Pegs, Downward Wage Rigidity, and Unemployment: The Role of Financial Structure

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Motivation

• Countries in the periphery of the eurozone have found themselves increasingly cut off from international financial markets.

• This paper presents a model-based analysis of how such changes in financial structure influence the welfare consequences of maintaining a fixed exchange rate regime.

Preview of Main Findings

- Low-debt peggers might be better off closing the current account.

- High-debt peggers might be better off opening the current account.

- Central banks have greater incentives to abandon a peg in financially open economies than in financially closed economies.

A Disequilibrium Model

(Schmitt-Grohé and Uribe, 2011)

Nominal Wages are Downwardly Rigid

$$\boldsymbol{W_t \geq \gamma W_{t-1}}$$

$W_t =$ nominal wage rate in period t

$\gamma \geq 0$ degree of downward wage rigidity

Traded and Nontraded Goods

Traded goods: stochastic endowment y_t^T

Nontraded goods: produced with labor: $y_t^N = F(h_t)$

The relative price on nontradables: $p_t = \frac{P_t^N}{P_t^T}$

Law of one price holds for tradables: $P_t^T = P_t^* E_t$

E_t = nominal exchange rate.

Assume that $P_t^* = 1$

Firms in the Nontraded Sector

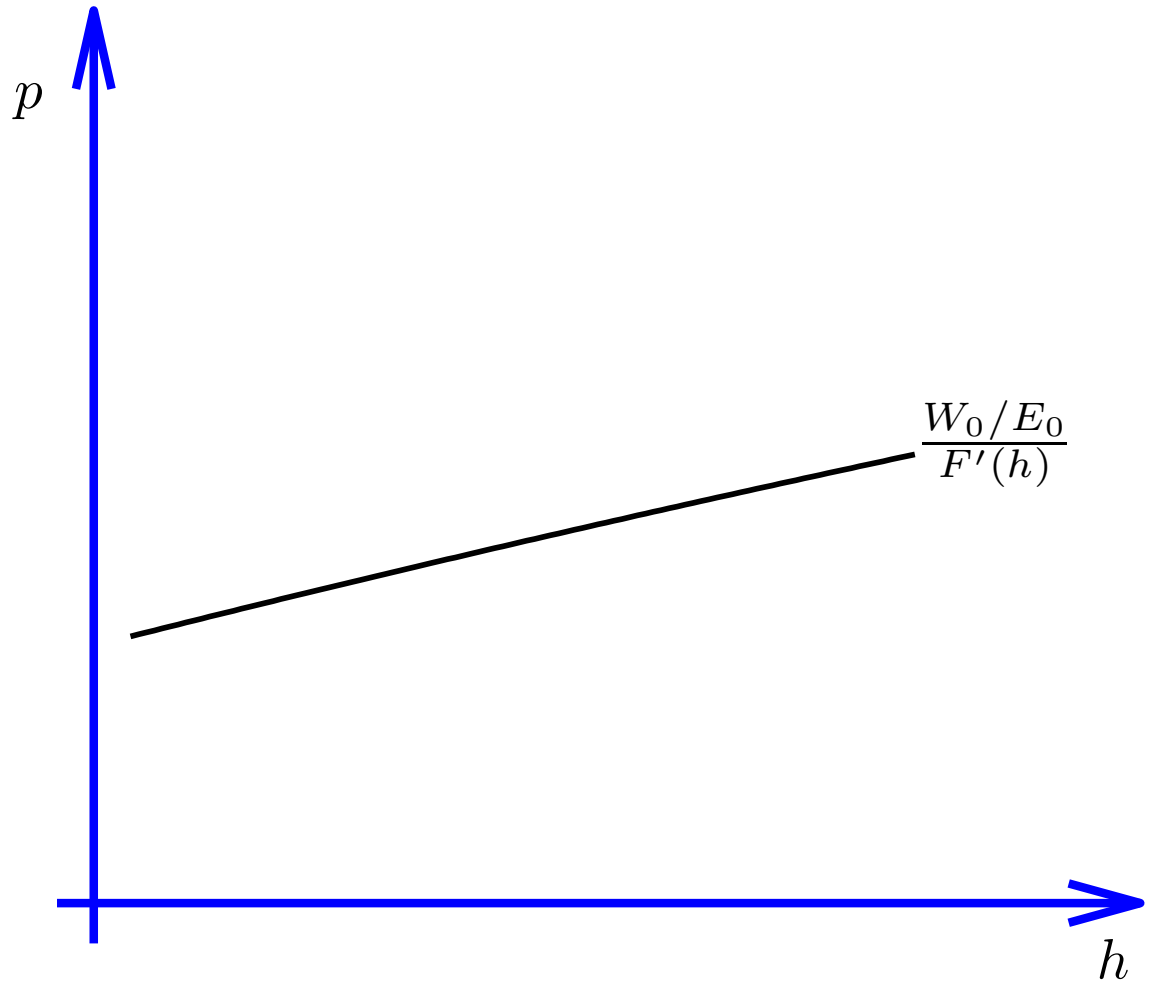
$$\max_{\{h_t\}} \quad p_t F(h_t) - w_t h_t,$$

