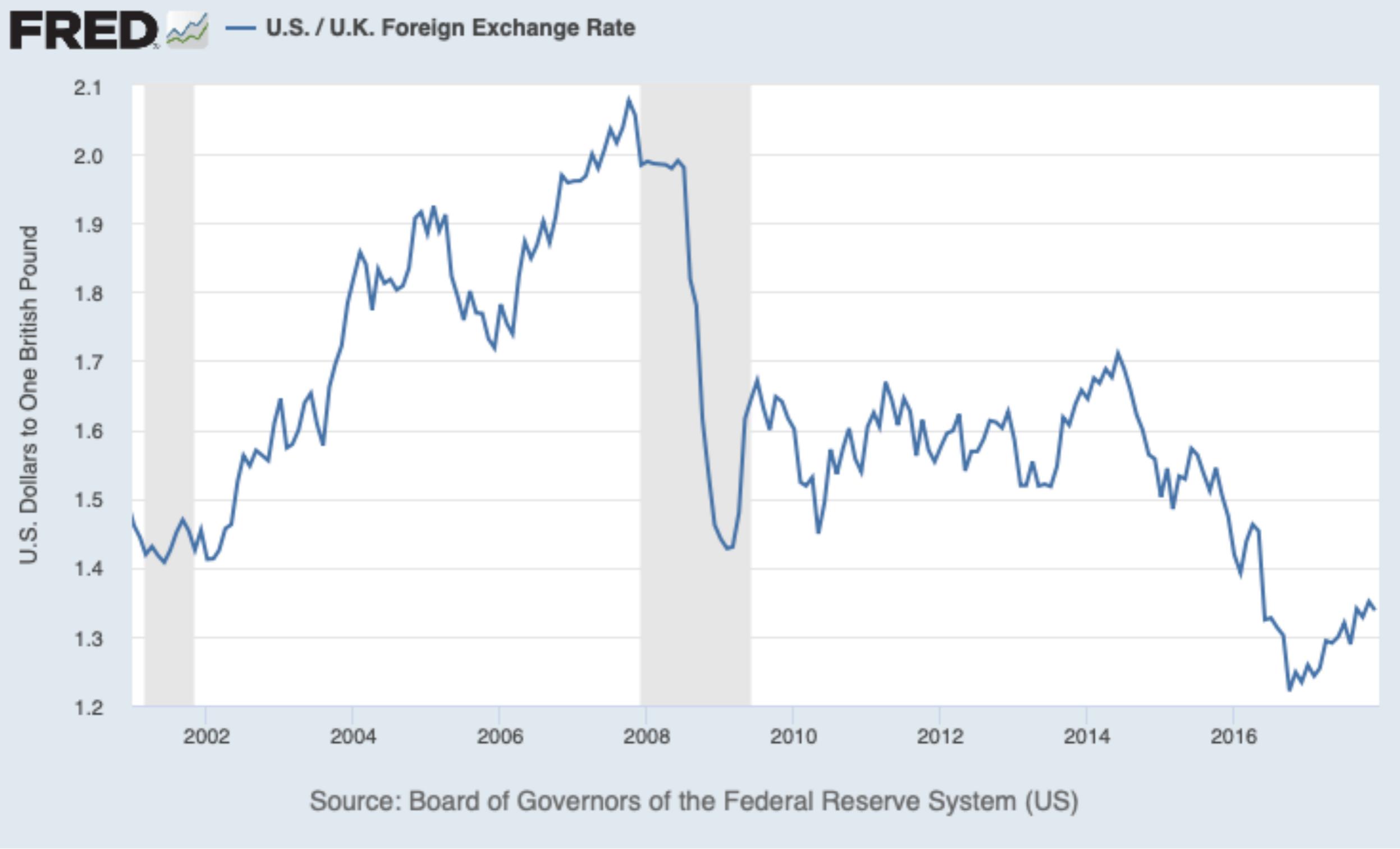


EC210 MACROECONOMIC PRINCIPLES

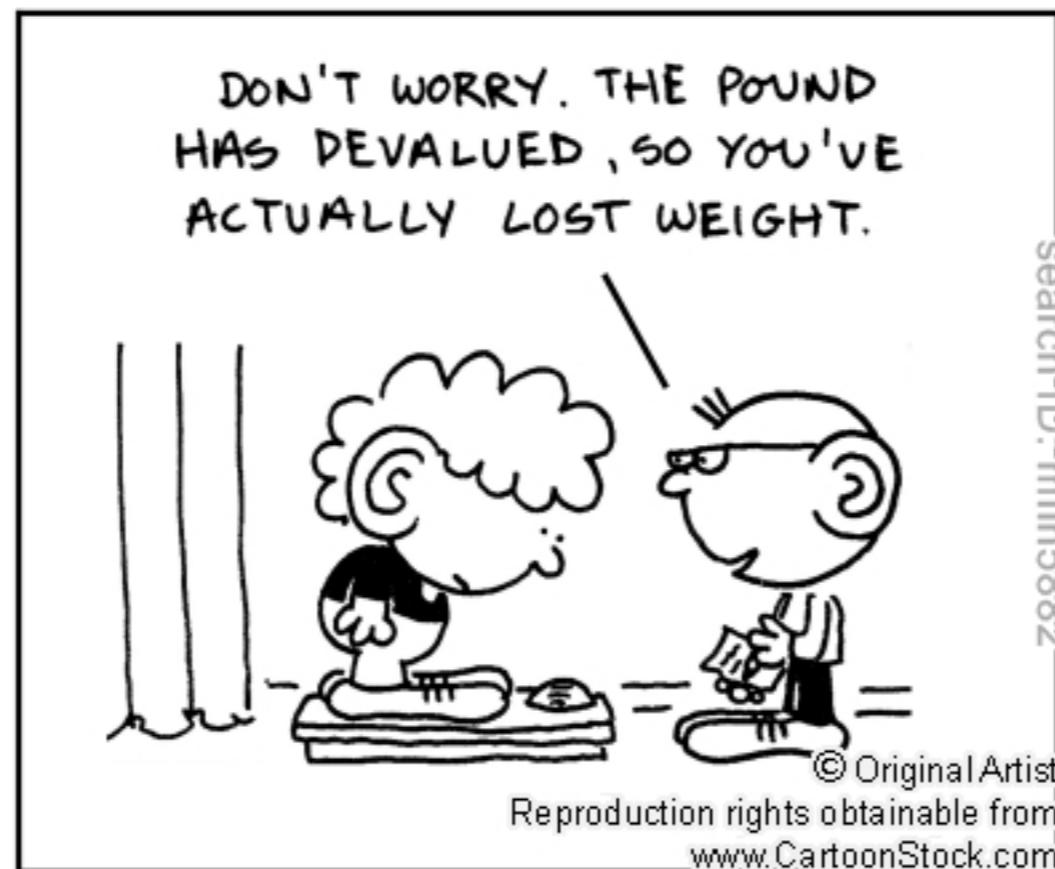
3: Exchange rates, capital flows

Professor Ricardo Reis
Department of Economics
Lent term 2020

WHY ARE EXCHANGE RATES SO VOLATILE?



Exchange rates



NOMINAL EXCHANGE RATE

- The **nominal exchange rate E** is the relative price of two currencies. How many euros must give to get one dollar.
- **Appreciation** is increase in E .
- **Depreciation** is a fall in E (like textbook).

REAL EXCHANGE RATE

- The real exchange rate ϵ is the relative price of goods of two countries. How many European baskets must give to get one American basket.



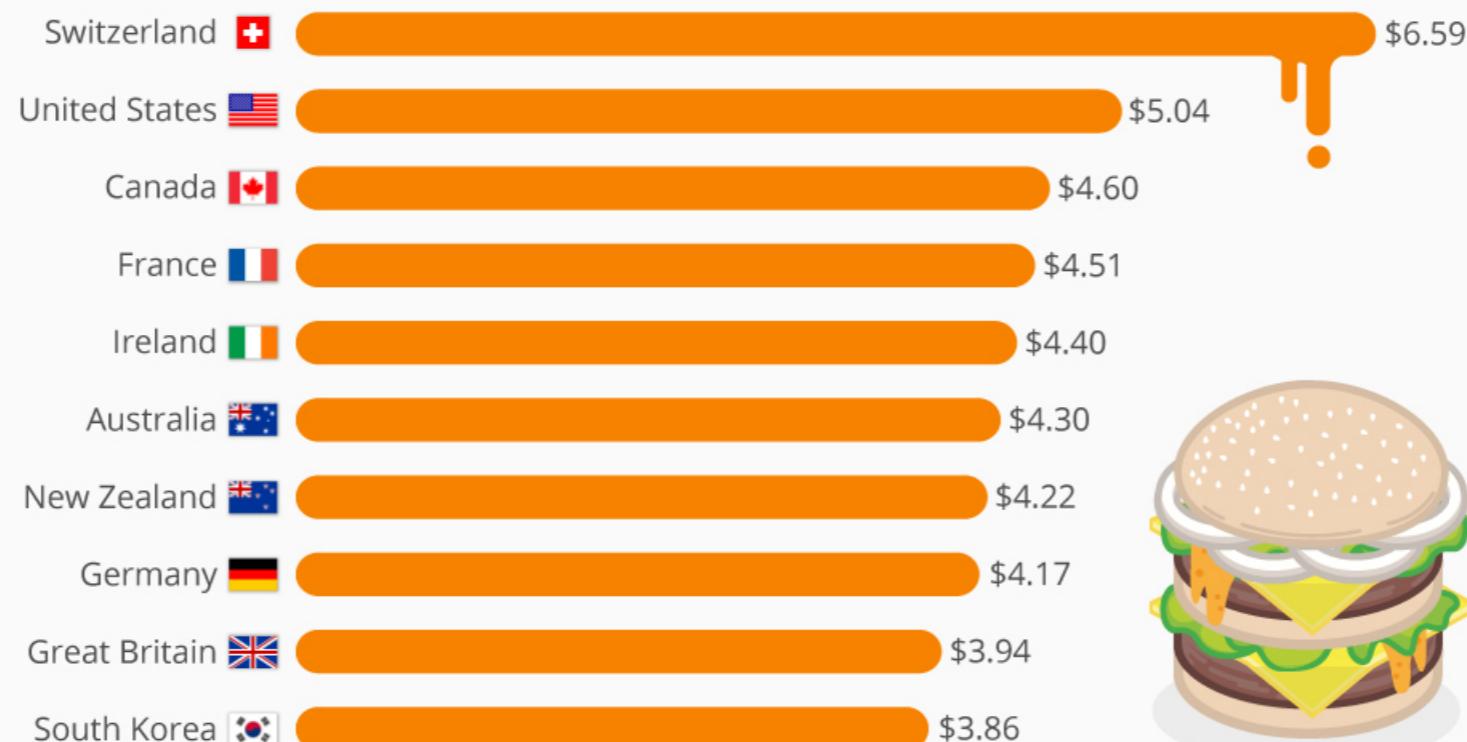
- Link from nominal to real exchange rates:

$$\epsilon = \frac{E \times P_{US}}{P_{Euro}} = \frac{EP}{P^*}$$

PPP and exchange rates

30 Years Big Mac Index

Global prices for a Big Mac in selected countries in 2016



@StatistaCharts Sources: IMF, McDonald's, Thomson Reuters, The Economist

statista

WHAT PINS DOWN ϵ ?

- **Law of One Price:** For an individual good, if there are no costs to transporting it between two locations, then it must sell for the same price.
- If p_i is the price of such good then it follows that:

$$p_i^* = E p_i$$

- **Purchasing power parity:** If LOP applies to all goods, benchmark for real exchange rate:

$$\epsilon = 1 \Rightarrow E = \frac{P^*}{P}$$

LOG($p_i^* / E p_i$)

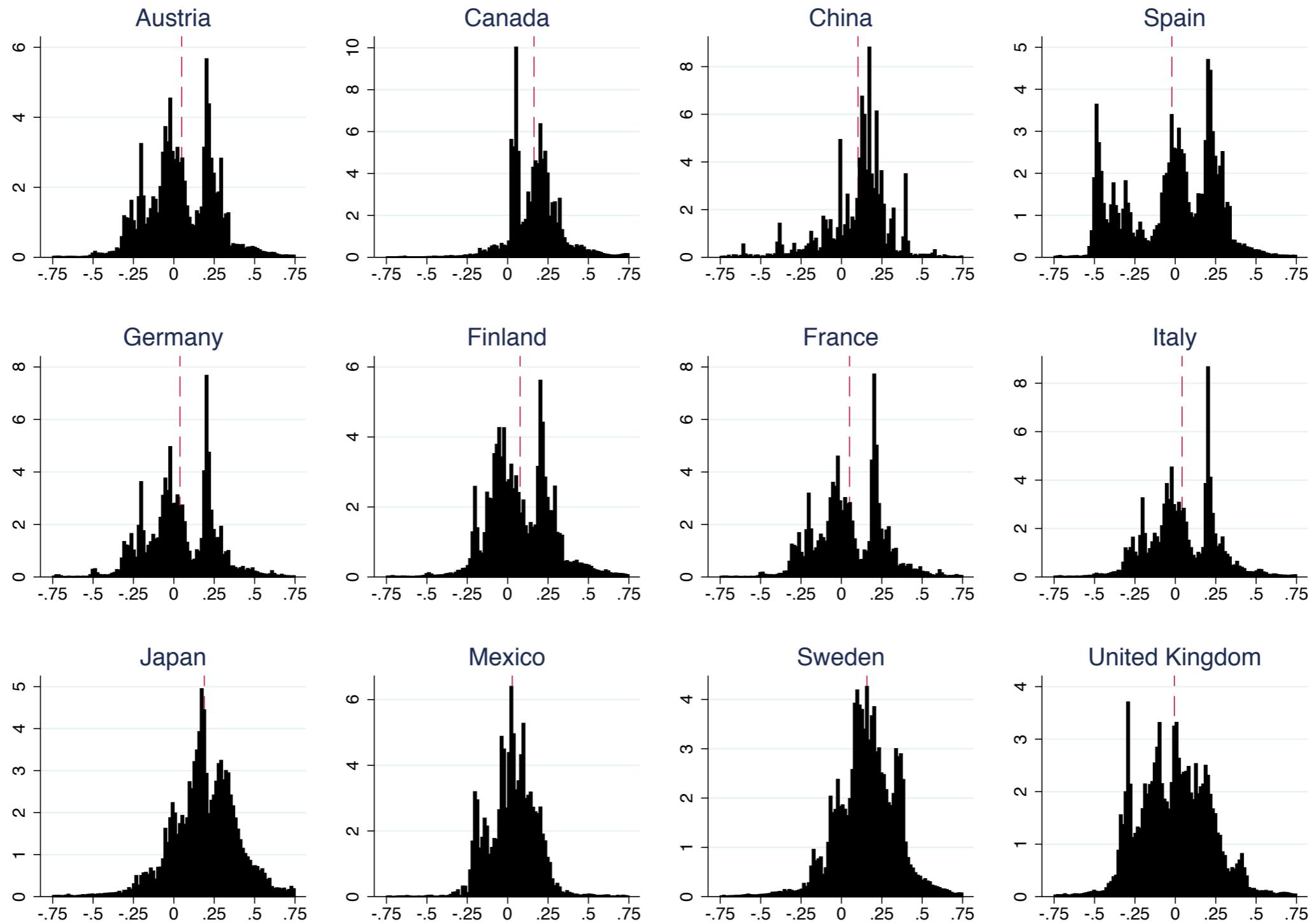
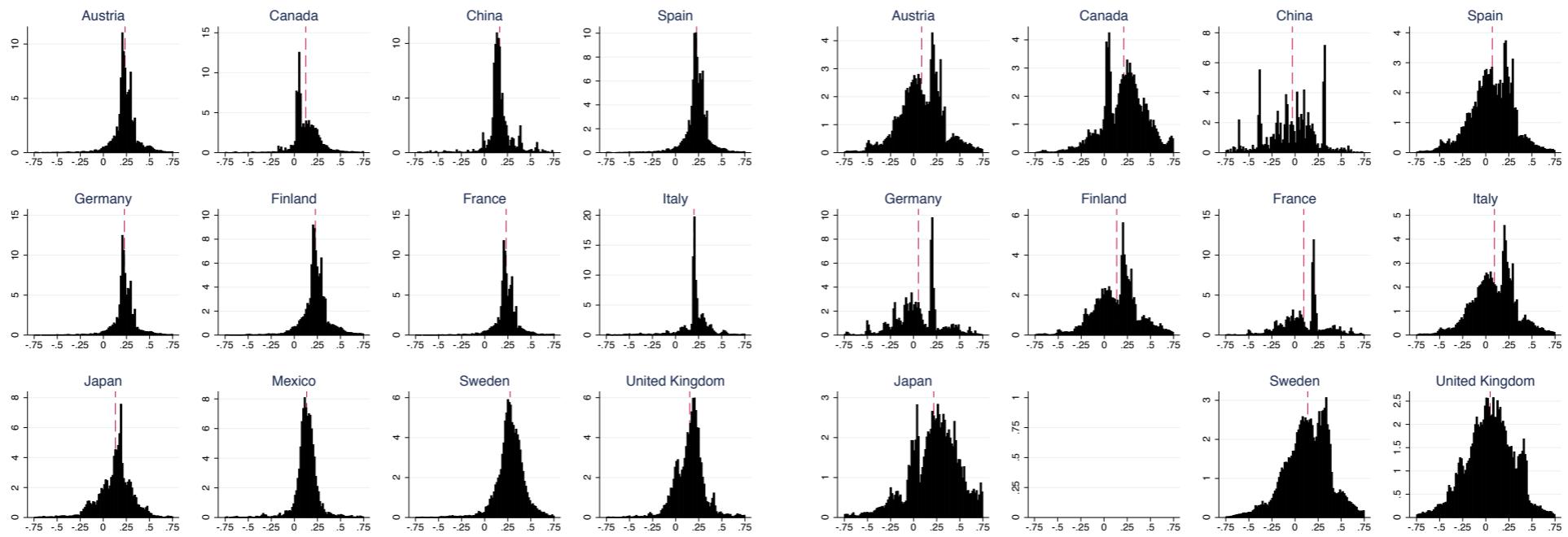


