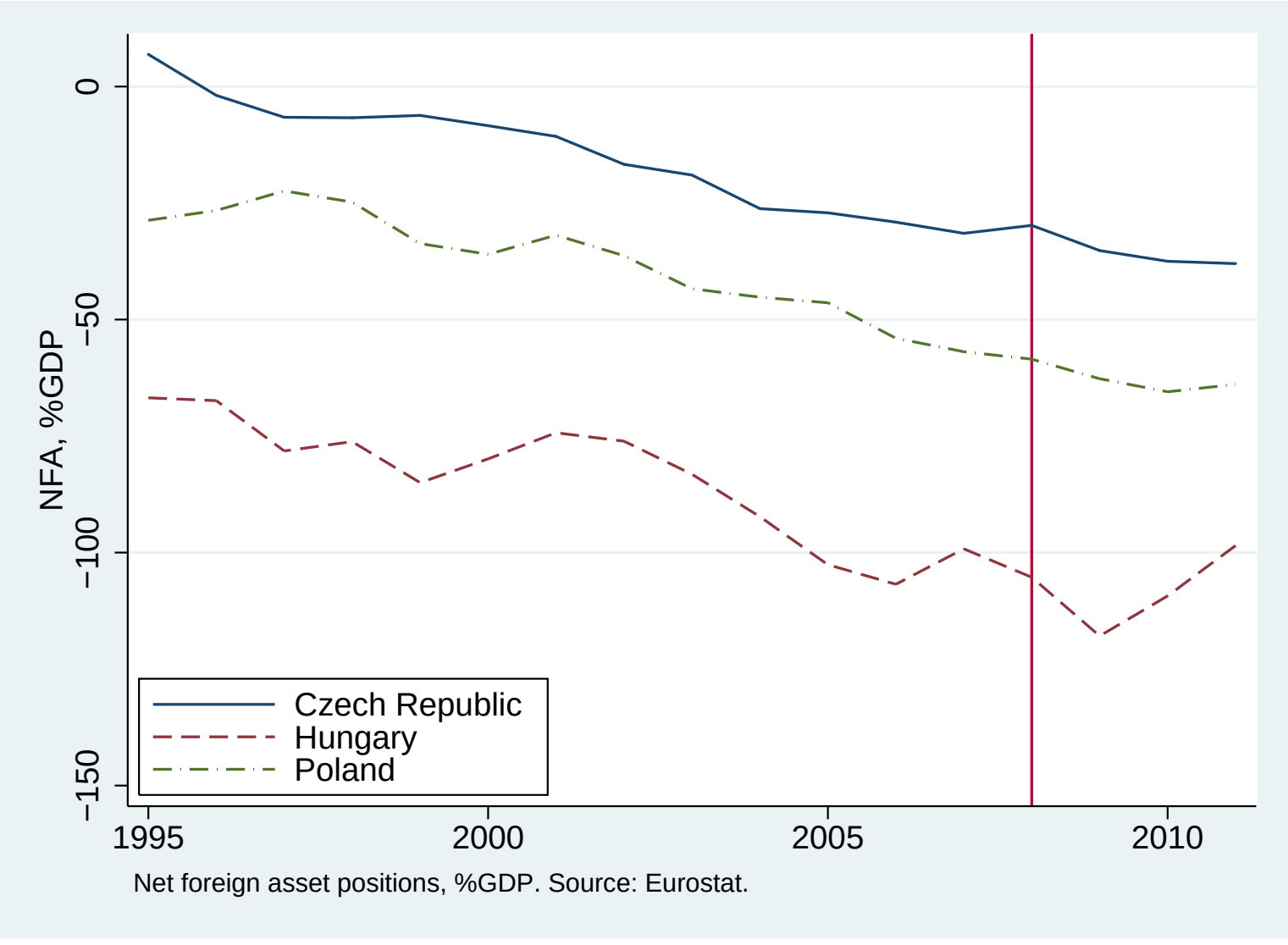
Disclaimer

The views expressed are those of the authors and do not necessarily reflect the official view of the Magyar Nemzeti Bank (the central bank of Hungary) or the European Commission.

