

# Sectoral allocation and macroeconomic imbalances in EMU

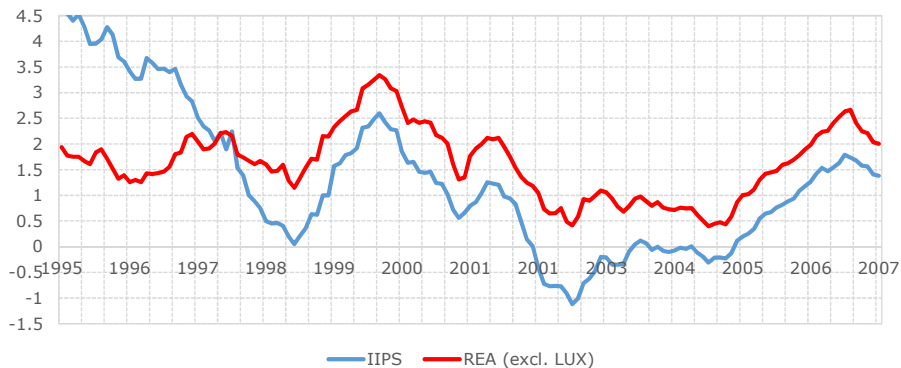
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June 24, 2017

# Introduction: real interest rate convergence

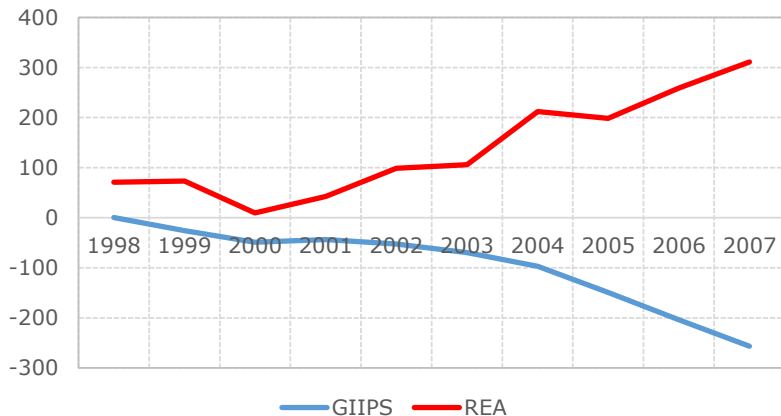
Figure: Ex-ante real interest rate 1 year bonds



Source: Thomson Reuters, Consensus forecasts.

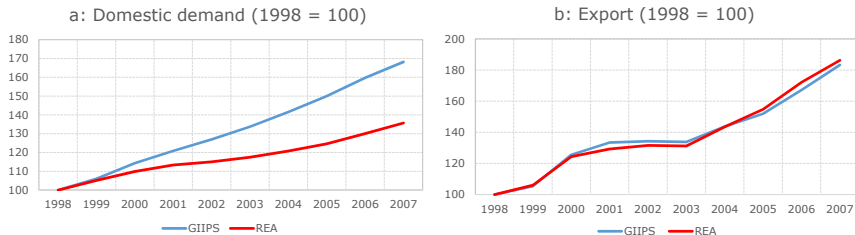
# Current account divergence

Figure: Current account euro area (billions)



# Domestic demand boom

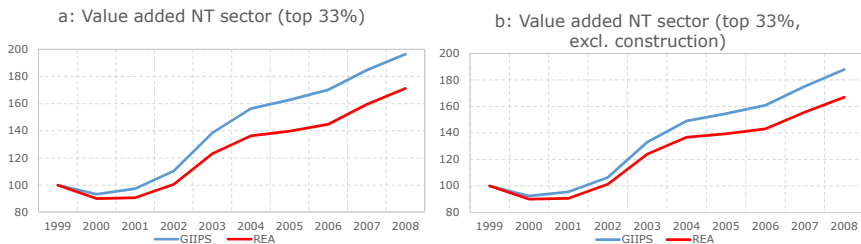
**Figure:** Growth was driven by domestic demand