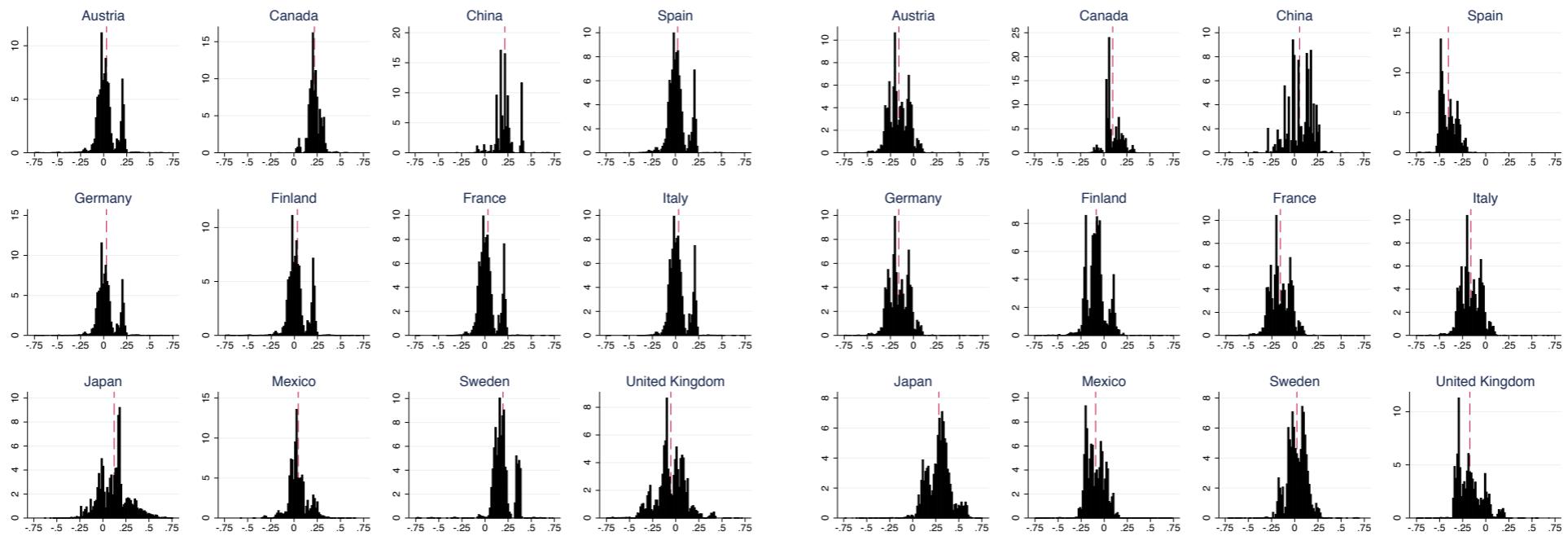
Figure 2: Good-level RERs q_{ij} for Various Countries (i) with the United States (j)

LOG($p_i^* / E p_i$)



(a) Apple

(b) IKEA



(c) H&M

(d) Zara

Figure 3: Good-level RERs q_{ij} for Various Countries (i) with the United States (j), by Store

PPP HOLDS OK IN LONG RUN

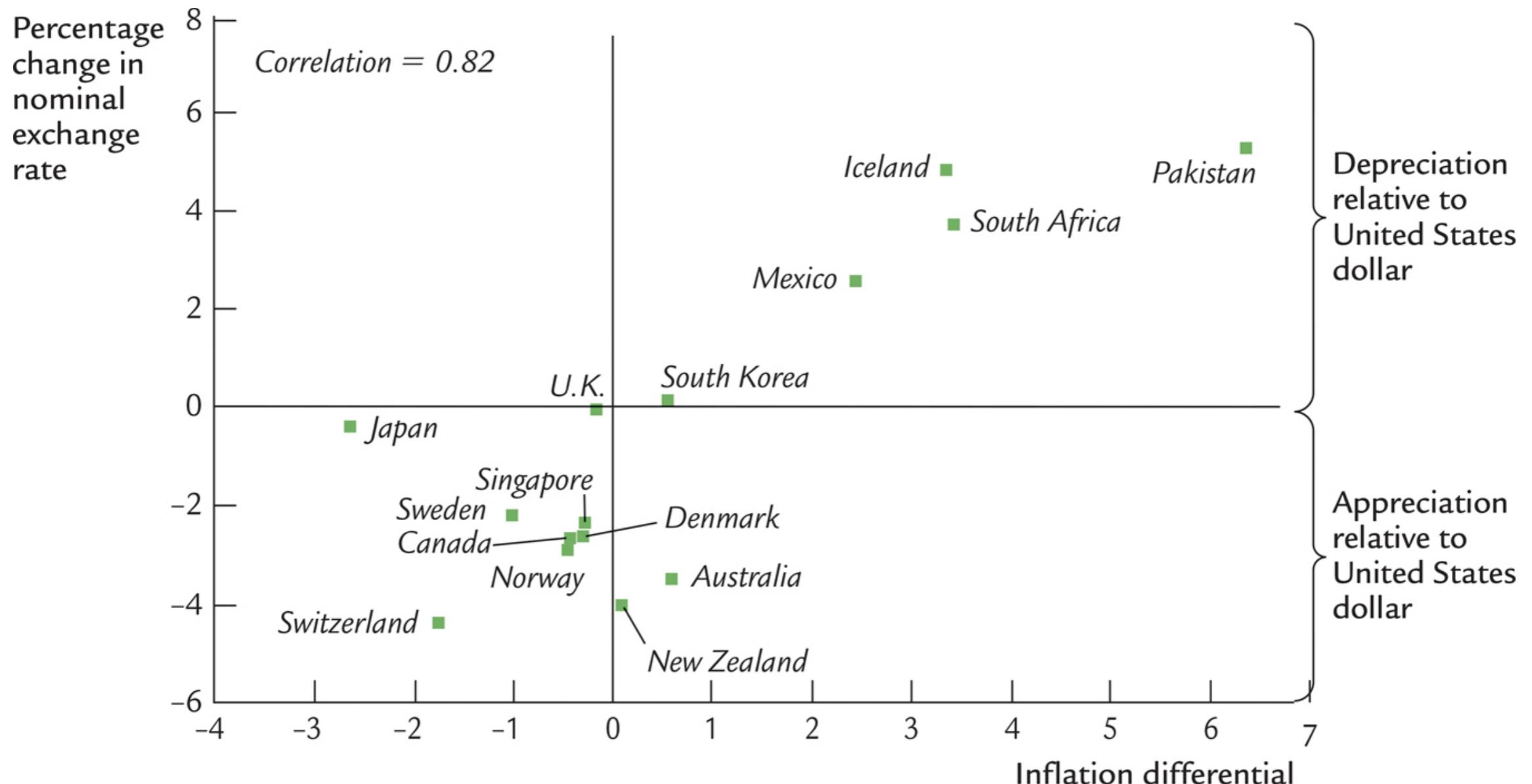


Figure 6.13 Inflation Differentials and the Exchange Rate

Mankiw: Macroeconomics, Ninth Edition

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BUT ONLY IN LONG RUN

- Reasons for violations of PPP:
 - Even LOP does not hold very well
 - The basket of goods in Europe and the US is not the same.
 - Many goods are non-traded (haircuts)
 - There are transportation costs.
 - There are barriers to trade.

WHAT PINS DOWN E?

- Using the definition of the nominal exchange rate:

$$\begin{aligned}\epsilon &= \frac{EP}{P^*} \Rightarrow E = \frac{\epsilon P^*}{P} \\ \Rightarrow \frac{\Delta E}{E} &= \frac{\Delta \epsilon}{\epsilon} + \frac{\Delta P^*}{P^*} - \frac{\Delta P}{P} \\ \Rightarrow \frac{\Delta E}{E} &= x + \pi^* - \pi\end{aligned}$$

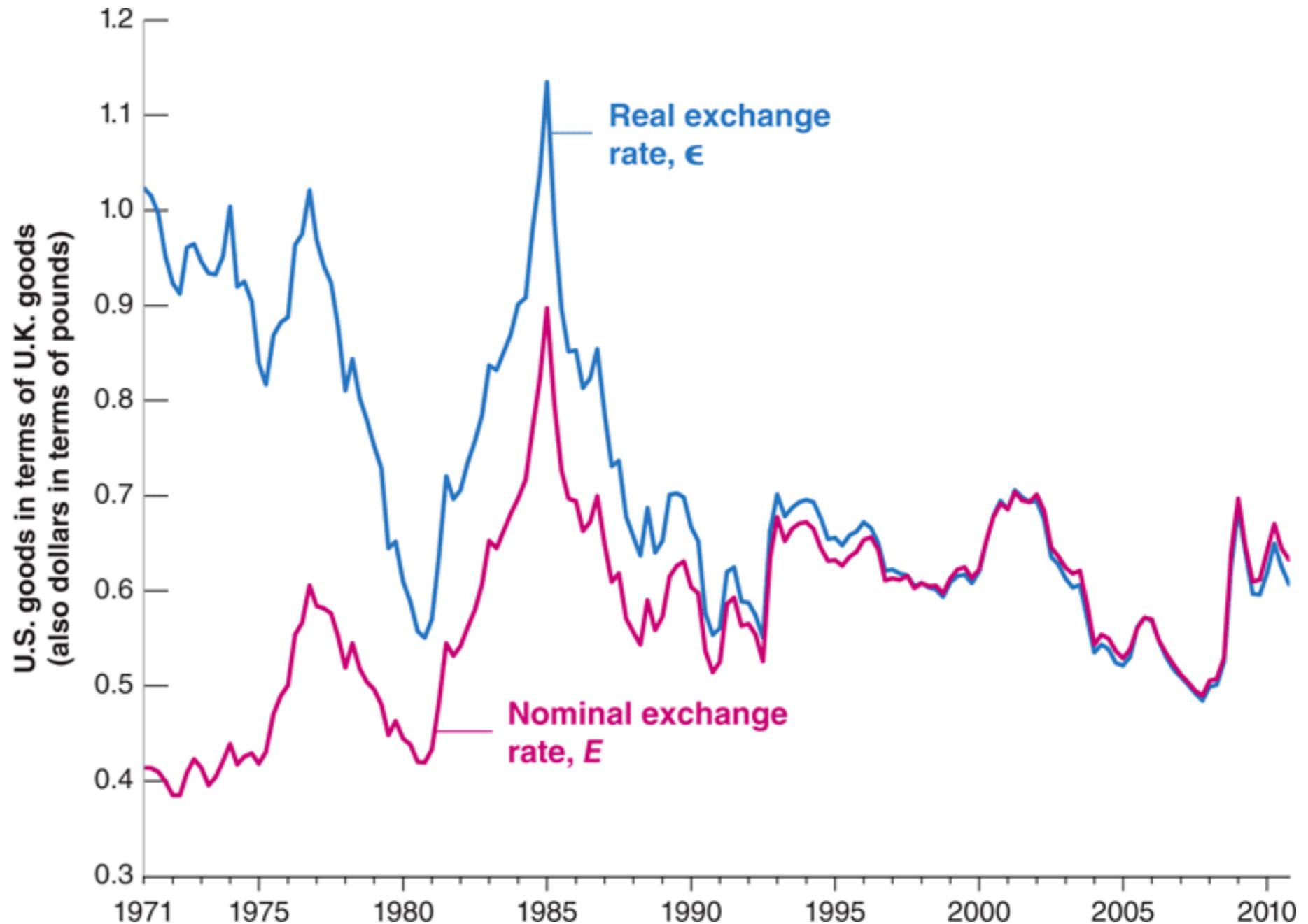
where x is the change in the real exchange rate.

- With Purchasing power parity, $x=0$, so:

$$\frac{\Delta E}{E} = \pi^* - \pi$$

ONCE SAME INFLATION, SAME

Figure 18-5 Real and Nominal Exchange Rates between the United States and the United Kingdom since 1971

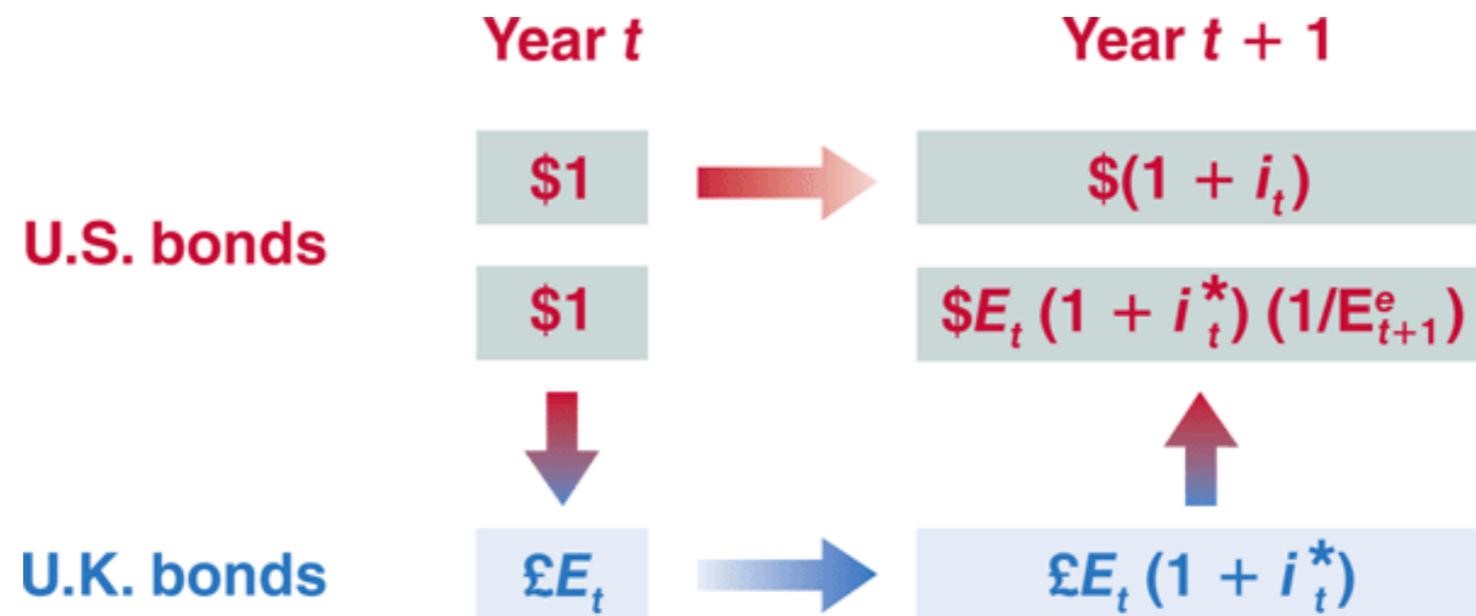


Interest parity



FREE CAPITAL FLOWS

- Investors can freely invest in euro or dollar bonds.
- **The carry-trade:** if domestic interest rates are low and foreign interest rates are high, the carry trade borrows in dollars and invests in Euros.