Motivation

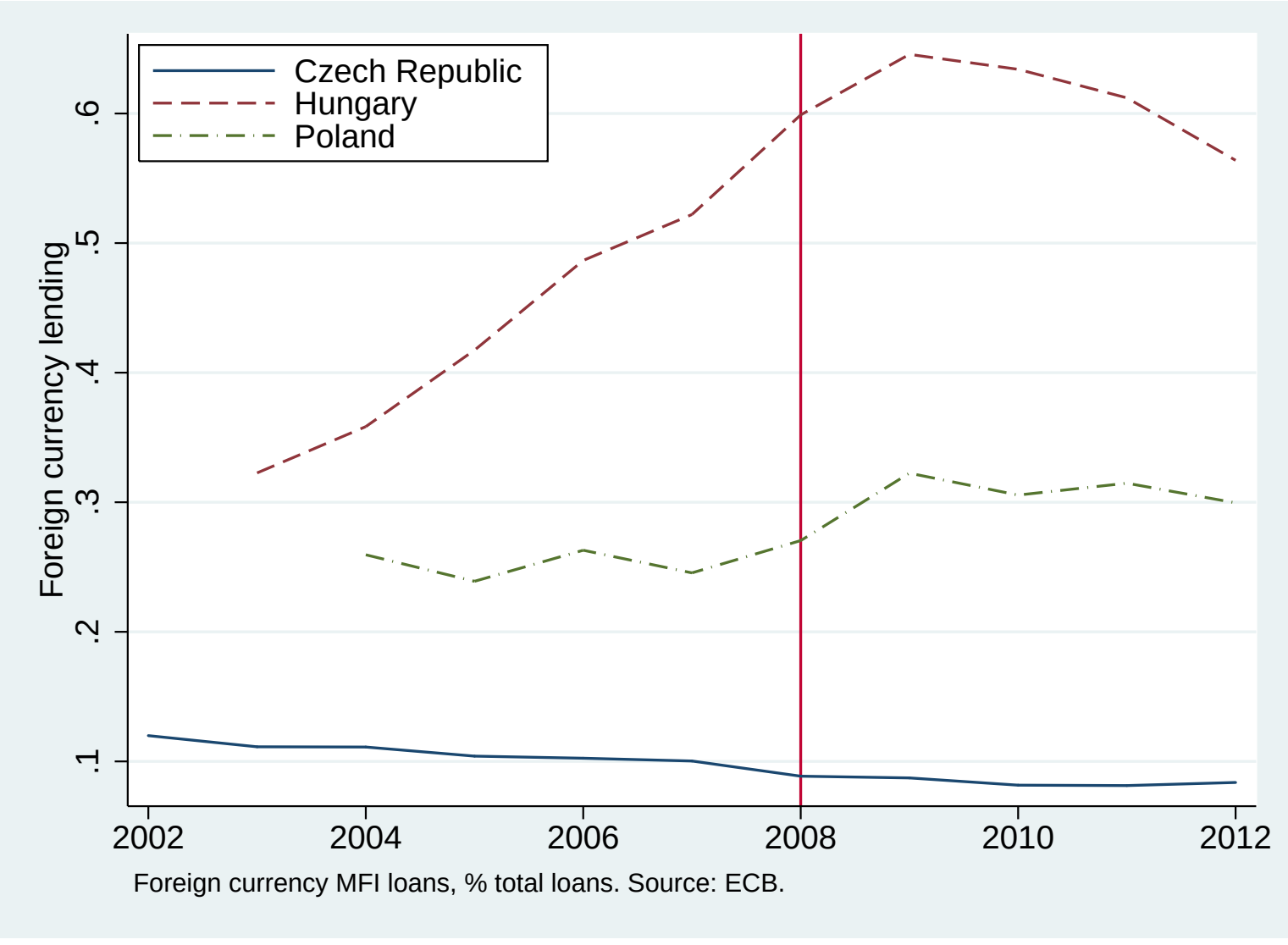
- The crisis of 2008-2009 hit many small open economies by tightening their external conditions
- The CEE economies provide a good laboratory
- Important differences in initial conditions and responses
  - NFA per GDP
  - Exchange rate regime
  - Currency mismatch
  - Balance sheet adjustment
  - Current account
  - Traded-nontraded reallocation

Net Foreign Assets



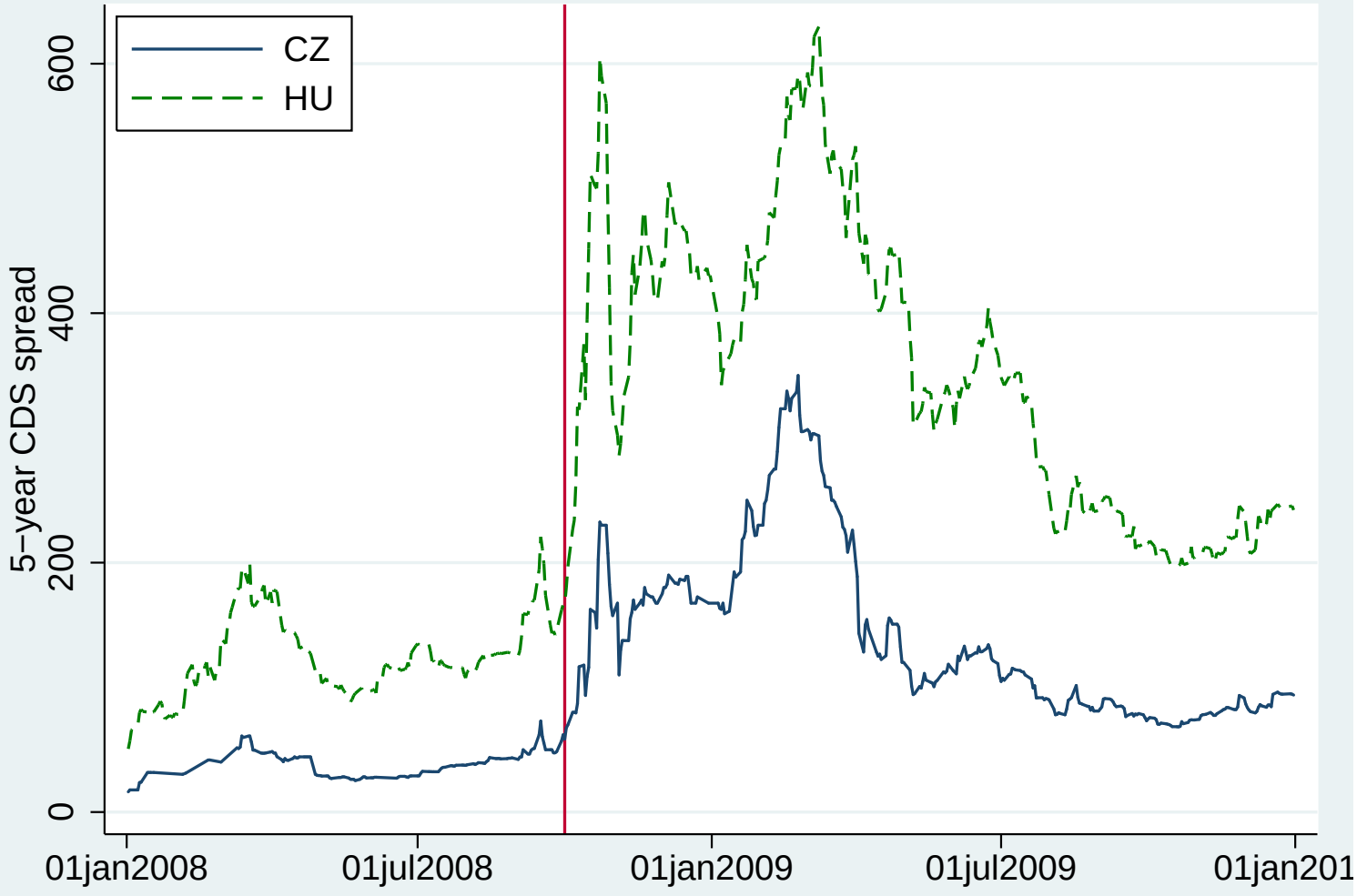
Net foreign asset positions, %GDP. Source: Eurostat.