Source: KLEMS Database, Euro area consists of AUT, BEL, ESP, FIN, FRA, GER, ITA and NLD

# Growth of nontradable sector

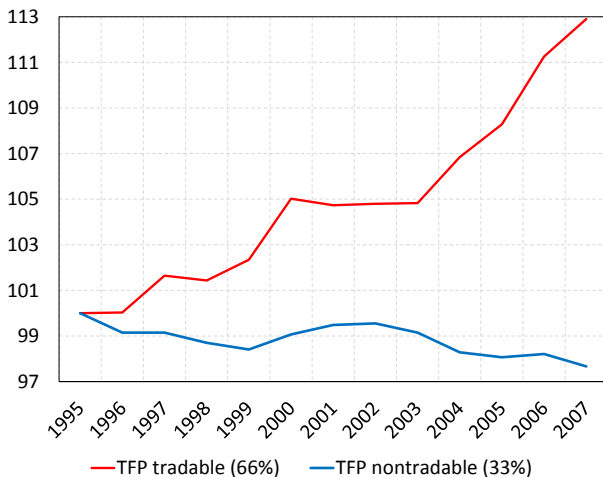
Figure: Growth of nontradeable sectors



1999 = 100. Source: own calculations based on WIOD database (Timmer et al, 2015).

# Tradable versus nontradable TFP-growth

Figure: Euro area TFP growth per sector



# Literature

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- Allocation of capital in Southern Europe and effects on productivity
  - Empirically: Borio et al. (2016): credit booms associated with reallocation of labor towards sectors with lower productivity growth.
  - Theoretically: exogenous interest rate drop can lead to growth of NT sector (Fagan and Gasper, 2005, Piton, 2015) and contribute to stagnating productivity growth (Benigno and Fornaro, 2014). Gopinath et al. (2015): with financial frictions, also misallocation within sectors.

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- Vulnerability of nontradable-driven growth
  - NT driven, debt financed, growth risks violating intertemporal b.c. (Giavazzi and Spaventa 2010) and can make economy financially fragile (Kalantzis, 2015).

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- Confirms the negative relation between interest rate shocks and growth of the nontradable sector in a panel-BVAR for the euro area
- Studies reform options that facilitate a smoother rebalancing process

# Model Overview

- Two regions, North and South, that are to form a monetary union
  - Prior to monetary integration: fixed exchange rates, but wedge between interest rates:  $r_{\text{South}} > r_{\text{North}}$
  - Post monetary integration: price level stabilized at union level, single risk free interest rate (debt-elastic interest rate premium remains)
  - Union as a whole is a closed economy
  - Labor is mobile across sectors, but not across regions

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  - Union as a whole is a closed economy
  - Labor is mobile across sectors, but not across regions
- Both regions exist of a representative household, tradable (T) and nontradable (NT) firms operating in a monopolistically competitive environment, and a simple government
  - Full business cycle model with capital, endogenous labor supply and capital adj. costs

# Households (1)

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- Households in each region  $j$  maximize lifetime utility:

$$U_t^j = \sum_{v=0}^{\infty} (\beta^j)^v \left[ \log C_{t+v}^j - \frac{\theta^j (L_{t+v}^j)^{1+\sigma_j}}{1+\sigma_j} \right]. \quad (1)$$

- Consumption good is a composite of tradables and nontradables:

$$C_t^j = (C_t^{j,N})^{\eta^j} (C_t^{j,T})^{1-\eta^j}. \quad (2)$$

- Consumer price index:

$$P_t^j = \frac{(P_t^{j,N})^{\eta^j} (P_t^{j,T})^{1-\eta^j}}{(\eta^j)^{\eta^j} (1-\eta^j)^{1-\eta^j}}. \quad (3)$$

## Households (2)

- Household can save/ borrow via one period risk free bonds. UIP:

$$r_t^{f,n} + \omega = r_t^{f,s}, \quad (4)$$

where  $\omega$  is an exogenous pre-EMU risk premium (cf. Kollmann, 2015)

- Stabilizing debt-elastic interest rate premium:

$$x_t^j = \xi e^{-N_t^j} - 1. \quad (5)$$

- Budget constraint:

$$\sum^{j'} B_t^{j'j} + P_t^{j,T} C_t^{j,T} + P_t^{j,N} C_t^{j,N} = \sum^{j'} (1 + r_{t-1}^j) B_{t-1}^{j'j} + \pi_t^j + L_t^j W_t^j, \quad (6)$$

where  $r_t^j = r_t^{f,j} + x_t^j$ .