NO ARBITRAGE

- On average should make no gain, return on both investments must be the same:

$$1 + i_t = (1 + i_t^*) \left(\frac{E_t}{E_{t+1}^e} \right)$$

- Approximation

$$i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t}$$

- From investor's perspective, if buy currency today, question is whether it is **expected to appreciate**, that is whether:

$$(\Delta E/E)^e = \frac{E_{t+1}^e - E_t}{E_t}$$

is positive.

NO ARBITRAGE

- Confusion: if E falls today temporarily with future E the same, then today **it depreciated and is expected to appreciate**.

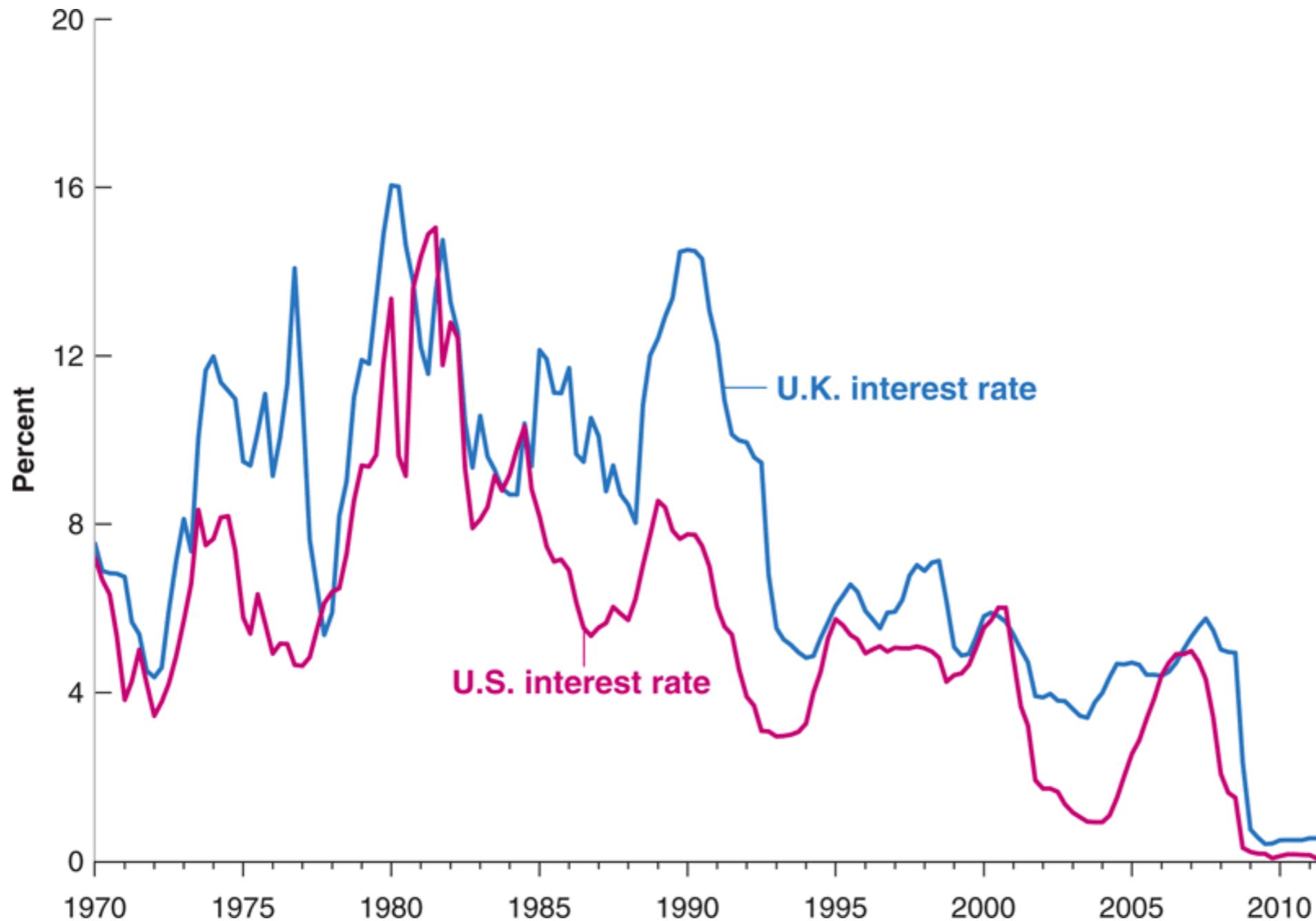
$$(\Delta E/E)^e = \frac{E_{t+1}^e - E_t}{E_t}$$

- **Theory of exchange rates:** expect appreciation if foreign interest rate above domestic interest rate

$$(\Delta E/E)^e = i_t^* - i_t$$

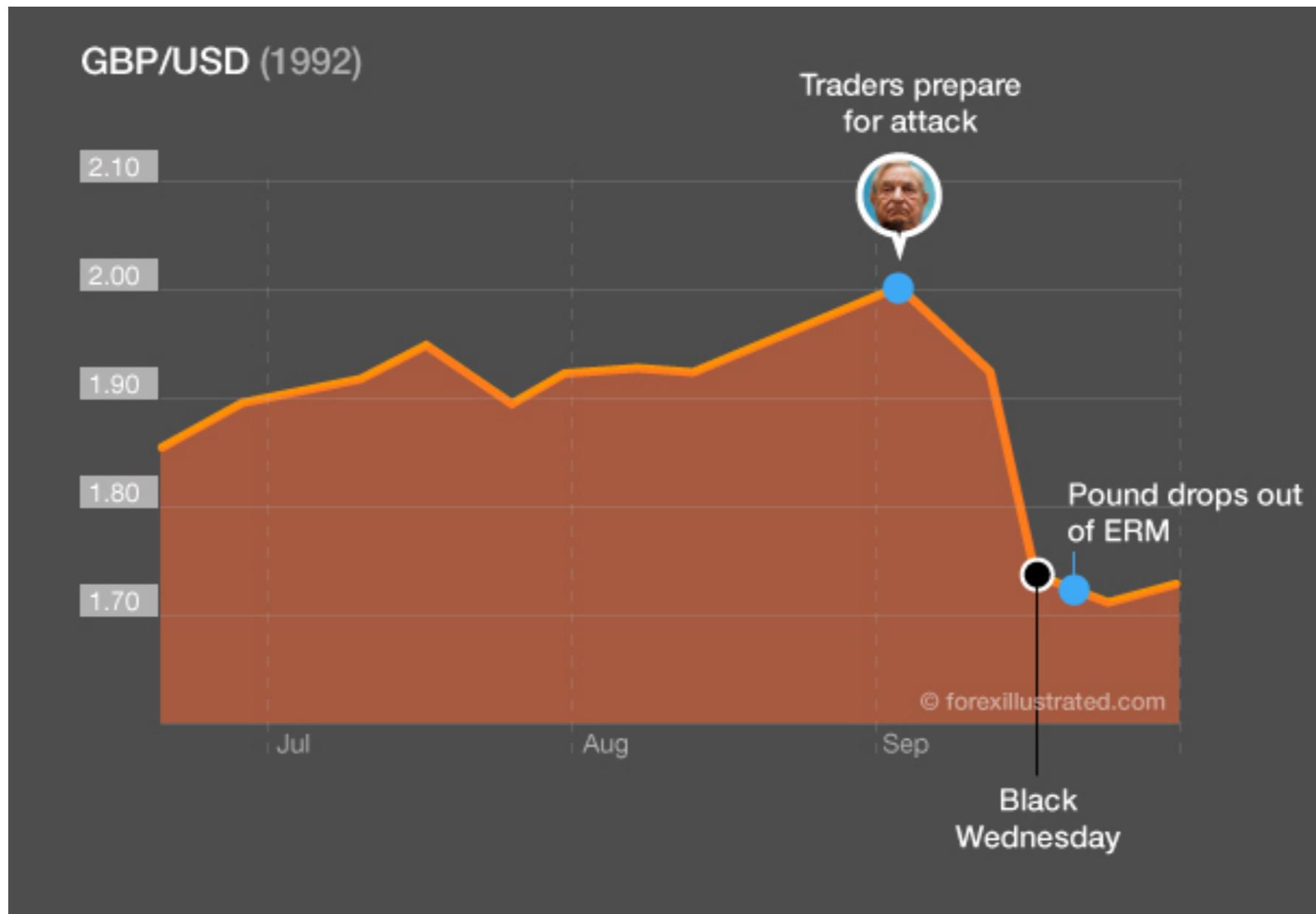
IN DATA

Figure 18-8 Three-Month Nominal Interest Rates in the United States and in the United Kingdom since 1970



Source: U.S. 3-Month Treasury Bill Rate Series DTB3(1); Federal Reserve Economic Data (FRED) <http://research.stlouisfed.org/fred2/>; U.K. 3-Month Treasury Bill Rate Series IUQAAJNB, Bank of England Web site.

Currency pegs



EXCHANGE RATE VOLATILITY

- Re-write interest parity condition

$$1 + i_t = (1 + i_t^*) \left(\frac{E_t}{E_{t+1}^e} \right) \Rightarrow E_t = \left(\frac{1 + i_t}{1 + i_t^*} \right) E_{t+1}^e$$

- Write it forward N times

$$\begin{aligned} E_t &= \left(\frac{1 + i_t}{1 + i_t^*} \right) E_{t+1}^e = \\ &= \left(\frac{1 + i_t}{1 + i_t^*} \right) \left(\frac{1 + i_{t+1}^e}{1 + i_{t+1}^{e*}} \right) E_{t+2}^e \\ &= \left(\frac{1 + i_t}{1 + i_t^*} \right) \cdots \left(\frac{1 + i_{t+N}^e}{1 + i_{t+N}^{e*}} \right) E_{t+N+1}^e \end{aligned}$$

EXCHANGE RATE VOLATILITY

$$E_t = \left(\frac{1 + i_t}{1 + i_t^*} \right) \cdots \left(\frac{1 + i_{t+N}^e}{1 + i_{t+N}^{e*}} \right) E_{t+N+1}^e$$

- Current exchange rate varies with:
 - future interest rates in both countries at far-away horizons;
 - proportionally with future exchange rate, and so real exchange rate as well;
 - expectations changes on these.
- Usually **extremely** volatile.

FIX EXCHANGE RATES

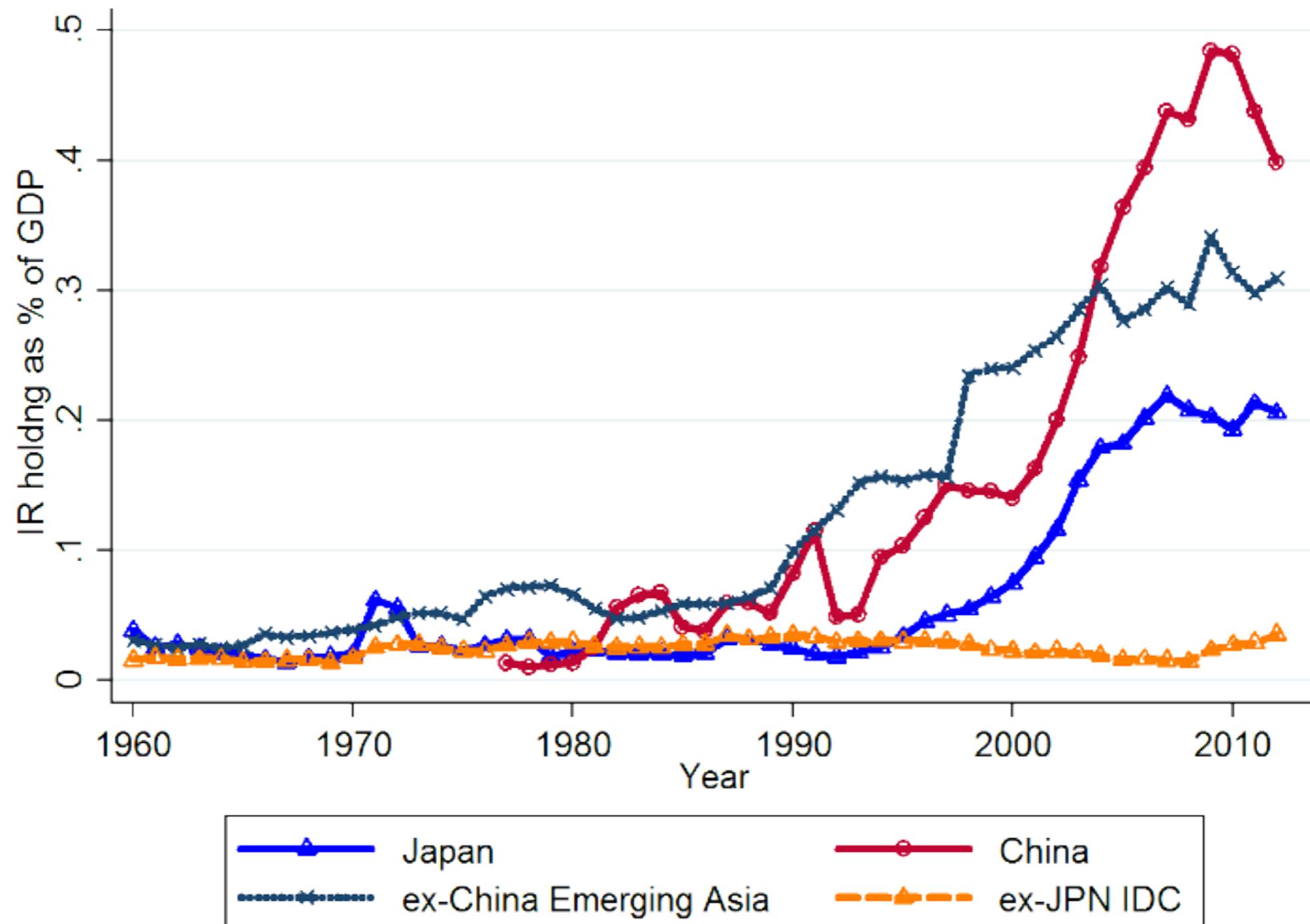
Attraction:

1. Promote trade by removing exchange rate variability
2. Commit publicly to an inflation target equal to the other countries' inflation.

How to implement it?