Foreign Currency Lending



Foreign currency MFI loans, % total loans. Source: ECB.

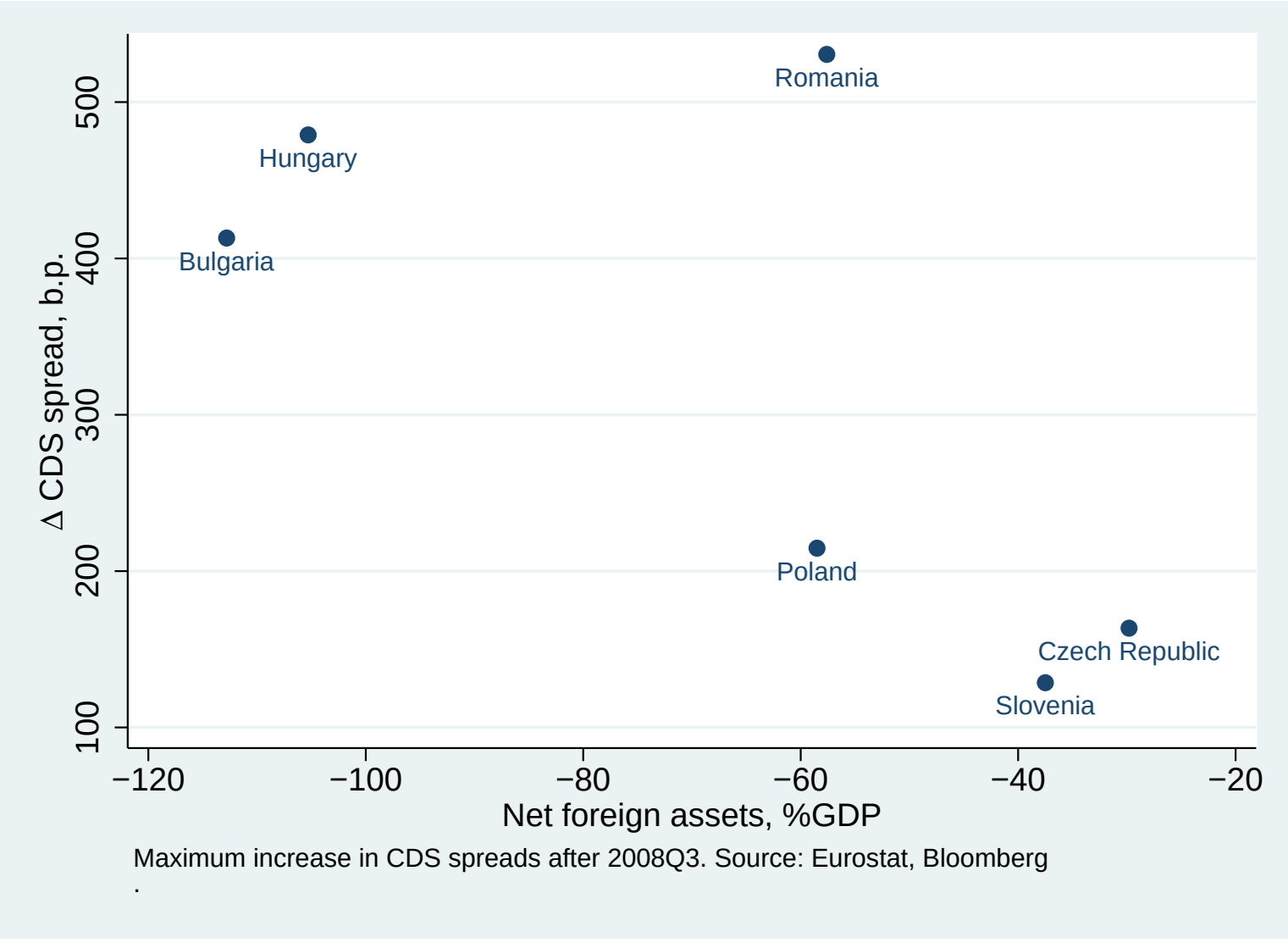
CDS Spreads



Source: Bloomberg. The vertical line indicates the start of the financial crisis.

Go

Debt and CDS Spreads



Maximum increase in CDS spreads after 2008Q3. Source: Eurostat, Bloomberg
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This Paper

- The crisis: a permanent tightening in the cost of foreign borrowing (and a one-period drop in export demand)
  - Calibrate the model to Hungarian data, evaluate quantitative fit conditional on only two shocks
  - Question #1: Hungarian policy dilemma in 2008
  - Question #2: “Optimal” policy and initial NFA
- Two-sector, flexible price model with money-in-the-utility and debt-dependent interest rate
  - Interest premium highly nonlinear, similar to credit constraint Go
  - Downward nominal wage rigidity (internal devaluation) Go
  - Currency mismatch

Literature: ingredients

- Nominal growth, model ingredients: Benczúr and Kónya (2013)
- Real models of the current account and real exchange rates: Kehoe and Fernandez de Cordoba (2000), Bems and Hartelius (2006)
- Small open economy models with money: Rebelo and Vegh (1995) and Burstein, Eichenbaum and Rebelo (2007)
- Valuation effects: Tille (2005)
- Downward nominal wage rigidity: Fahr and Smets (2010)
- Occasionally binding credit constraints and sudden stops: Mendoza (2010)
- Penalty function approach: Judd (1998), De Wind (2008), Den Haan and Ocaktan (2009)

Literature: related issues

- Sudden stops: Curdia (2008), Christiano et al. (JME 2009)
- Exchange rate regimes and financing frictions: Cook and Devereux (2006), Gertler *et al* (2007), Brzoza-Brzezina and Makarsky (2011), Heer and Schubert (2012)
- The usual story:
  - Peg is costly for the economy due to financial frictions
  - Peg slows adjustment to an external financing shock
- Faia 2010: in case of domestic and external shocks, a peg may lead to a softer interest rate response
- Our story: add FX mismatch
  - A large depreciation hurts balance sheets
  - Peg protects balance sheets, but hampers real adjustment
  - A peg might be “better” even for purely external shocks