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- Both sectors hire labor from the household sector, buy capital from the capital producers, and sell their wholesale goods to retailers.
- Retailers use the wholesale goods to produce the final goods
- Structure serves to realize monopolistic competition and adjustment costs in a tractable manner
  - Note: Tradable consumption good serves as the investment good

## Firms (2)

- Capital producers sell their capital for a price  $q_t^{j,Z}$ :

$$q_t^{j,Z} = P_t^{j,T} \left[ 1 + \phi \left( \frac{I_t^{j,Z}}{K_t^{j,Z}} - \delta \right) \right] \quad (7)$$

- The intermediary price is set as a mark-up over their marginal costs  $\lambda_t^{j,Z}$  such that aggregate prices are:

$$P_t^{j,Z} = \left( \frac{\mu^{j,Z}}{\mu^{j,Z} - 1} \right) \lambda_t^{j,Z}. \quad (8)$$

# Prices

- Absence of trade restrictions ensure law of one price:  $P_t^{n,T} = P_t^{s,T}$
- The monetary authority stabilizes the union's price level

$$P_t^e = hP_t^n + (1 - h)P_t^s \equiv 1. \quad (9)$$

where  $h$  is the Northern share in the union.

# Market equilibrium conditions

- Market for nontradables:

$$Y_t^{j,N} = C_t^{j,N} + G_t^{j,N}. \quad (10)$$

- Market for tradables:

$$\sum_j Y_t^{j,T} = \sum_j \left[ C_t^{j,T} + I_t^{j,T} + I_t^{j,N} + AC_t^j + IC_t^j + G_t^{j,T} \right]. \quad (11)$$

- Closure on the bond market:

$$NFA_t^j = (1 + r_{t-1}^{f,j}) NFA_{t-1}^j + P_t^{j,T} (Y_t^{j,T} - C_t^{j,T} - I_t^{j,T} - I_t^{j,N} - AC_t^j - IC_t^j - G_t^{j,T}). \quad (12)$$

- Finally, equilibrium in the market for financial assets requires:

$$NFA_t^n + NFA_t^s = 0. \quad (13)$$

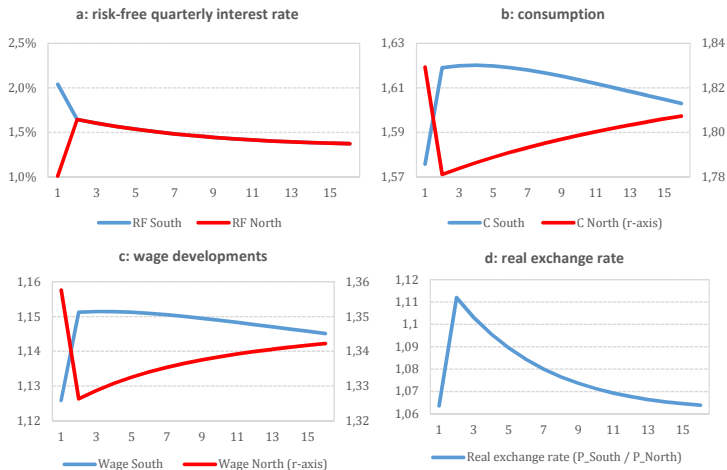
# Calibration

- Key parameters:
  - Both regions are of equal size
  - Discount factors set to match pre-EMU current account balances (close to zero in both blocks)
  - Country specific risk premium set to match NFA dynamics
  - Productivity constant across blocks and sectors (baseline only)
- Some sectoral and cross-country heterogeneity, but not key to results
- Use Dynare for a numerical simulation of the full nonlinear model
  - Deterministic simulation, assuming perfect foresight