- If exchange rate higher than desired: lower interest rates, print money and buy foreign currency with it.
- If lower than desired: raise interest rates, sell foreign currency to lower money growth.
- Need reserves of foreign currency to do it.

WORLD RESERVES OF CURRENCY



This is expensive: insurance premium.

Currency unions and the trilemma



Rip Matteson The New Yorker Collection/
The Cartoon Bank

“How about Nebraska? The dollar’s still strong in Nebraska.”

PAIN OF PEGS

- If overvalued, trying to **stop depreciation**, can run out of international currency reserves to sell.
- **Floats** happen before, rather let the peg go to be able to cut nominal interest rates.
- To prevent them: same currency, same central bank, no foreign reserves, no individual central banks. Fix exchange rates forever and share a common monetary policy.
- **The euro**: improve trade and competition in Europe. Politically forge a European identity.

EFFECTIVENESS OF CURRENCY UNION

Recall the law of one price. In a currency union?

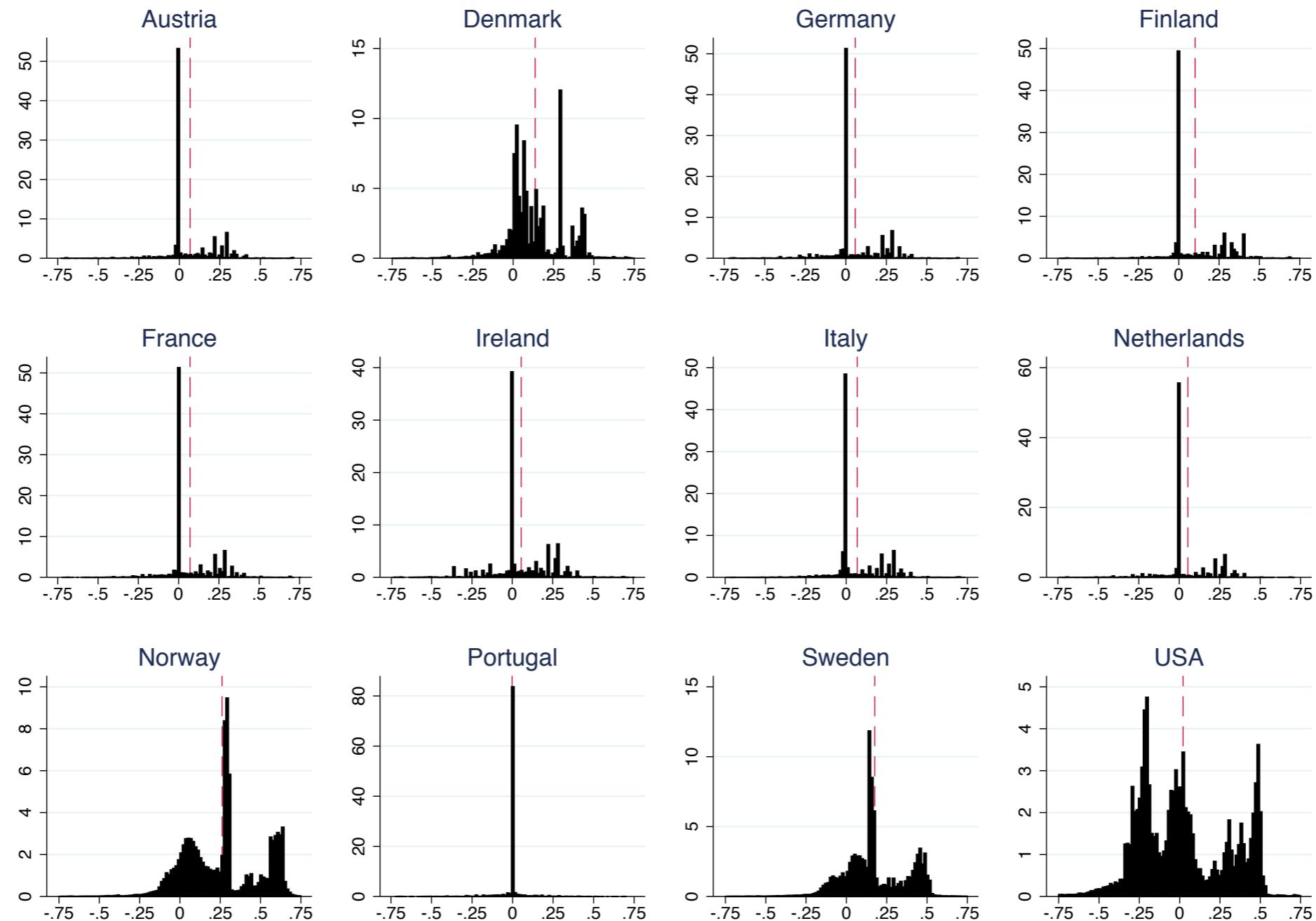


Figure 4: Good-level RERs q_{ij} for Various Countries (i) with Spain (j)

LATVIA IN THE EUROZONE

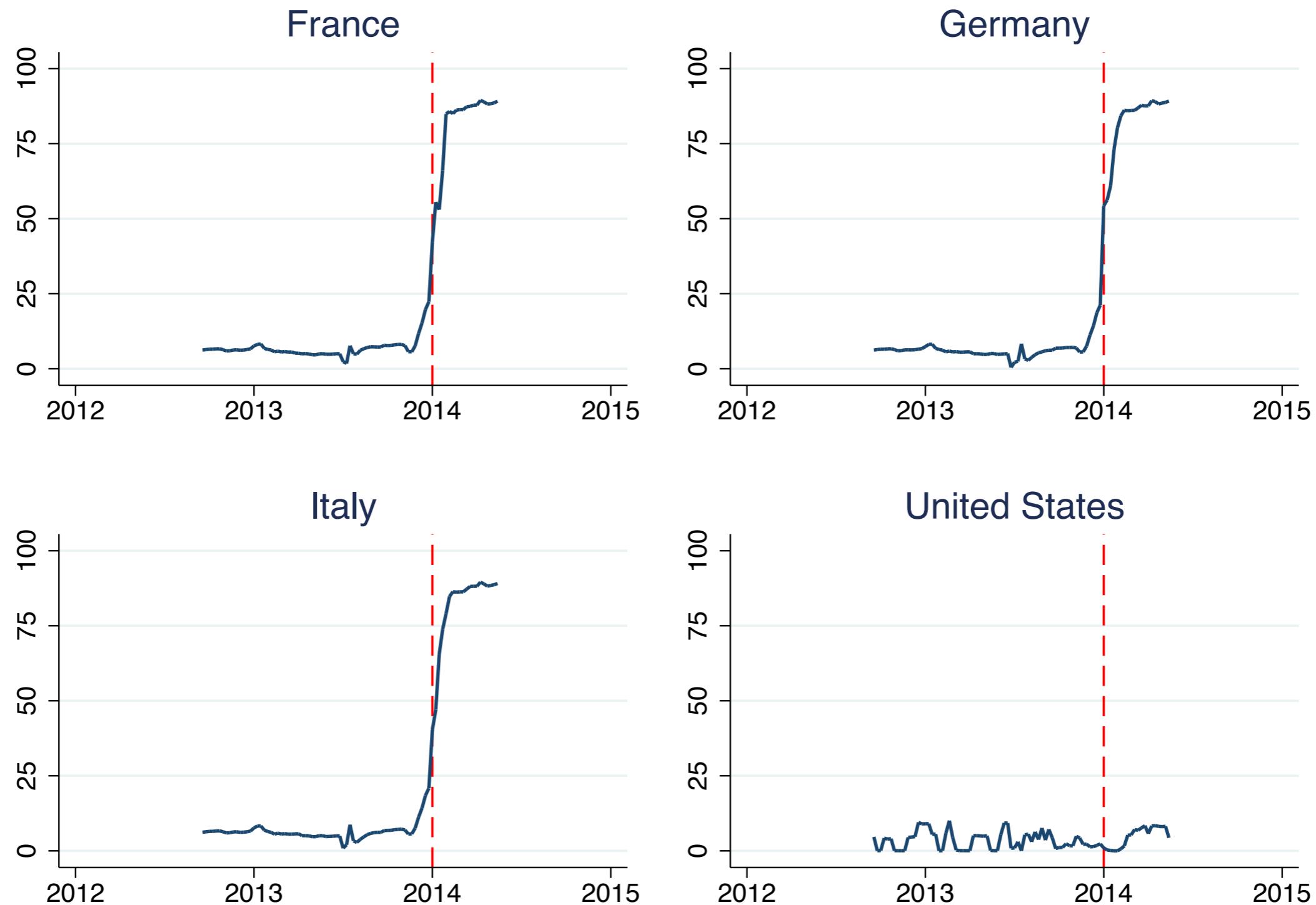


Figure 3: Share of Goods With Same Relative Price (Defined as $|q_{ij}| < 0.01$) for Selected Bilateral Pairs with Latvia

THE TRILEMMA

Can only have two of the following three:

- Free capital flows
- Independent monetary policy
- Fixed nominal exchange rates

$$\Delta E/E = x + \pi^* - \pi$$

$$(\Delta E/E)^e = i_t^* - i_t$$

Do you want to live with:

- exchange-rate volatility,
- no use of your monetary policy, or
- capital controls?

THE TRILEMMA

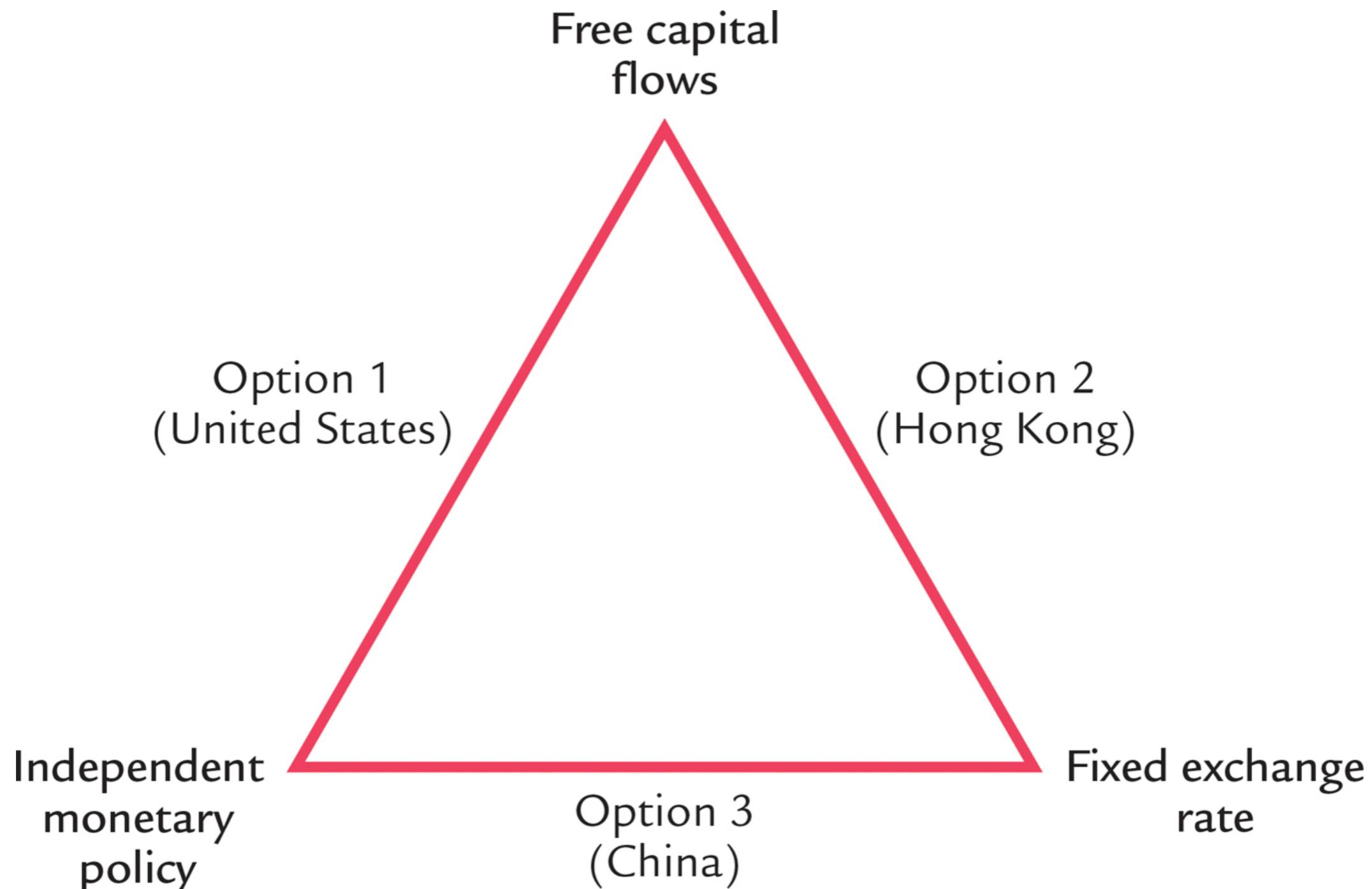
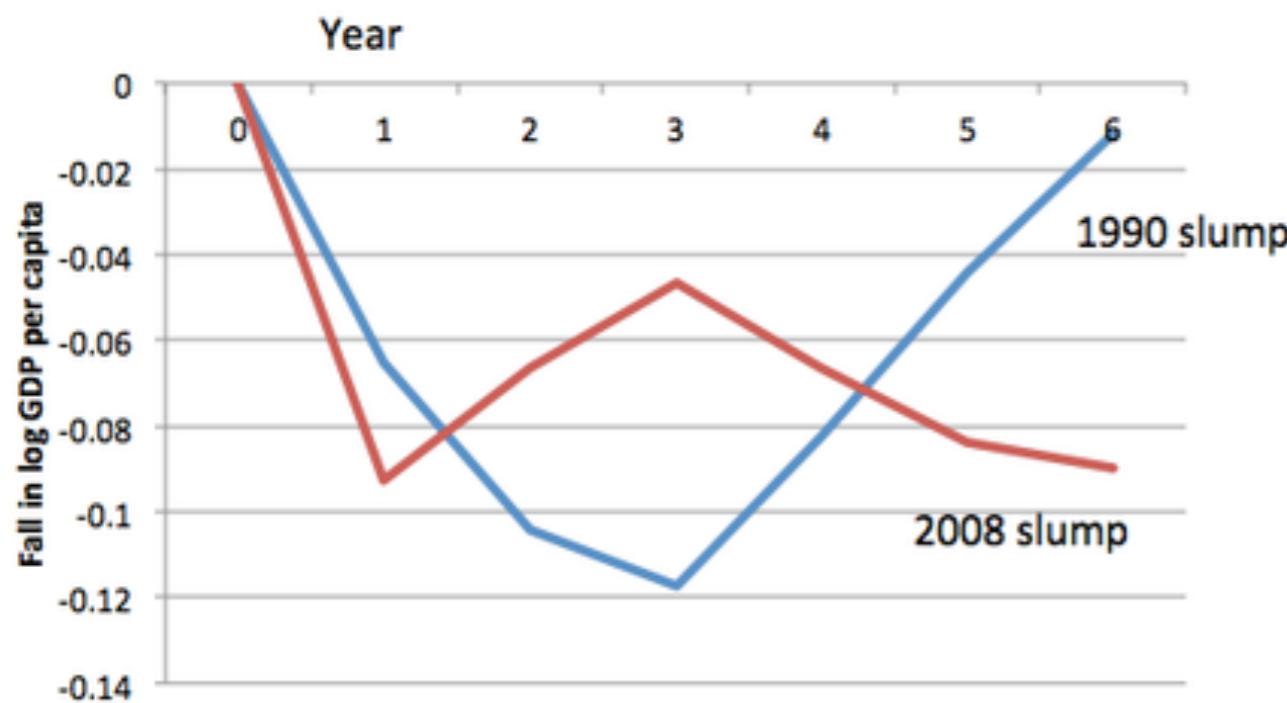


Figure 13.12 The Impossible Trinity
Mankiw: Macroeconomics, Ninth Edition
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DEBATE: ASYMMETRIC SHOCKS

Finland, net exports took big hit from Russia embargo and Nokia's demise. Real exchange rate needs to depreciate. But prices don't move fast, can't use nominal exchange rate to speed adjustment.