Model

- Production: exports and nontradables, consumption: imports and nontradables
- Sector-specific investment with adjustment costs
- Money-in-the-utility and non-linear, debt-dependent foreign interest premium
- Endogenous labor supply, downward nominal wage rigidity
- Monetary policy: degree of exchange rate flexibility
- Small open economy with downward-sloping export demand

Mechanism

- MIU implies households hold assets (money) in domestic currency; foreign borrowing assumed to be in foreign currency $\Rightarrow$ currency mismatch
- Higher premium makes HHs poorer, debt more expensive
  - External rebalancing $\Rightarrow$ exchange rate depreciates $\Rightarrow$ mismatch exacerbated
- Fixed exchange rate protects HH balance sheets, but hinders CA adjustment through exports (DNWR)
- Usually: revaluation of CB reserves exactly offset this
  - Here, premium depends only on unconsolidated HH position
  - Reserves are only for liquidity provision, not for bailout
  - Reserves earn lower interest rate (Benczúr-Kónya, 2013)

The Central Bank

- Per period budget constraint

$$\underbrace{S_t\left(B_t^c - R_{t-1}^c B_{t-1}^c\right)}_{\text{CB foreign reserves}} + D_t - R_{t-1}^d D_{t-1} + T_t = H_t - H_{t-1}$$

- Policy rule in terms of exchange rate flexibility

$$\left(\frac{H_t}{H_{t-1}}\right)^{\rho_s}\left(\frac{S_t}{S_{t-1}}\right)^{1-\rho_s} = 1$$

- Reserve policy

$$B_t^c = \rho_h \frac{H_t}{S_t}$$

NFA evolution and the impact of money

$$
\begin{aligned}
B_t^h - R_{t-1} B_{t-1}^h &= TB_t - \rho_h \left(\frac{H_t}{S_t} - \frac{R_{t-1}^c H_{t-1}}{S_{t-1}} \right) \\
B_t - R_{t-1} B_{t-1} &= TB_t - \rho_h \left(R_{t-1} - R_{t-1}^c \right) H_{t-1} / S_{t-1}
\end{aligned}
$$

- Under pure floating ($\rho_h = 0$), money does not enter the current account
  - Like a cashless economy, money determined residually
- Under a currency board ($\rho_s = 0, \rho_h = 1$), changes in money demand are matched by changes in reserves
  - Money is not neutral, risk premium accommodation
- Interim cases: a partial response to the risk premium

The experiment

- We simulate the deterministic, nonlinear model
- Model calibration: Hungarian data
- Transition from an initial to a new steady state
  - Neutral (non-reserve) NFA per GDP $\downarrow$
    - Unexpected, permanent shock, from -1.238 to -0.228
  - (First period only: large decline in export demand)
    - To match decline in exports

Policy choices

- Hungarian baseline
  - Increase in reserves (ρ_h : 0.45 $\rightarrow$ 0.7, with an AR coefficient of $\psi = 0.55$), calibrated to Hungary
  - Monetary policy ($\rho_s = 0.133$), calibrated to exchange rate response
- Alternative policy #1
  - Fixed exchange rate ($\rho_s = 0$)
  - Larger increase in reserves ($\rho_h \rightarrow 1$)
- Alternative policy #2
  - More flexible exchange rate ($\rho_s = 0.28$)
  - No increase in reserves ($\rho_h = 0.45$)
- Policy choice with lower initial indebtedness?