# Simulation results

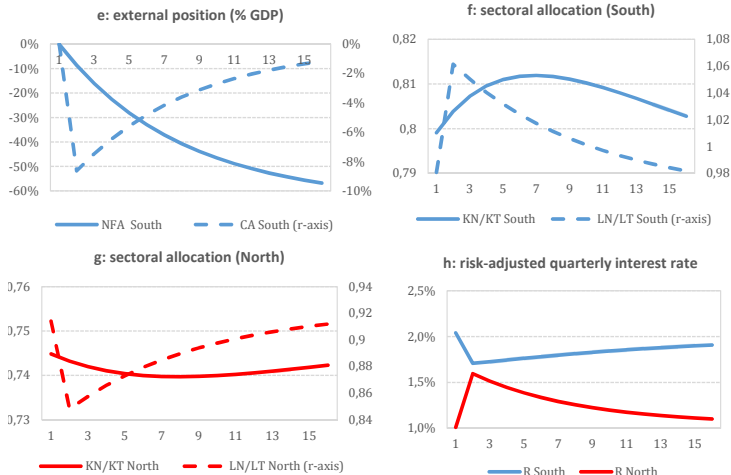
# Simulation results

**Figure:** Consequences of monetary integration (1)



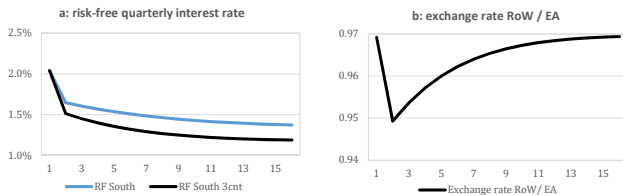
# Simulation results

Figure: Consequences of monetary integration (2)



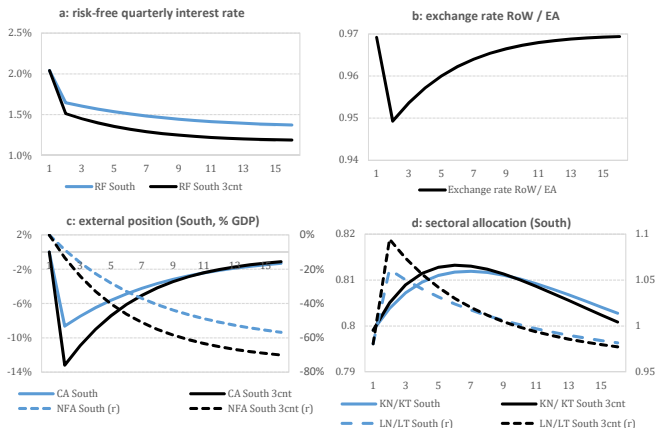
# Simulation results including RoW

Figure: Consequences of monetary integration - model including RoW



# Simulation results including ROW

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# EMU Panel BVAR

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- BVAR representation

$$X_t = \alpha_0 + \alpha_1 D_t + \Phi(L)X_{t-1} + \varepsilon_t, \quad (14)$$

- where  $\Phi(L) \equiv \Phi_0 + \Phi_1 L^1 + \dots + \Phi_p L^p$  is a lag polynomial,  $X_t$  is a stacked vector containing the observed variables:

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$$X_t = \left[ (y_{t,i}^N - \bar{y}_t^N), (y_{t,i}^T - \bar{y}_t^T), \left( \frac{B_{t,i}}{Y_{t,i}} - \frac{\bar{B}_t}{\bar{Y}_t} \right), (i_{t,i}^r - \bar{i}_t^r) \right]',$$

- where  $y_{t,i}^N$  and  $y_{t,i}^T$  denote nontradable and tradable sector growth
- $i_{t,i}^r$  is the ex-ante expected real interest rate
- $\frac{B_{t,i}}{Y_{t,i}}$  denotes a country's current account balance (%GDP)