The euro bonanza



INTEREST RATES AND RISKS

- Uncovered interest parity with default: with probability d_t , the domestic bond does not pay at all, defaults. Equating expected returns:

$$d_t \times 0 + (1 - d_t)(1 + i_t) = (1 + i_t^*) \left(\frac{E_t}{E_{t+1}^e} \right)$$

$$\Rightarrow \frac{1 + i_t}{1 + i_t^*} = \frac{1}{1 - d_t} \left(\frac{E_t}{E_{t+1}^e} \right)$$

$$\Rightarrow i - i^* \approx d - (\Delta E/E)^e$$

- Spread on interest rates depends on both **default risk** as well as on the exchange rate risk.

EURO ELIMINATED E-RISK

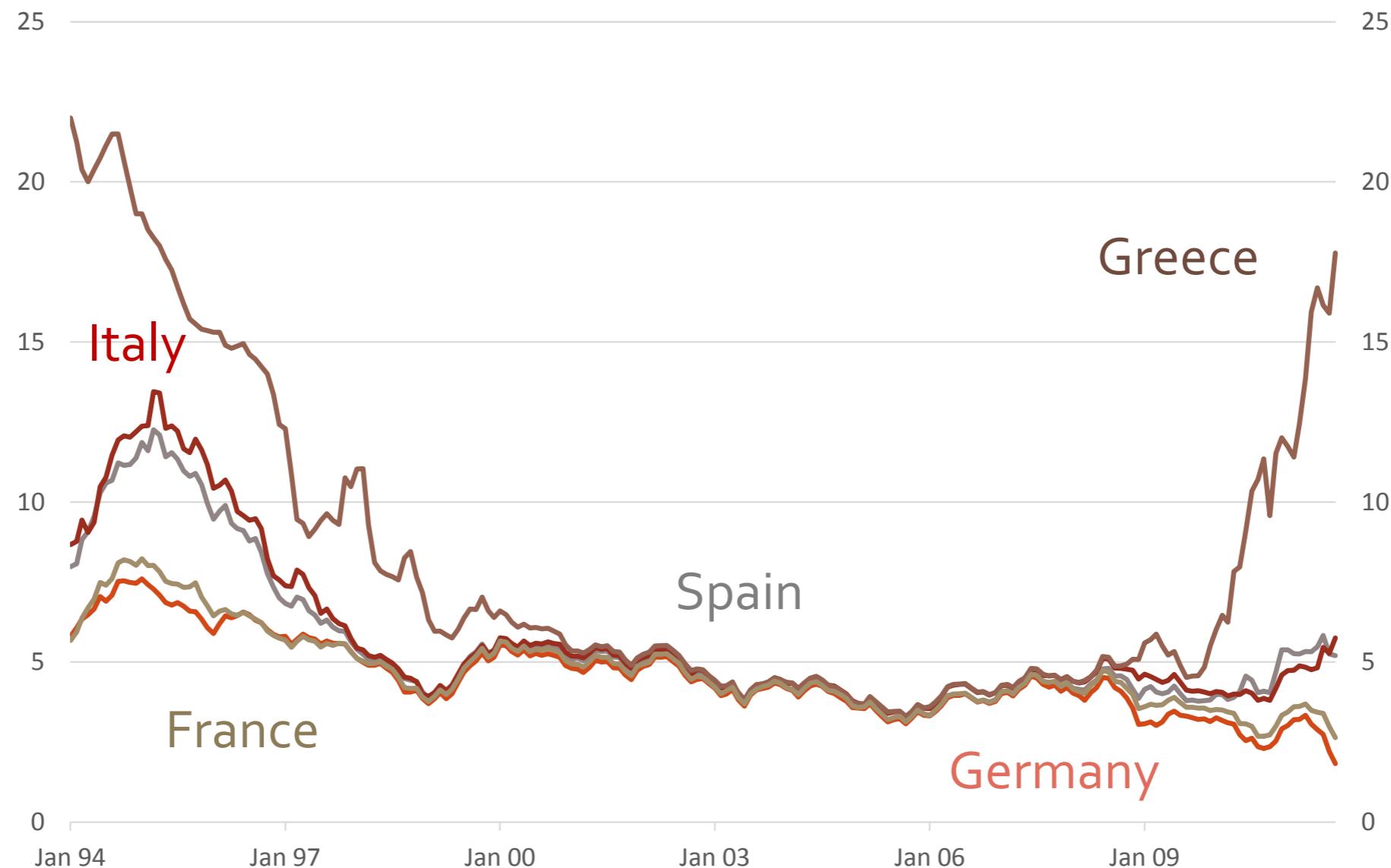
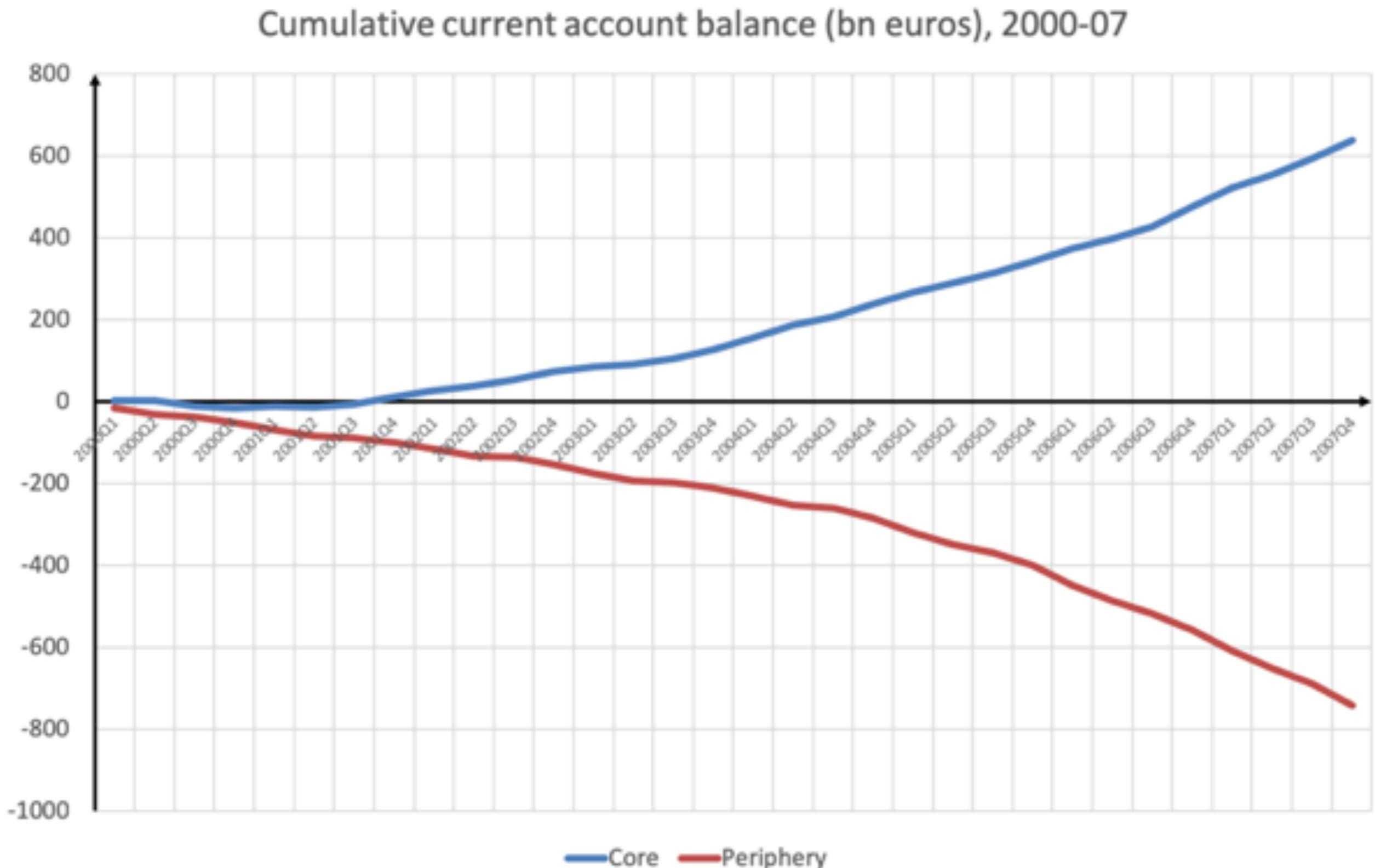


Figure 1: Sovereign yields, from 1995 to 2013. Source: EuroStat

Investors seemed to think default risk was zero!

CAPITAL FLOWS CORE-PERIPHERY



Misallocation between sectors



"IF WE AGREE TO FINANCE YOUR ARMY WILL YOU
PROMISE NOT TO ATTACK THE BANK?"

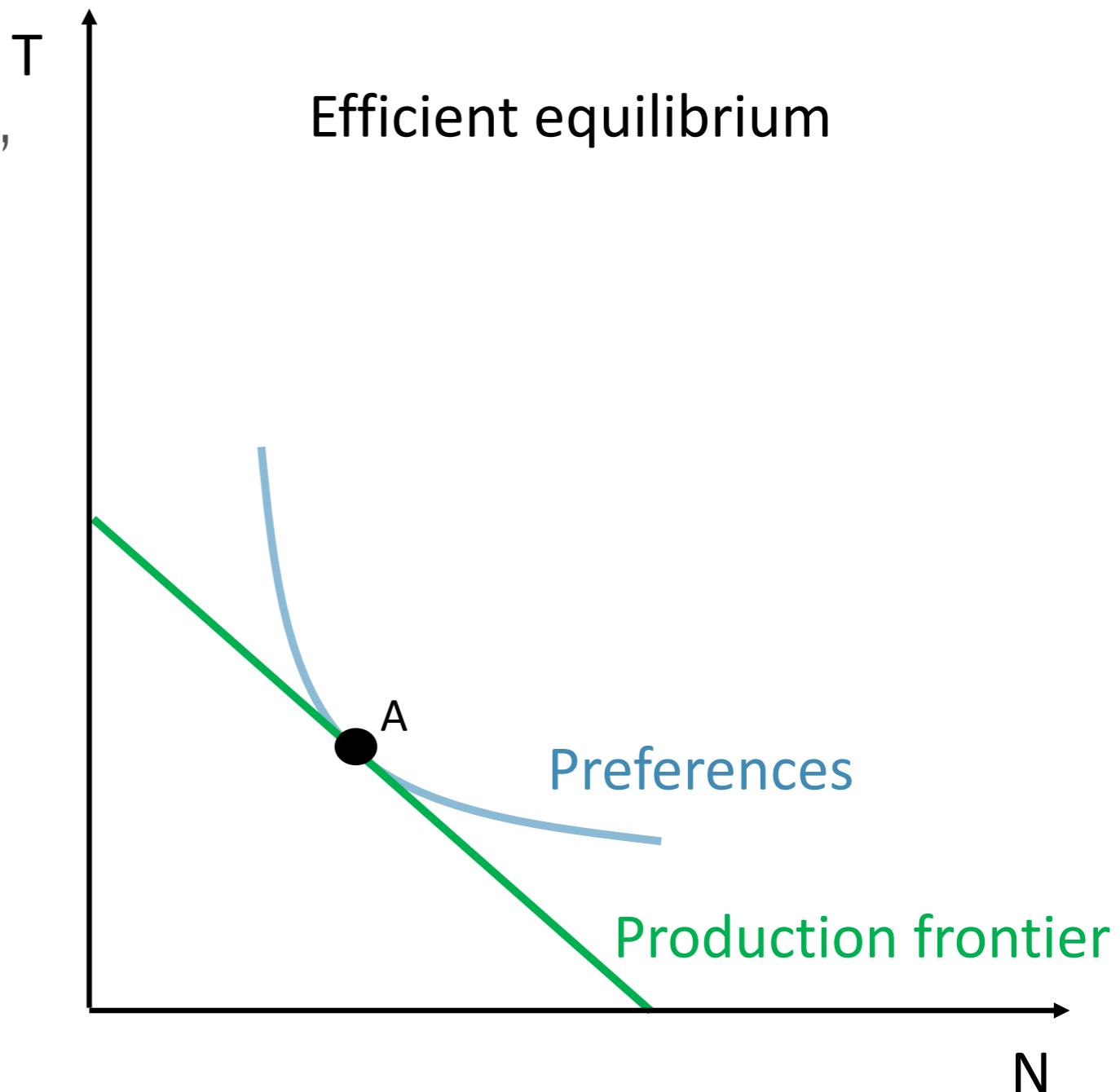
ALLOCATING CAPITAL BETWEEN

Sector T

- Produces goods that are traded in international markets, subject to fierce competition
- E.g., manufacturing

Sector N

- Produces goods for the domestic market, protected from foreign competition by natural and political barriers
- E.g., construction and real estate



MISALLOCATION SOURCES

Politics

- Sector N protected by local politicians
- Given lack of competition can form local cartels
- Coordinate political contributions

Finance

- Sector N favoured by local bankers
- In construction collateral is available and is easy to price.
- Large construction companies often have important shareholder stakes in local banks

Rents

- Favouring sector N creates rents.
- Effort and resources are diverted to capture these rents
- Directly lowers the economy's resources.

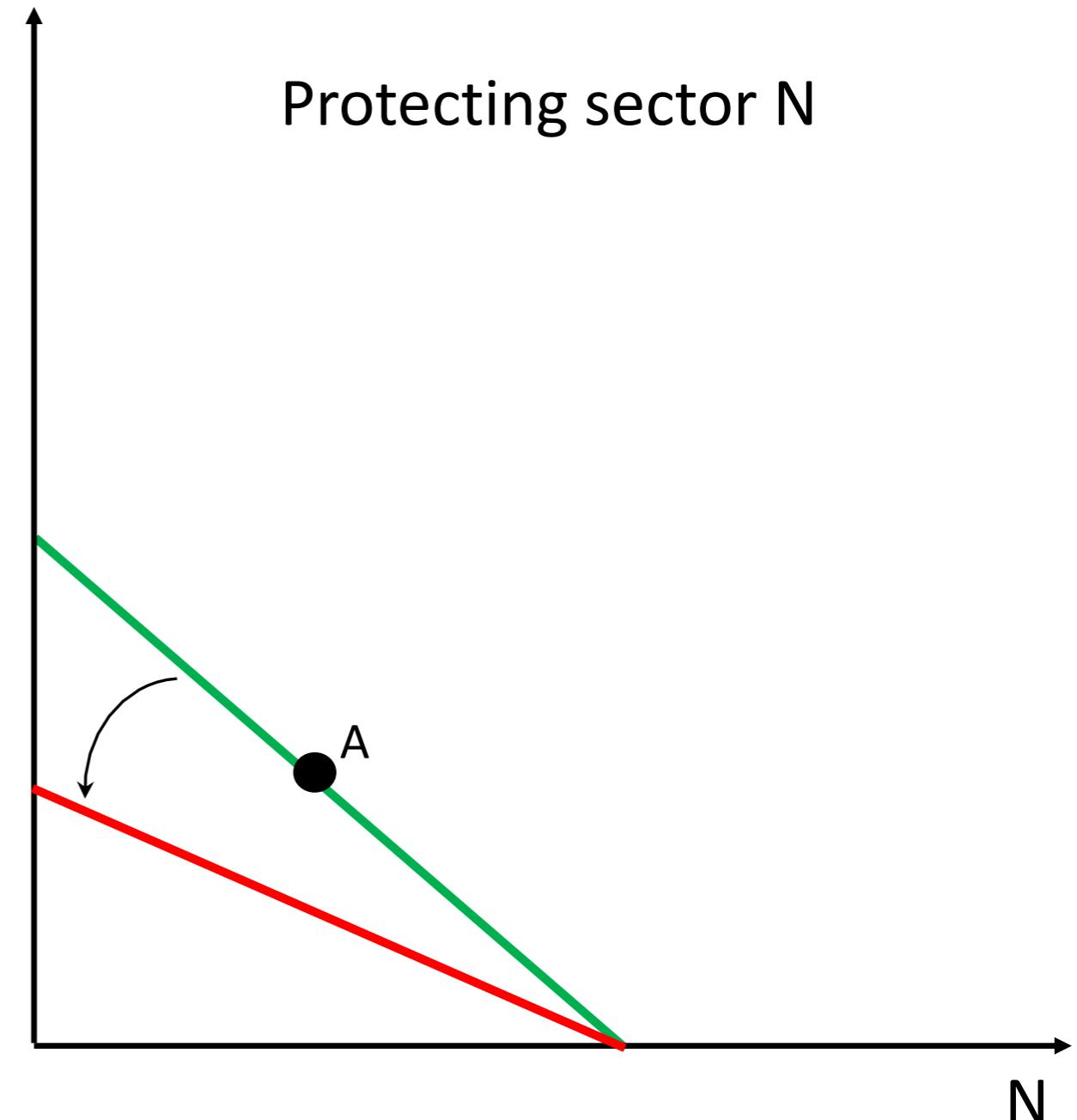
BACK TO MODEL

Favoring N:

- Illustrated as a **tax** on sector T over their output leading to a lower marginal product of capital
- The production frontier is now **flatter** since diverting one unit of capital from N to T gives a lower return

Rent

- Production function **shifts in**
- For simplicity, assume all of the taxes on T is lost this way.