taking as given p_t and w_t,
where $w_t \equiv W_t/E_t$ is the real wage in terms of tradables.

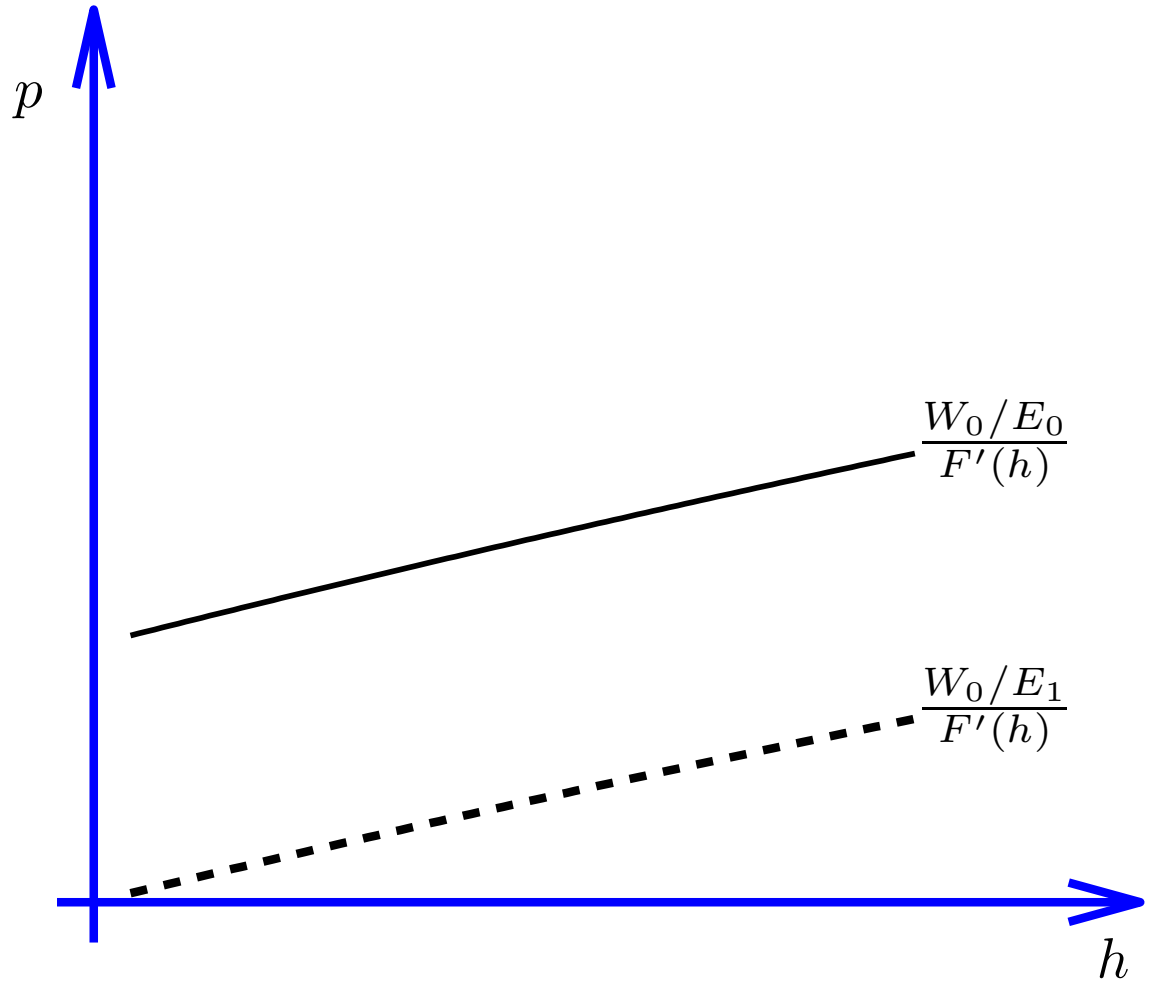
Optimality condition (or the Supply of Nontradables):