## Panel BVAR specification

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- Cholesky Decomposition ordering as in (15)
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- The data is observed at an annual frequency and therefore only one lag is included
- Pooled Bayesian estimation procedure
- Agnostic Minnesota prior: the unit root coefficient takes a prior value of 0.8 and Inverse-Wishart Distribution
- Hyperparameters are set at “standard” values

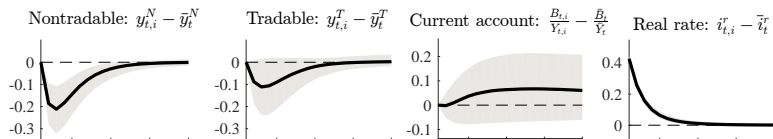
# Data

- Output growth for 10 euro area countries (Austria, Belgium, Germany, Finland, France, Italy, Ireland, Netherlands, Spain and Portugal) is calculated using Eurostat data
- The disaggregated time-series are categorized in either the tradable or nontradable sector
- Annual nominal interest rates on 1-year government bonds minus consensus forecast inflation expectations one year ahead to transform the nominal interest rates into ex-ante real interest rates
- WEO database to collect data on current account balances
- The time-series cover the period 1996-2013

# Empirical results

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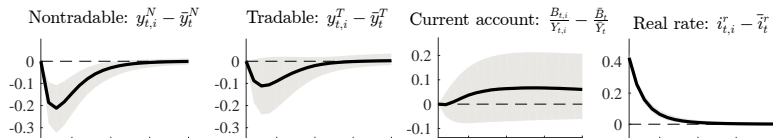
**Figure:** Bayesian estimation results for sample period 1996-2008



Sample 1996-2008. 68% credibility intervals are generated by drawing from the posterior distribution: 50,000 draws of which 40,000 draws are discarded as burn-in iterations. Time is quarterly.

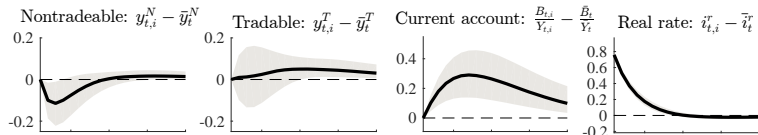
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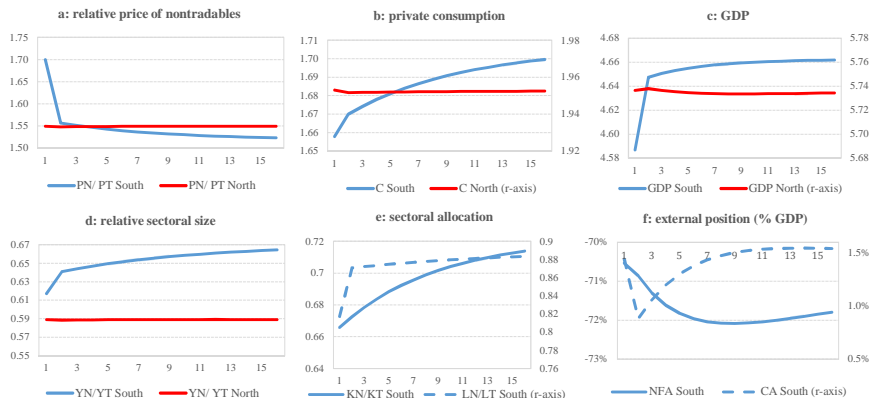
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# Policy options

- Crisis can be modeled as a 'Minsky moment' in which risk aversion suddenly increases
- Fiscal policy also offers a fairly straightforward tool to lean against excessive private borrowing
- Various policy options that can accommodate a less disruptive rebalancing process are examined
  - Increasing competition in the nontradable sector
  - Deepening the internal market