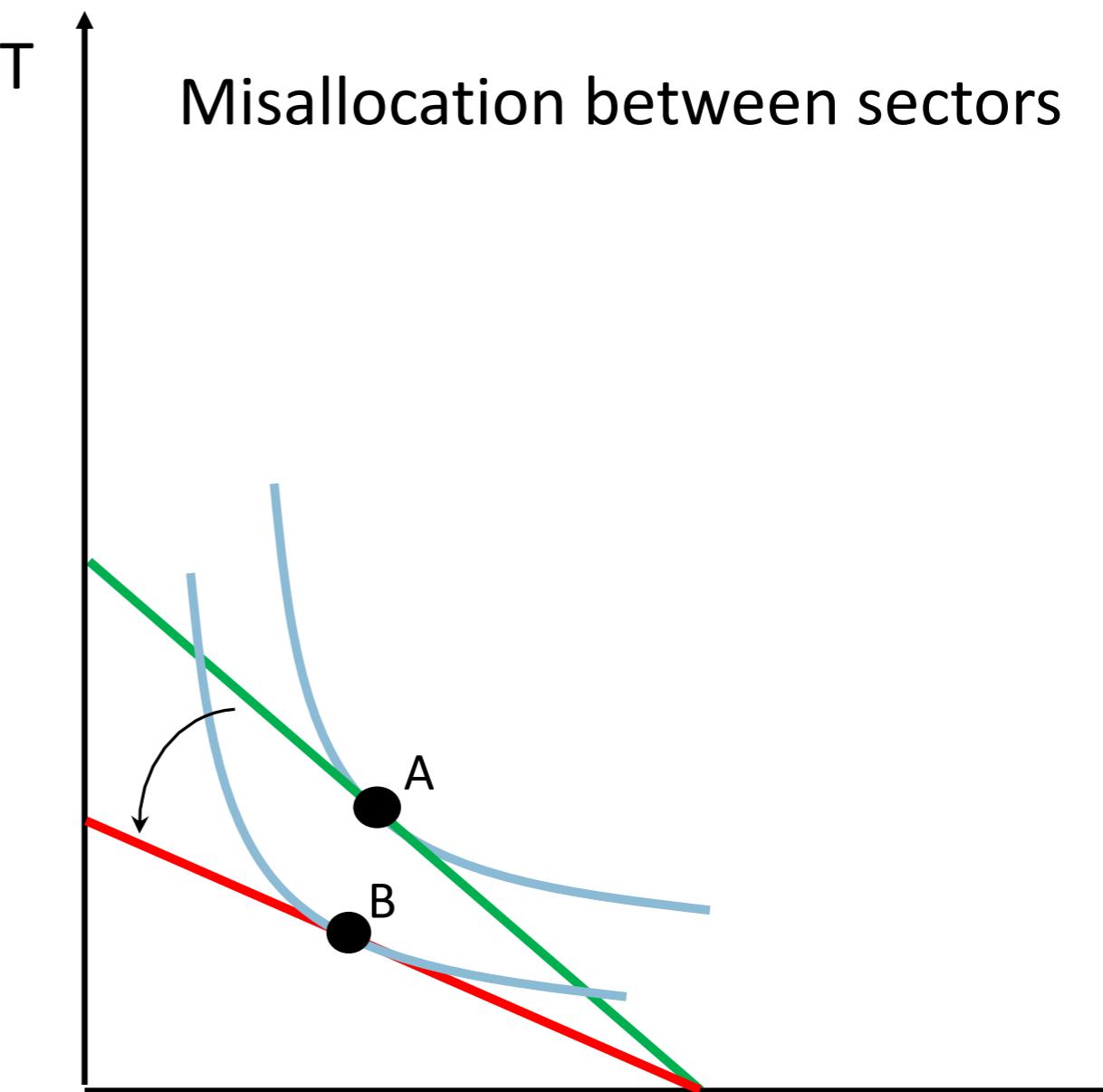


EFFECT OF MISALLOCATION

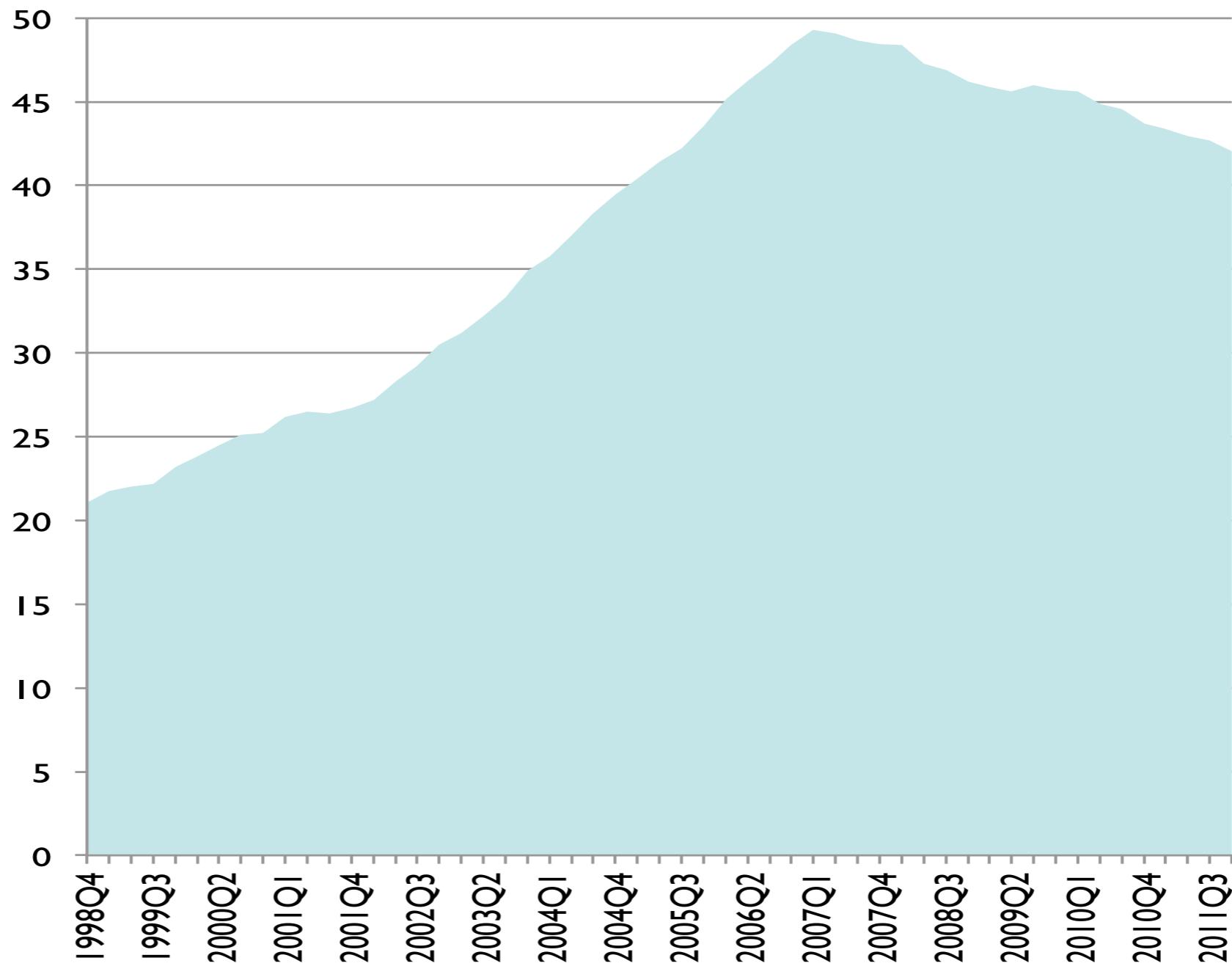
Equilibrium moves from A to B

Ratio of output in T to output
in N falls

Economy worse off



CONSTRUCTION IN SPAIN



Credit institutions: Loans to construction and real estate developers
as a percentage of loans granted to firms
(BE4.18.4 plus BE4.18.10 divided by BE4.18.1)
Quarterly: 1998Q4-2011Q4. Data source: Bank of Spain

Source: Santos (2012)

Misallocation within sectors



MISALLOCATION SOURCES

Politics

- Without foreign competition, firms can more easily lobby for local regulations to erect barriers to entry and constraints on firms growing
- Politicians are receptive to small firms as entrepreneurship is seen as income mobility and small firms employ a large share of the population

Finance

- Banks in underdeveloped financial markets lack managerial talent and tools to diversify their credit portfolio
- So they are weary of giving large loans to a few firms.

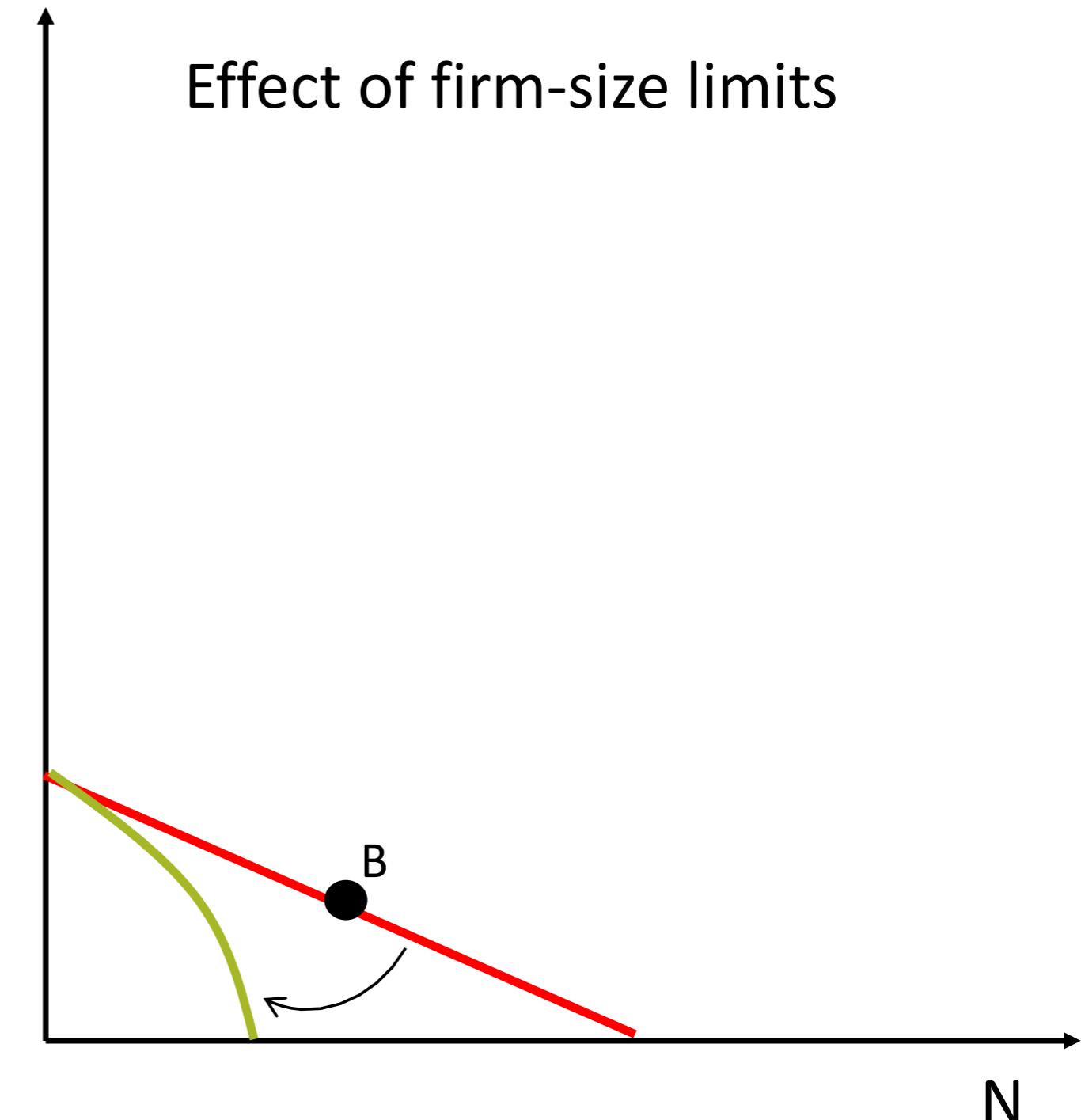
BACK TO MODEL

Implication:

- Every extra unit produced in sector N takes more capital
- More T output is sacrificed for an extra unit of N
- And increasingly so, as N production expands