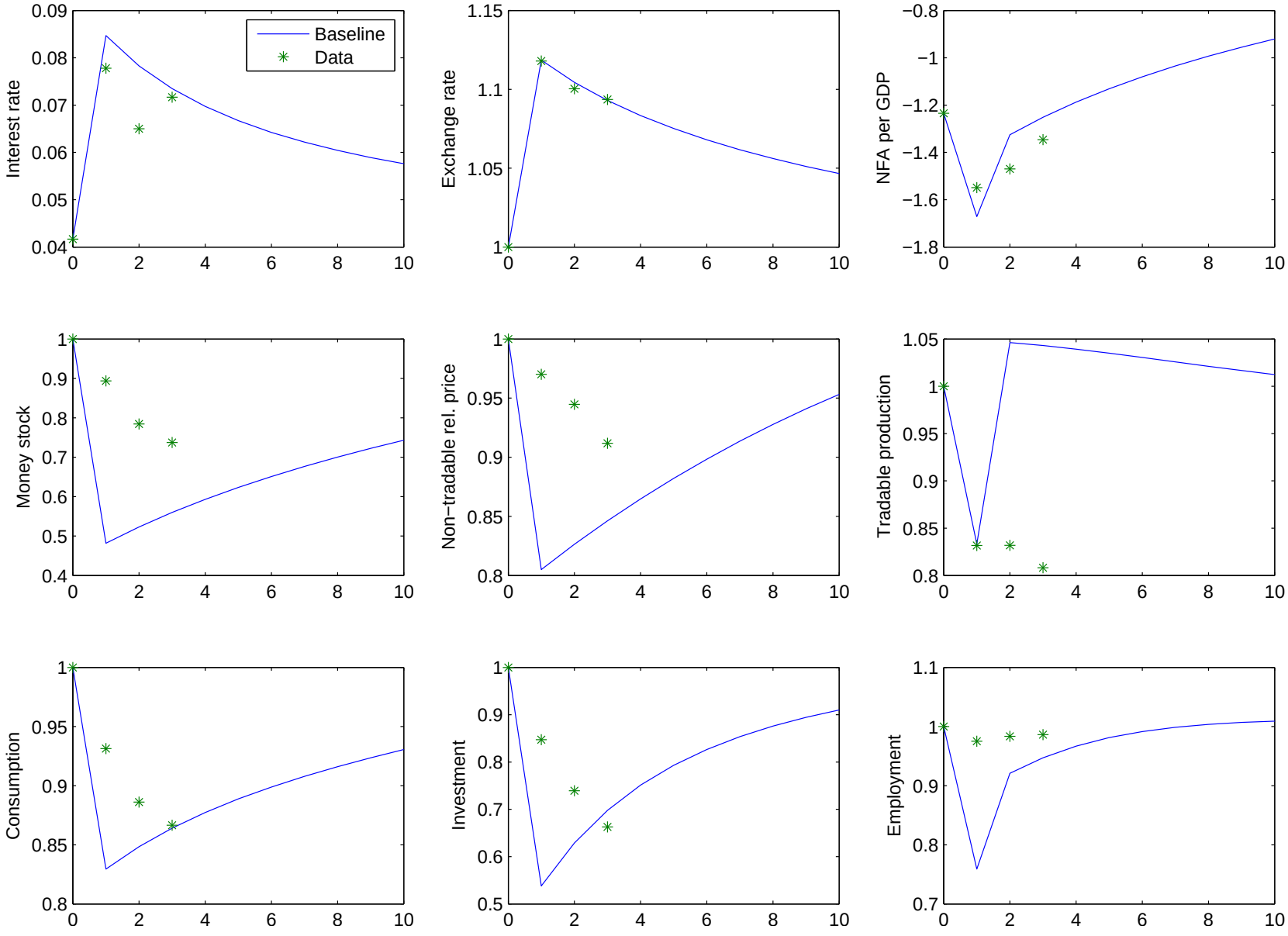
Calibrating the linex premium function

$$\log R_t = -\log \beta + \nu \left(e^{-\zeta\left(b_t/Y_t - \bar{b}/\bar{Y}\right)} - \zeta\left(b_t/Y_t - \bar{b}/\bar{Y}\right) - 1 \right) / \zeta^2$$

- CDS and NFA data before and at the crisis, HUN and CZE
- The pre-crisis CDS spread included a constant premium
  - HUN was in the neutral NFA position before the crisis:
    - $\bar{b}_0/\bar{Y}_0 = -1.235$
    - The constant premium is the average HUN CDS spread for October 2007-September 2008 (120 bp)
- We need $\bar{b}/\bar{Y}$ and the two linex parameters Go
  - CZE before the crisis: a spread of 35 bp, $b/Y = -0.588$
  - CZE right at the crisis: a spread of 232 bp
  - HUN right at the crisis: a spread of 605 bp