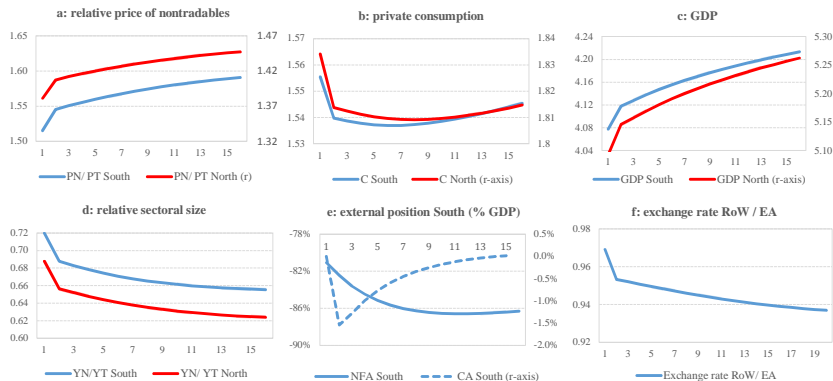
# Increasing competition in the nontradable sector

Figure: Product market reform in South, transition path



# Deepening the internal market

Figure: Deepening the EA internal market, transition path

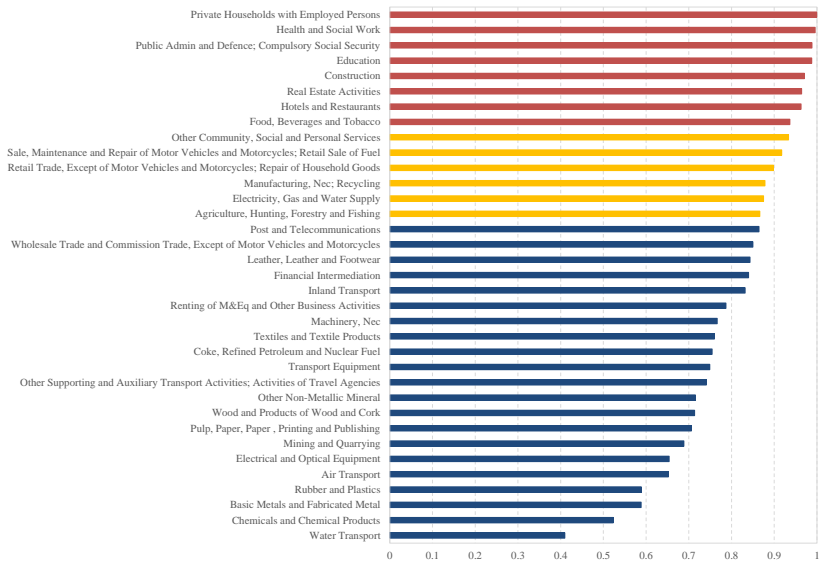


# Conclusion

- CA deficit and growth of NT sector in Southern Europe are natural consequences of the fall in real interest rates
  - Wage growth (competitiveness problems) consequence, rather than prime cause of imbalances
  - Shift towards less-productive NT sector potential driver of aggregate productivity slowdown
- Southern boom can also explain pivot towards export growth and wage moderation in Northern Europe
- Policy options/counterfactuals:
  - Liberalizing the Southern nontradable sector does not improve the region's external position
  - Deepening the European market for tradables induces a shift of productive resources towards the tradable sector and boosts growth

# Calibration parameters

Parameters	Description	Value
$\beta^n$	Discount factor households	0.990
$\beta^s$	Discount factor households	0.980
$\sigma$	Inverse of the elasticity of work effort	2.00
$\theta^z$	Weight of leisure	1.000
$\eta^z$	Share of nontradables in consumption	0.667
$\alpha^T$	Share of labor in the production function	0.550
$\alpha^N$	Share of labor in the production function	0.600
$\delta$	Depreciation rate of physical capital	0.030
$\mu^{N,n}$	Market power nontradable sector	5.000
$\mu^{N,s}$	Market power nontradable sector	3.500
$\mu^{T,n}$	Market power tradable sector	10.000
$\mu^{T,s}$	Market power tradable sector	10.000
$h$	Relative share of North in union	0.500
$\phi$	Capital adjustment costs	2.000



# Simulation results crash (Minsky moment)