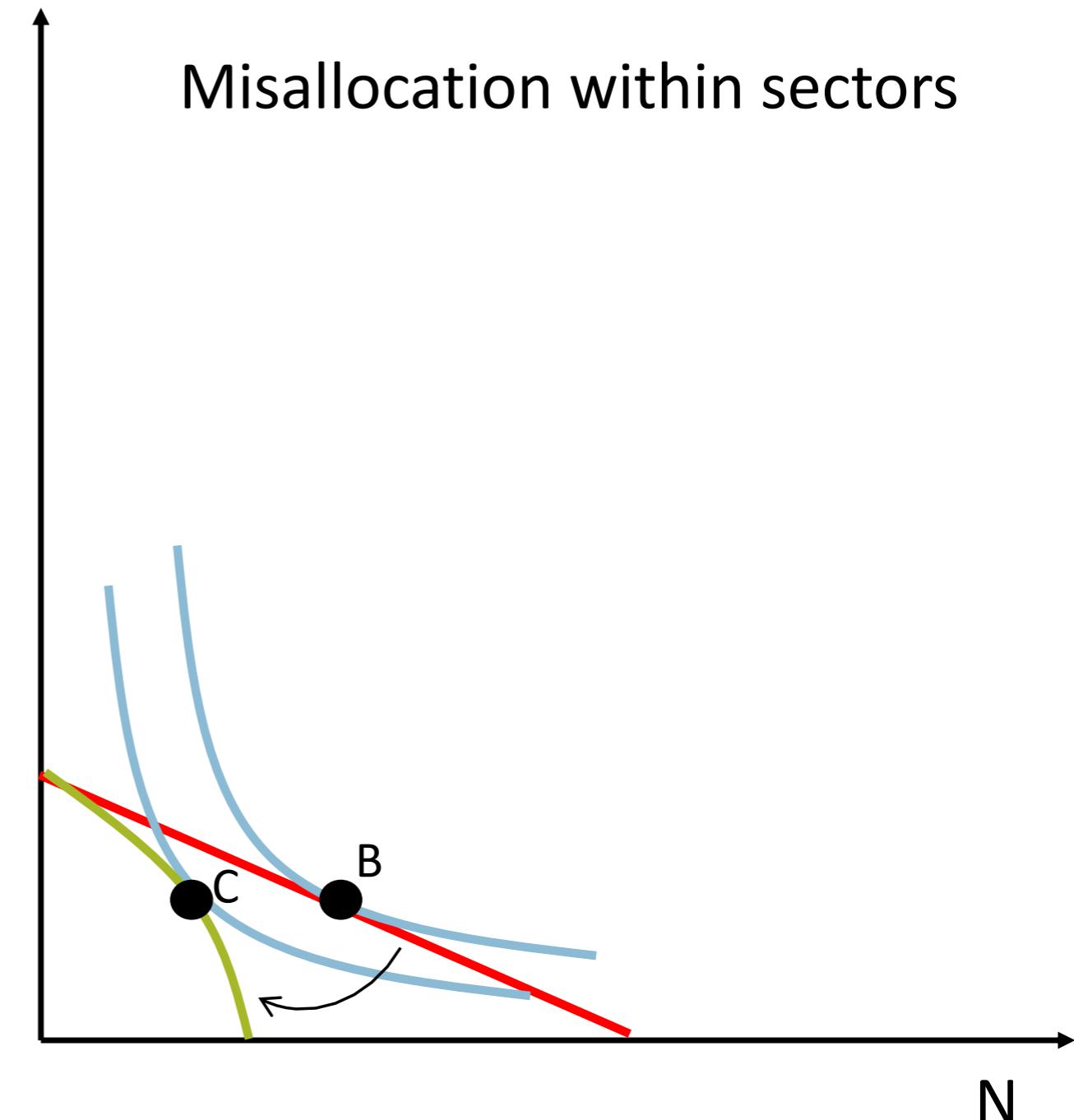
Production frontier

- Becomes **concave**
- Start at same vertical intercept



MISALLOCATION EFFECT

- The distribution of firm size is therefore skewed to **smaller** firms
- Moving the equilibrium from B to C
- Economy worse off

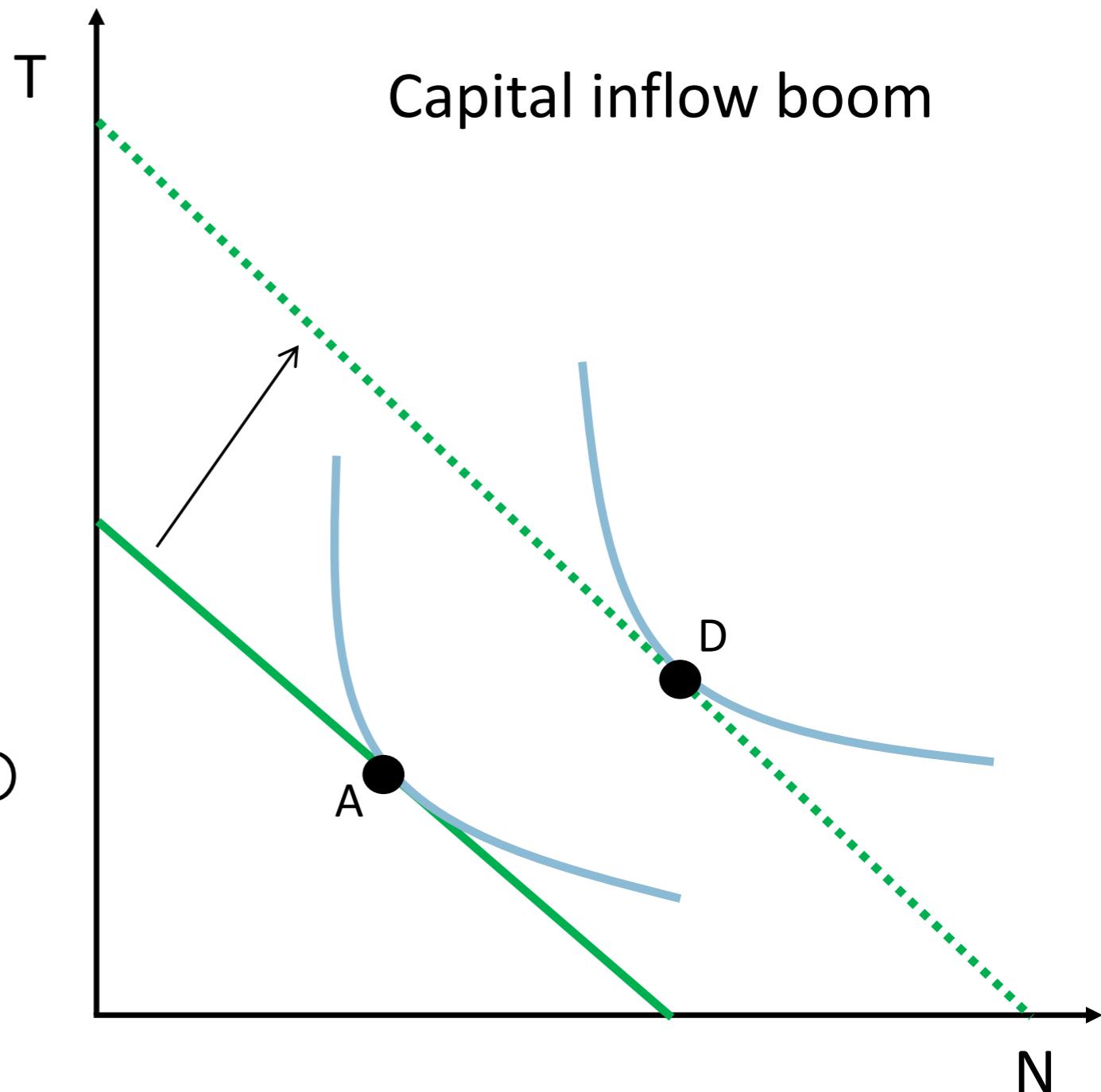


The euro crisis



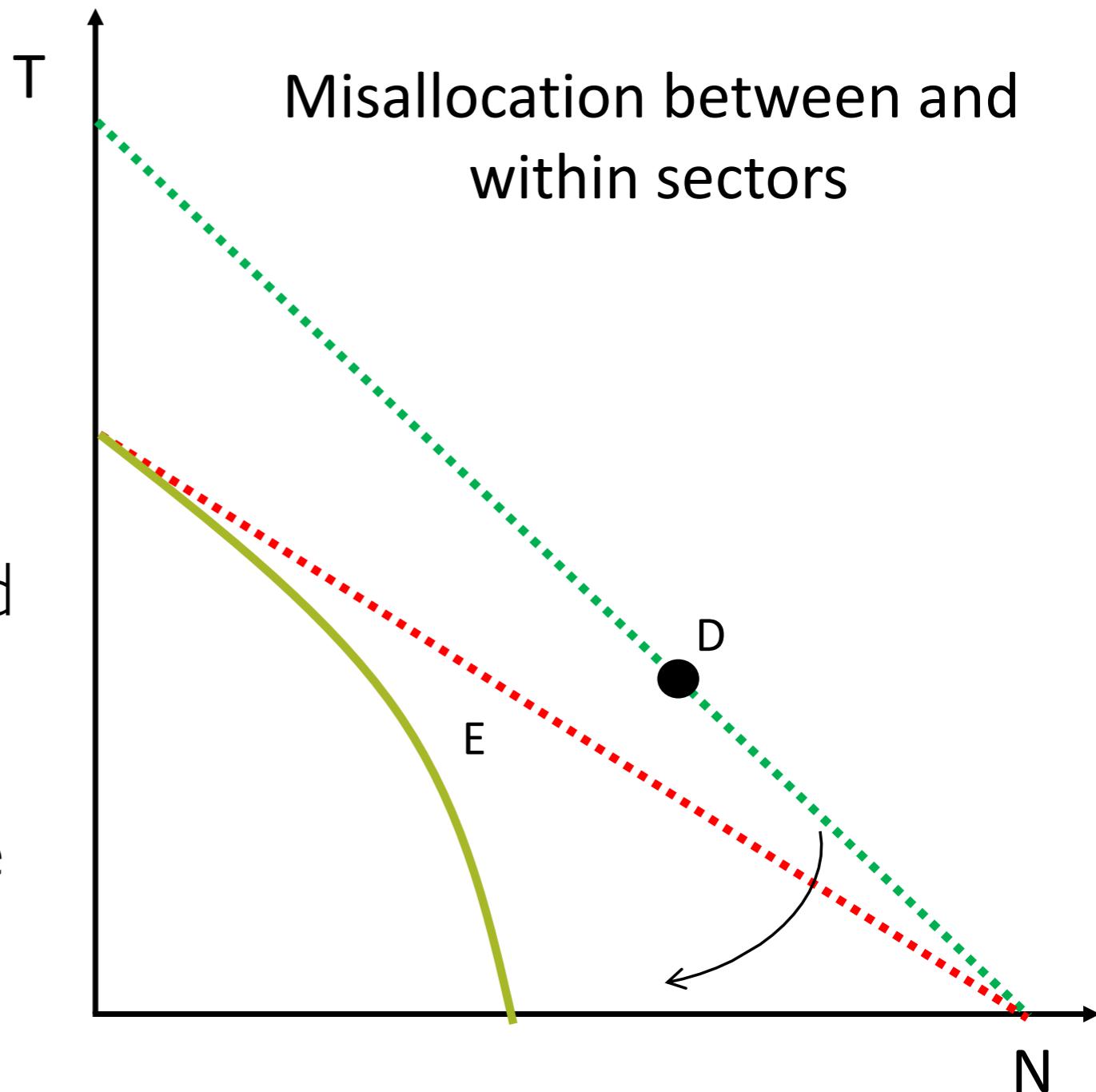
CAPITAL INFLOW

- More capital available for production
- Production function **shifts out**
- Close-to-efficient economy at start (for simplicity): point A
- If efficient economy, move to D



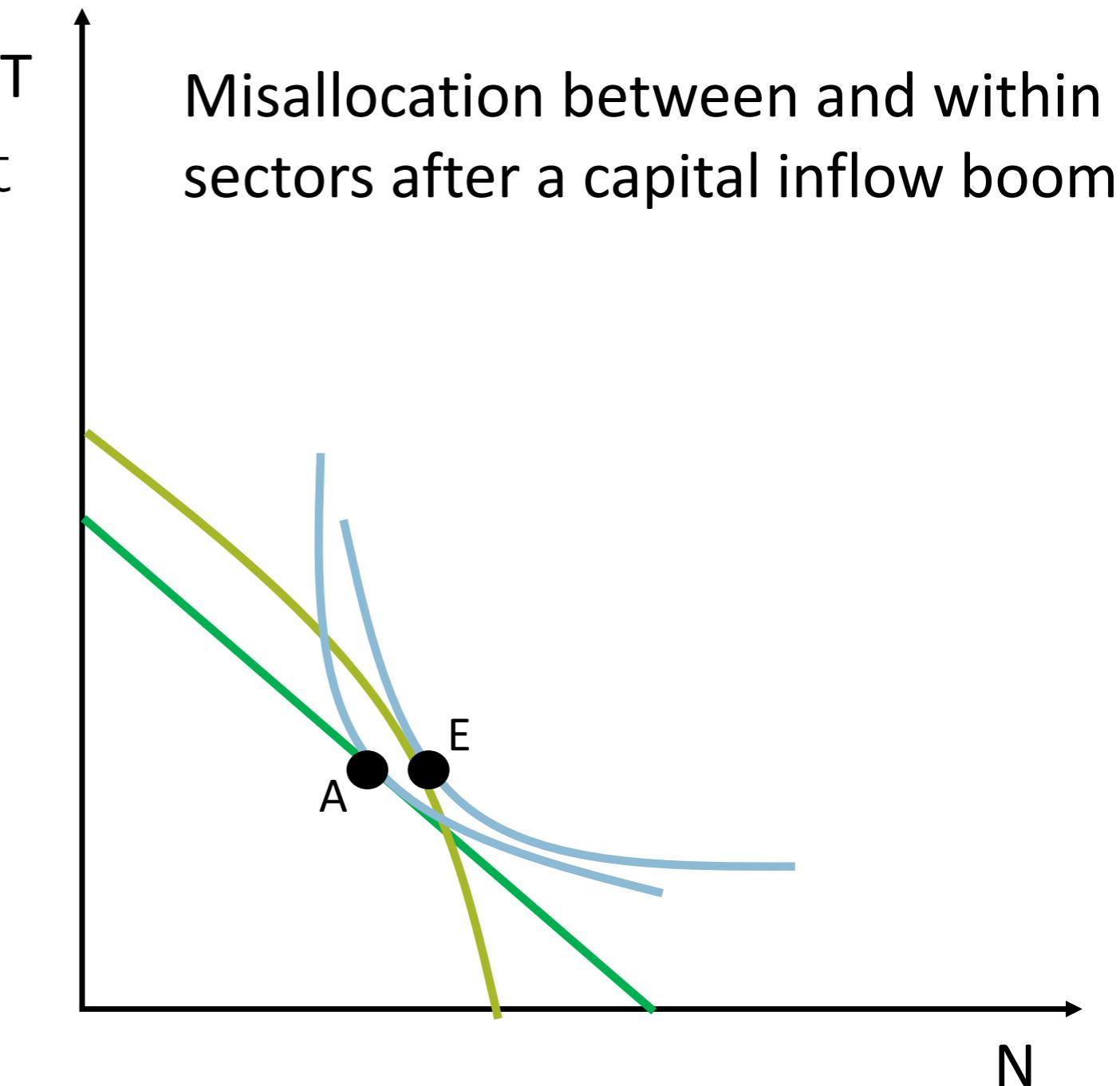
WITH MISALLOCATION

- The pressure on politicians to make structural reforms is relaxed
- Abundant credit makes it harder to distinguish productive projects
- Some of the funds get diverted to assets which are inelastically supplied, creates capital gains, augments future expectations and fuels asset bubbles that spurs further credit in inefficient sectors