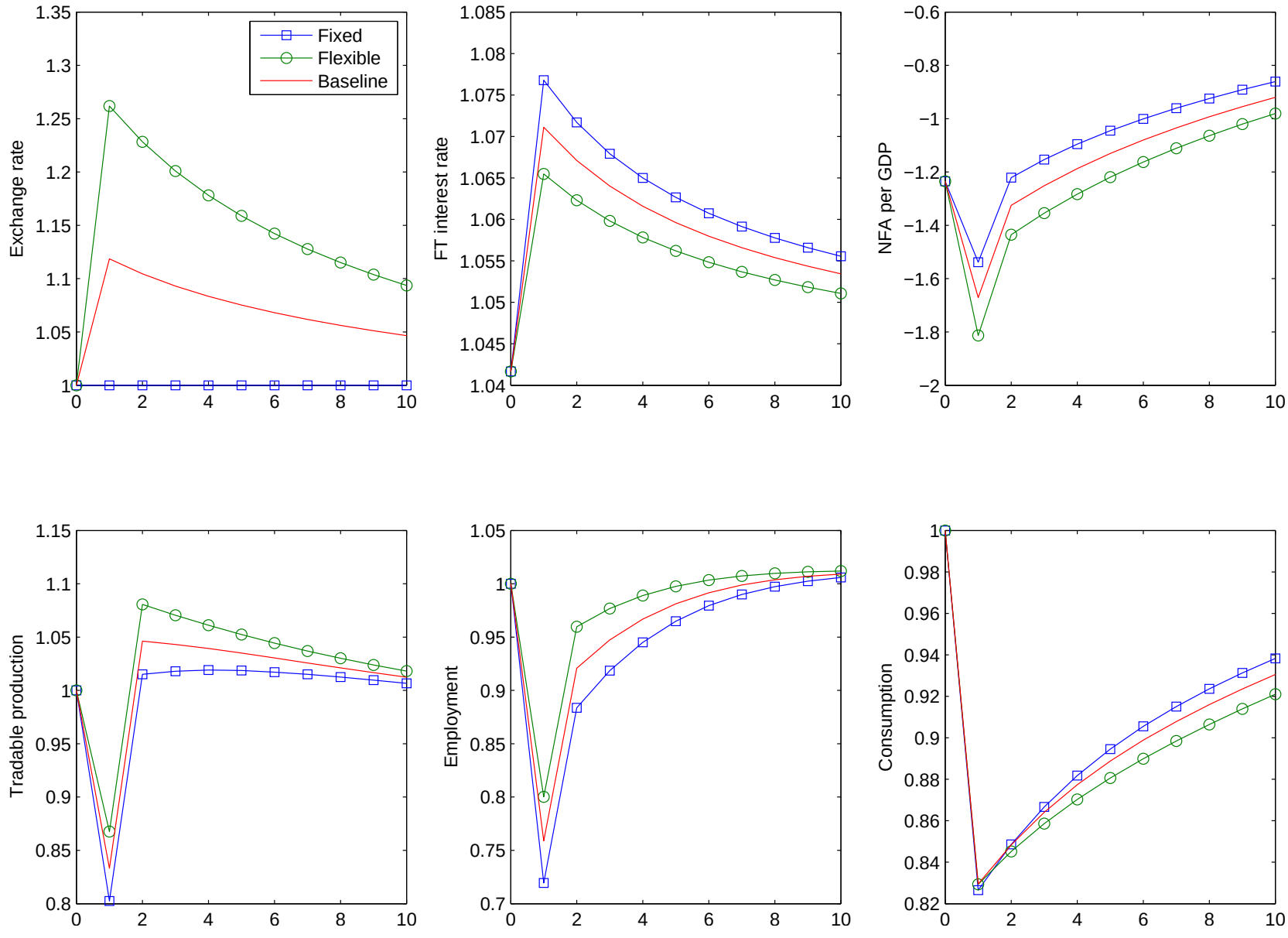
Calibration

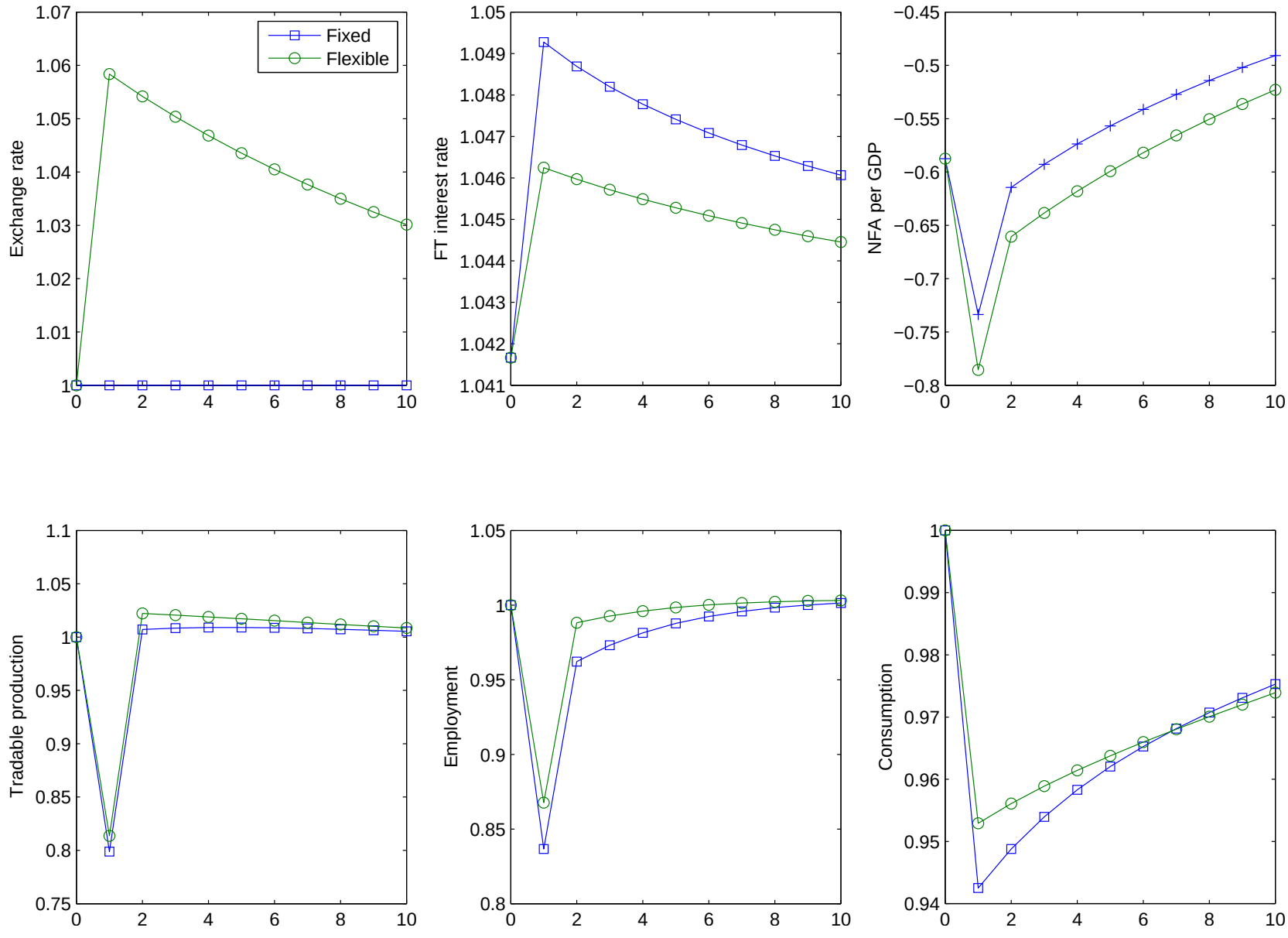
Parameters	Notation	Value	Calibration target
Discount rate	β	0.96	Real interest rate
Depreciation	δ	0.06	Literature
Imports share in *C*	λ	0.315	National accounts
Import share in *I*	λ_I	0.478	National accounts
Capital share in *X*	α_T	0.427	National accounts
Capital share in *NT*	α_N	0.337	National accounts
Labor supply elast.	$1/\omega$	1/3	Literature
Steady state labor	$\bar{N}$ (χ)	1/3	Literature
Wage markup	σ_w	3.5	Literature
Wage adjustment function	ν_w; ξ_w	1; 100	Literature
Cap. adj. cost	ϕ	5	Literature
Exp. demand elast.	$-\eta$	0.5	HU DSGE model
Importance of money	$\bar{H}/\bar{Y}$ (γ)	0.48 (0.025)	M2/GDP
Initial and final (non-reserves) NFA position	$\frac{b_0}{y_0}$; $\frac{\bar{B}}{\bar{Y}}$	-1.238; -0.228	HU and CZ CDS, NFA
Interest premium function	ν; ζ	0.0145; 2.095	HU and CZ CDS, NFA


Baseline
Data
Interest rate
Exchange rate
NFA per GDP
Money stock
Non−tradable rel. price
Tradable production
Consumption
Investment
Employment

Baseline Results

- Data points: pre-crisis trends removed
- Model captures relevant movements qualitatively, often quantitatively as well
- Money drops too little, consumption and NT relative price too much
  - Cumulative three period changes closer to data
  - Portfolio adjustment costs, illiquid assets?
  - Price rigidities?
- Employment, exports
  - Labor hoarding, tax changes, capacity utilization – and still a large unexplained drop in TFP


Fixed
Flexible
Baseline
Exchange rate
FT interest rate
NFA per GDP
Tradable production
Employment
Consumption


Fixed
Flexible
Exchange rate
FT interest rate
NFA per GDP
Tradable production
Employment
Consumption

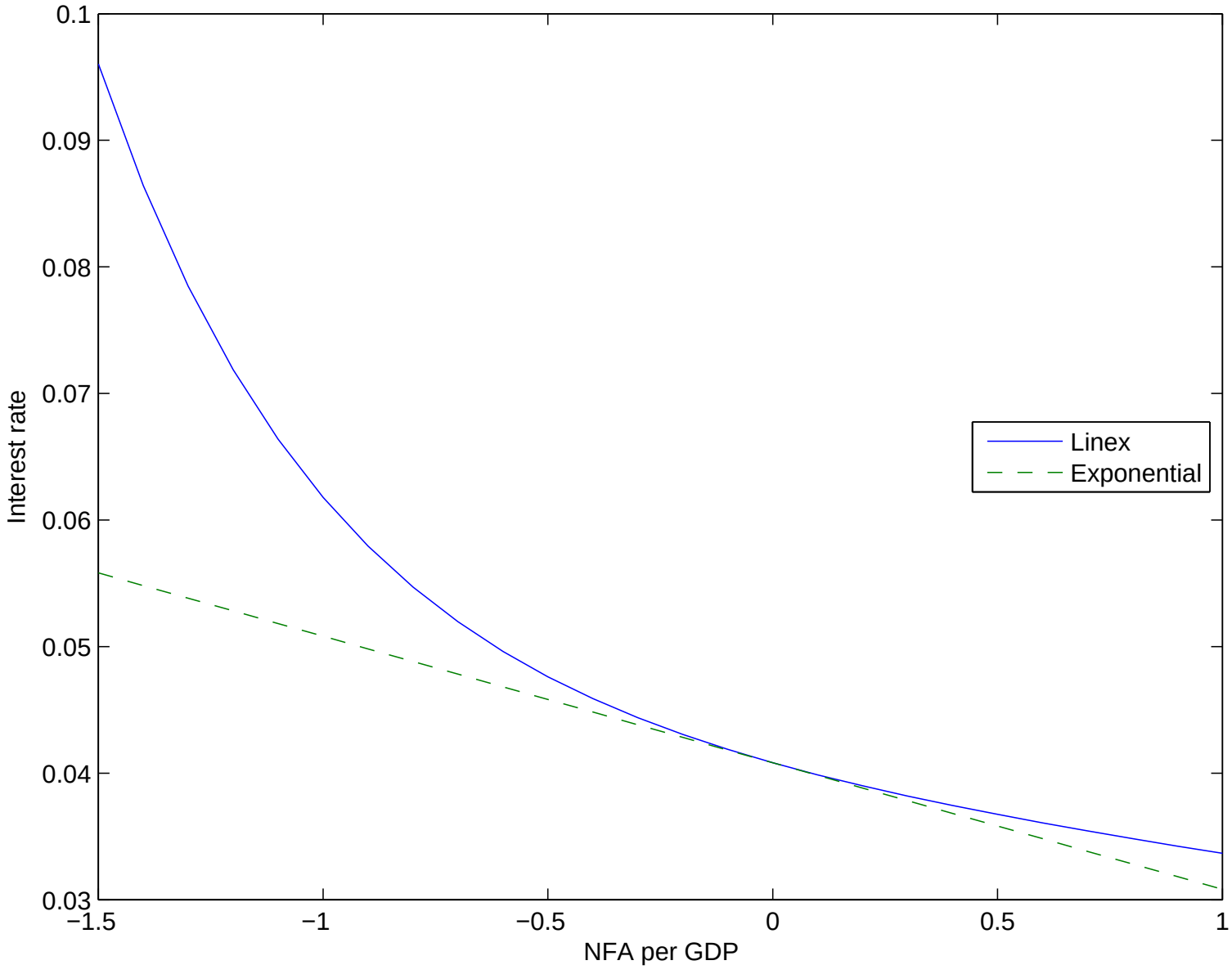
Counterfactual Results

- More flexible exchange rate
  - Employment falls less (DNWR), export sector declines less
  - Consumption drops more, because of valuation effects
- Fixed exchange rate
  - Employment falls more (DNWR), export sector declines more
  - Consumption falls less, because HH balance sheets are protected
- Lower indebtedness: in terms of employment and consumption, the more flexible regime dominates

Conclusion

- We built a simple two-sector model to quantitatively evaluate the impact of the crisis of 2008-2009 in a small open economy
- Key features are external interest premium, currency mismatch, DNWR
- Model captures stylized facts well (even quantitatively)
- We highlight the interactions between the exchange rate regime and initial indebtedness
  - Export sector and employment vs. balance sheets and consumption
  - Exchange rate policy of central bank important for tradeoff
- Many things still to be explored! Regional comparisons