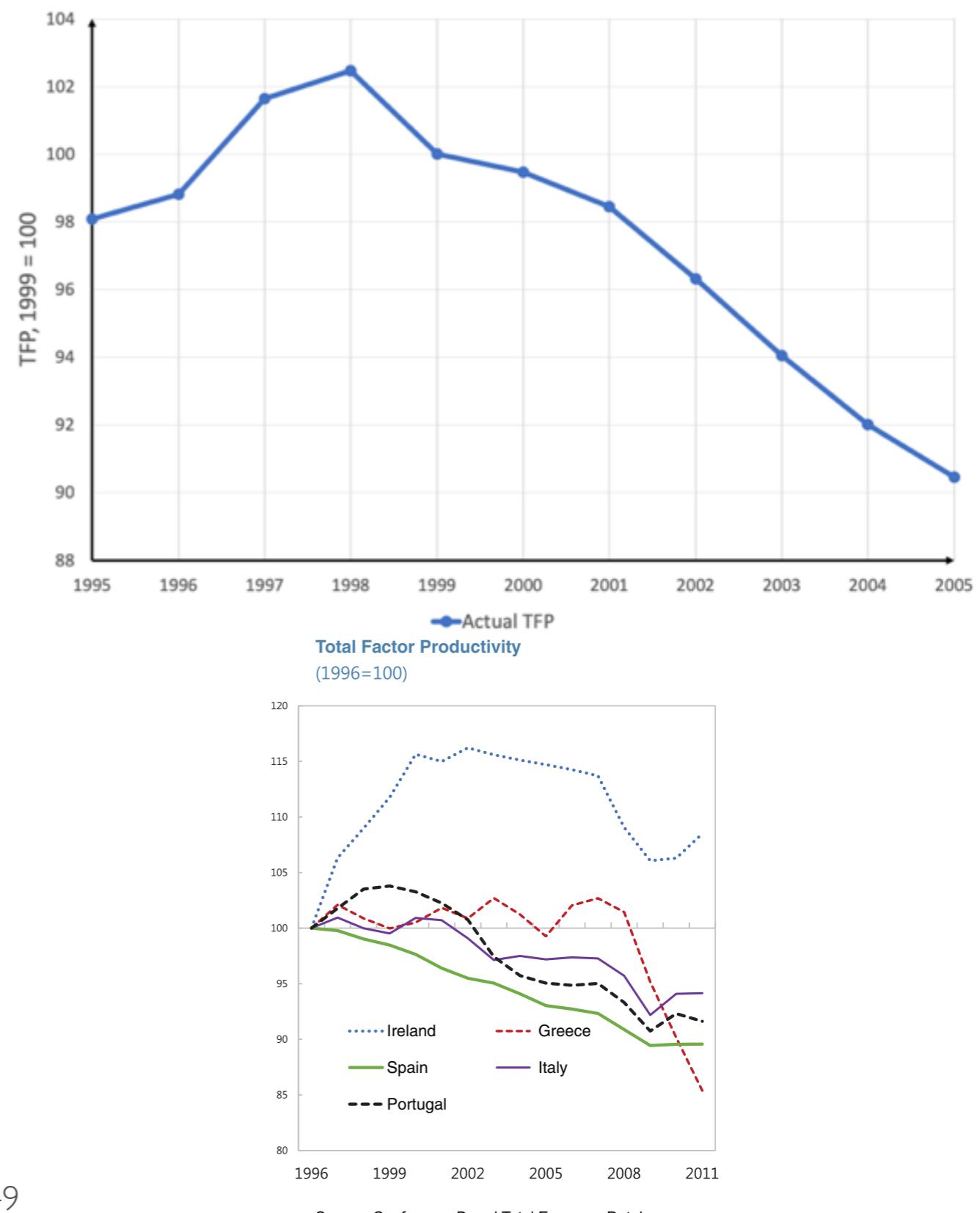
END RESULT

- Economy moves instead to E
- Non-tradable sector booms at expense of tradable sector
- TFP falls on aggregate
- Dispersion of TFP across firms rises as left tail grows
- And debt that funded capital flow must eventually be repaid.



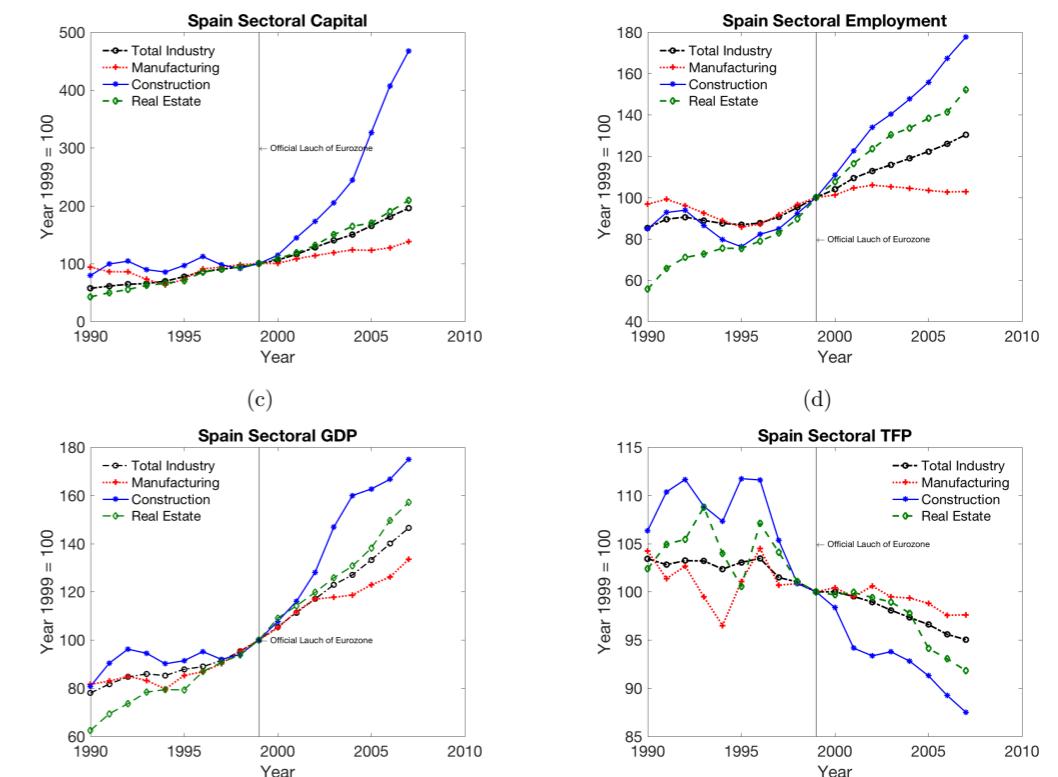
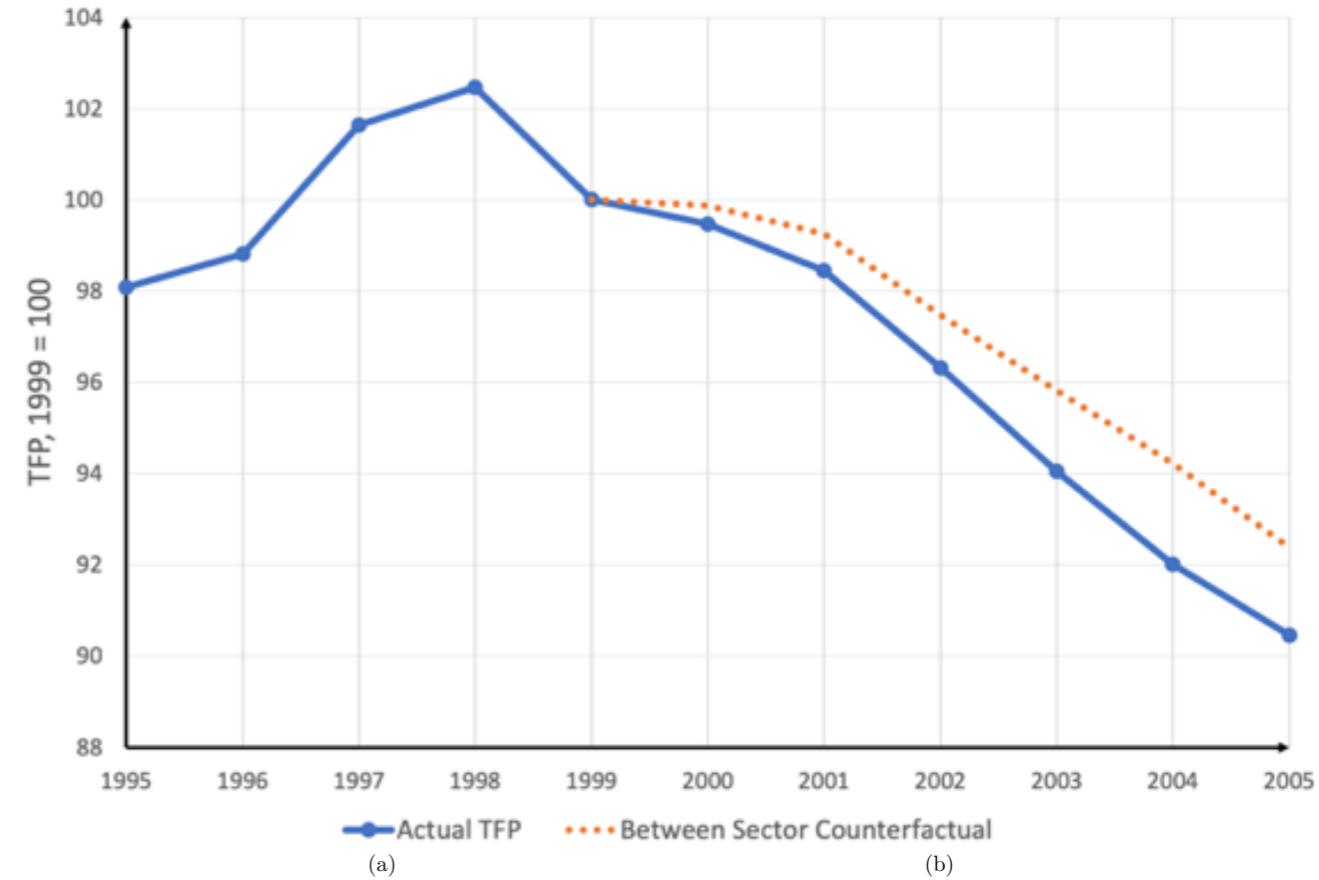
ACTUAL TFP IN PORTUGAL

- The blue line is **actual TFP**
- Post 1999 it falls
- Seemed puzzling: local firms now had capital from abroad to expand, conquer new markets
- Same happened in Ireland, Spain, Italy.
- Construction and real estate sectors boomed, wages rose.
- But **productivity fell**.



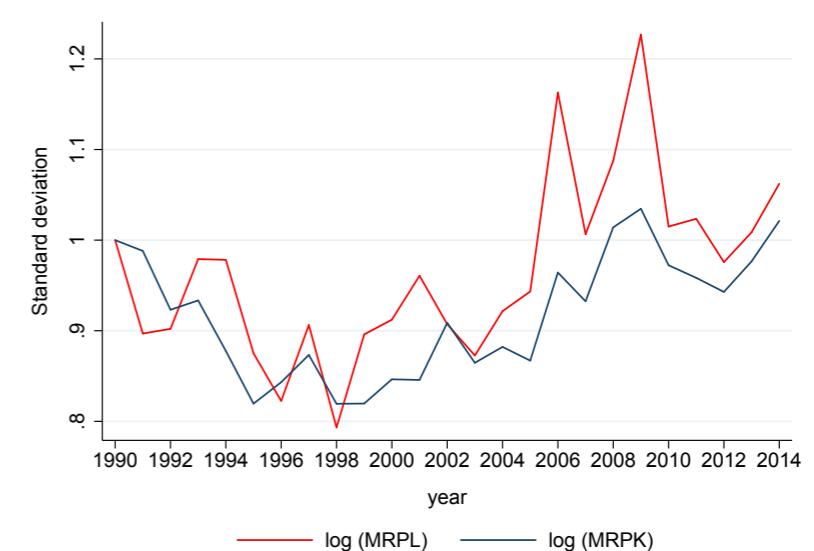
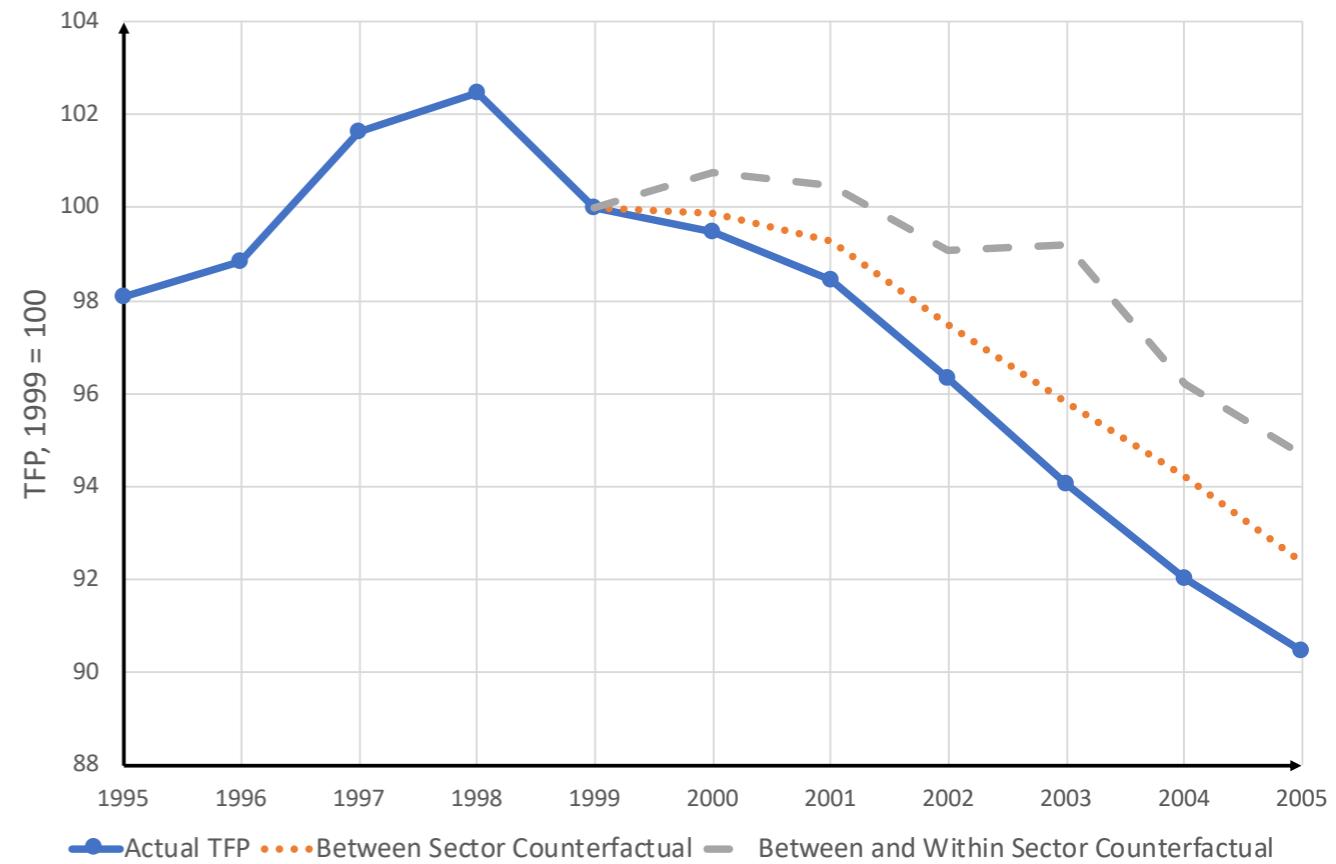
COUNTERFACTUAL TFP

- Orange line fixes the relative size of each economic sector at its 1999 level to build a counterfactual TFP
- Eliminate possible between-sector misallocation.
- Explains some of the decline.



COUNTERFACTUAL TFP

- As well as fixing the relative size, the grey line shows the TFP counterfactual if misallocation **within** sectors also remained at their 1999 levels
- Eliminate possible between and within-sector misallocation.
- Explains about half the decline
- Portugal's slump in productivity can be partly explained by capital misallocation after the euro in 1999



Notes: This figure plots the within-industry dispersion of the marginal revenue products of capital and labor over time. The numbers depicted are relative to 1990, which is normalized to one. Marginal revenue products are measured at the firm-level according to the Hsieh and Klenow (2009) framework. Standard deviations at the sector level are aggregated using time-invariant labor weights.

Source: ESEE data and own calculations.

LESSONS THIS WEEK

What determines how many dollars I pay to get one Euro?

Real exchange rate combined with inflation differentials.

Why are countries always trying to peg exchange rate?

Because it can be very volatile, hurt trade and LOP.

Is a currency union harmless?

No, must give some independence away.

What is the default spread?

Compensation to investors for possibility bond doesn't pay.

Is more credit and capital always good?

No, allocation is crucial.