Interest Premium: Linex



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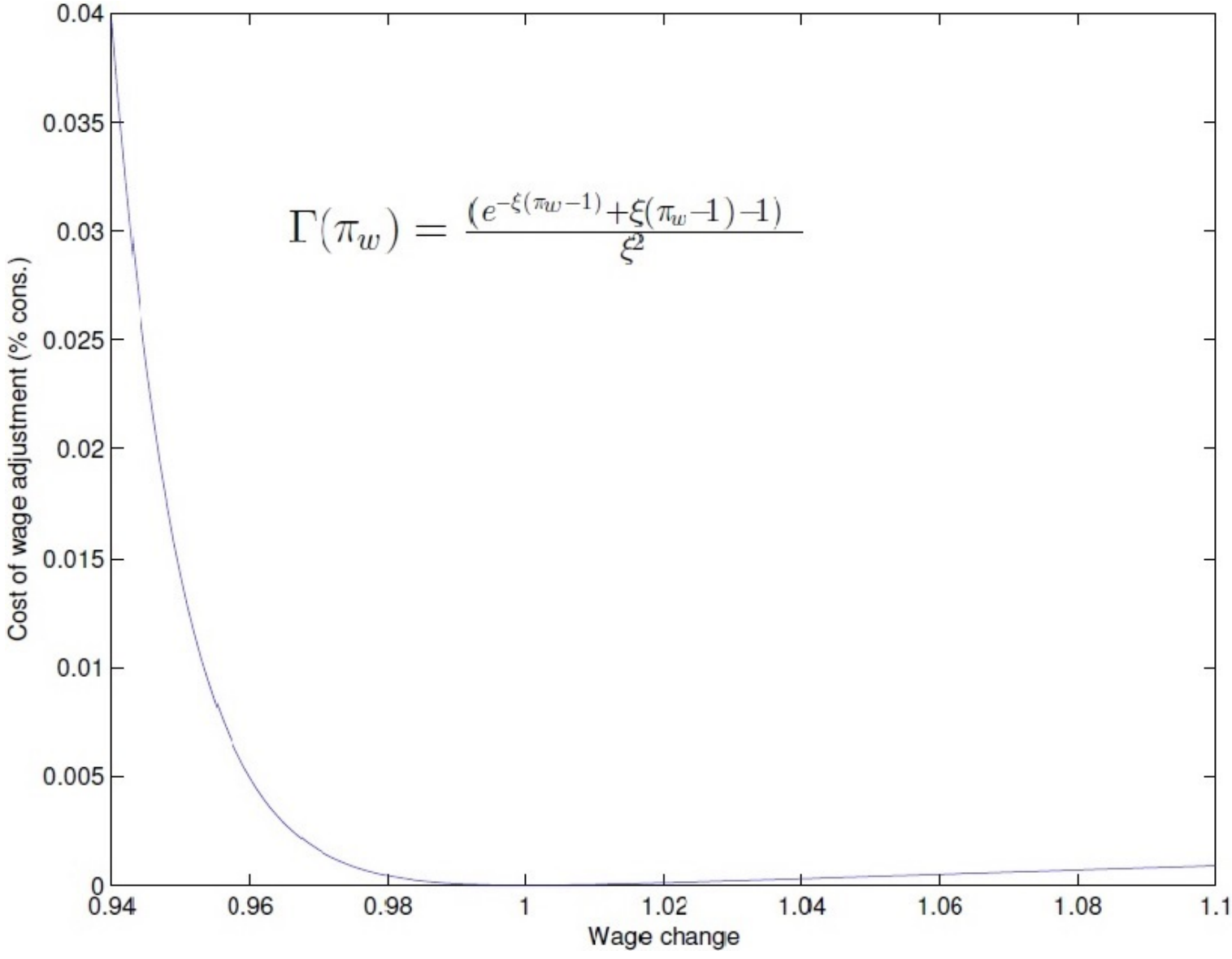
Downward Nominal Wage Rigidity



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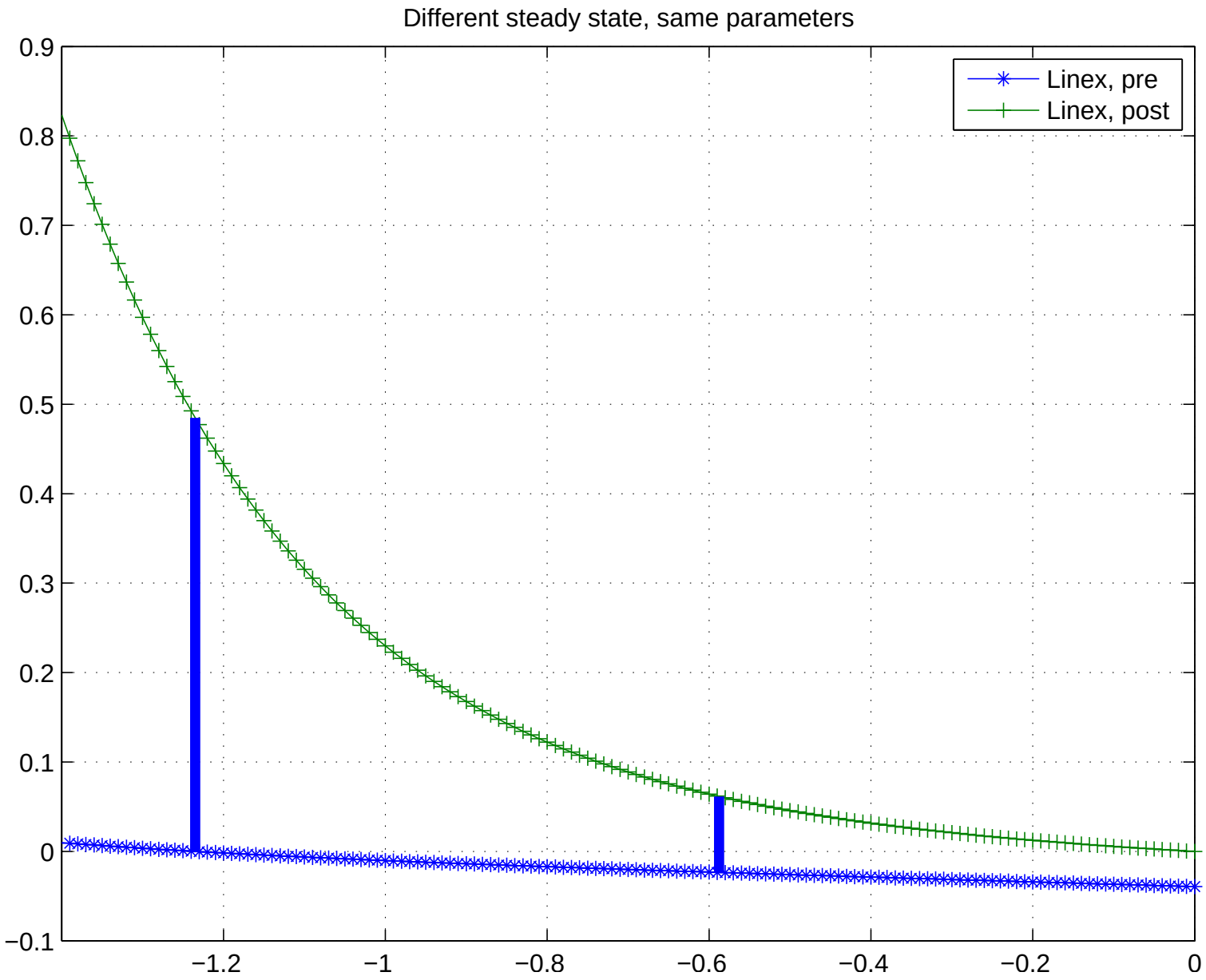
Interest Premium: Linex



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