$$p_t = \frac{W_t/E_t}{F'(h_t)}$$

The Supply of Nontraded Goods



$E_t \uparrow$: A Devaluation Shifts The Supply Schedule Down



$(E_1 > E_0)$

Households

$$\max_{\{c_t^T, c_t^N, d_{t+1}\}} \quad \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(c_t)$$

subject to

$$c_t = A(c_t^T, c_t^N)$$

$$c_t^T + p_t c_t^N + d_t = y_t^T + w_t h_t + \frac{d_{t+1}}{1 + r_t} + \phi_t$$

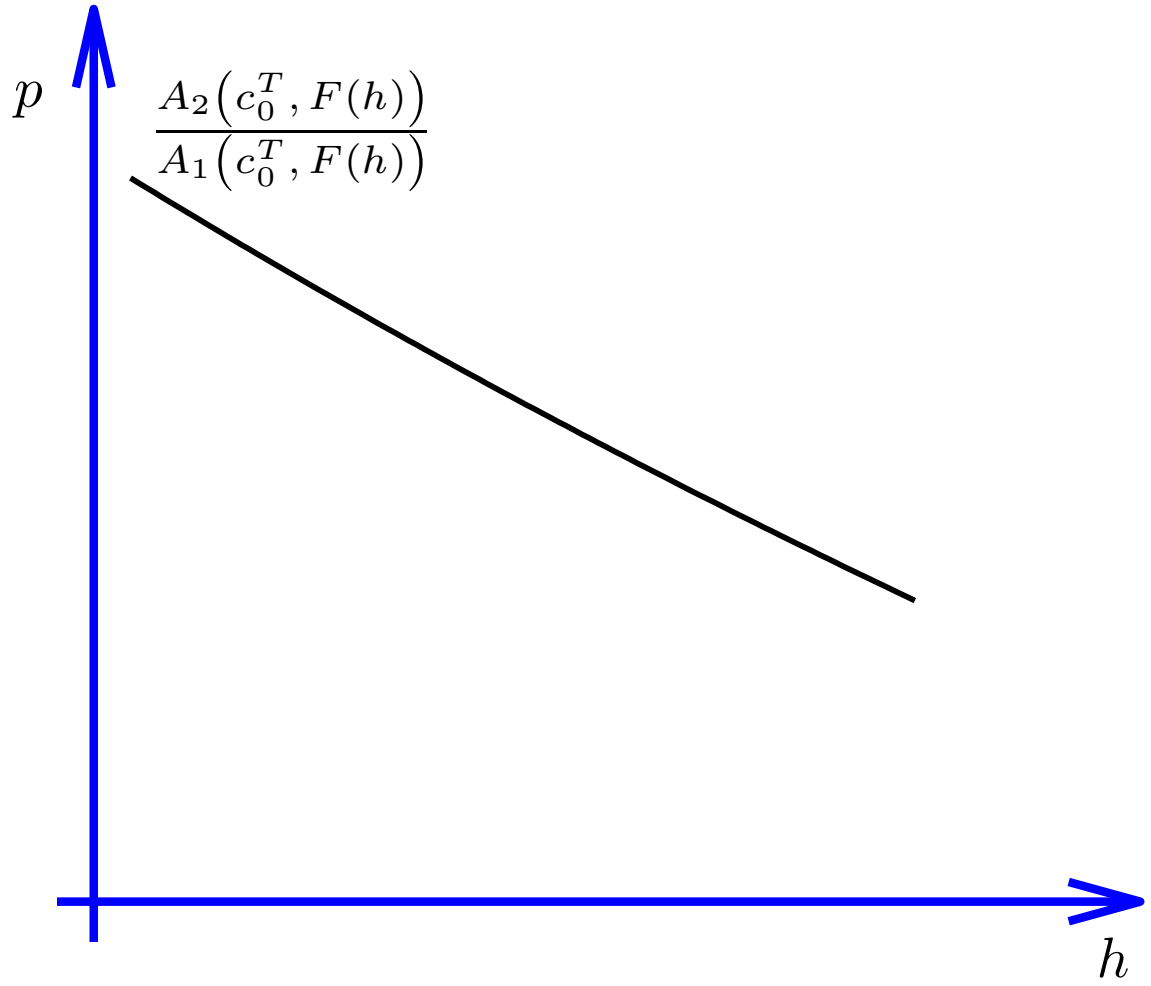
$$d_{t+1} \leq \bar{d}$$

- Workers supply $\bar{h}$ hours inelastically, but may not be able to sell them all. They take $h_t \leq \bar{h}$ as given.

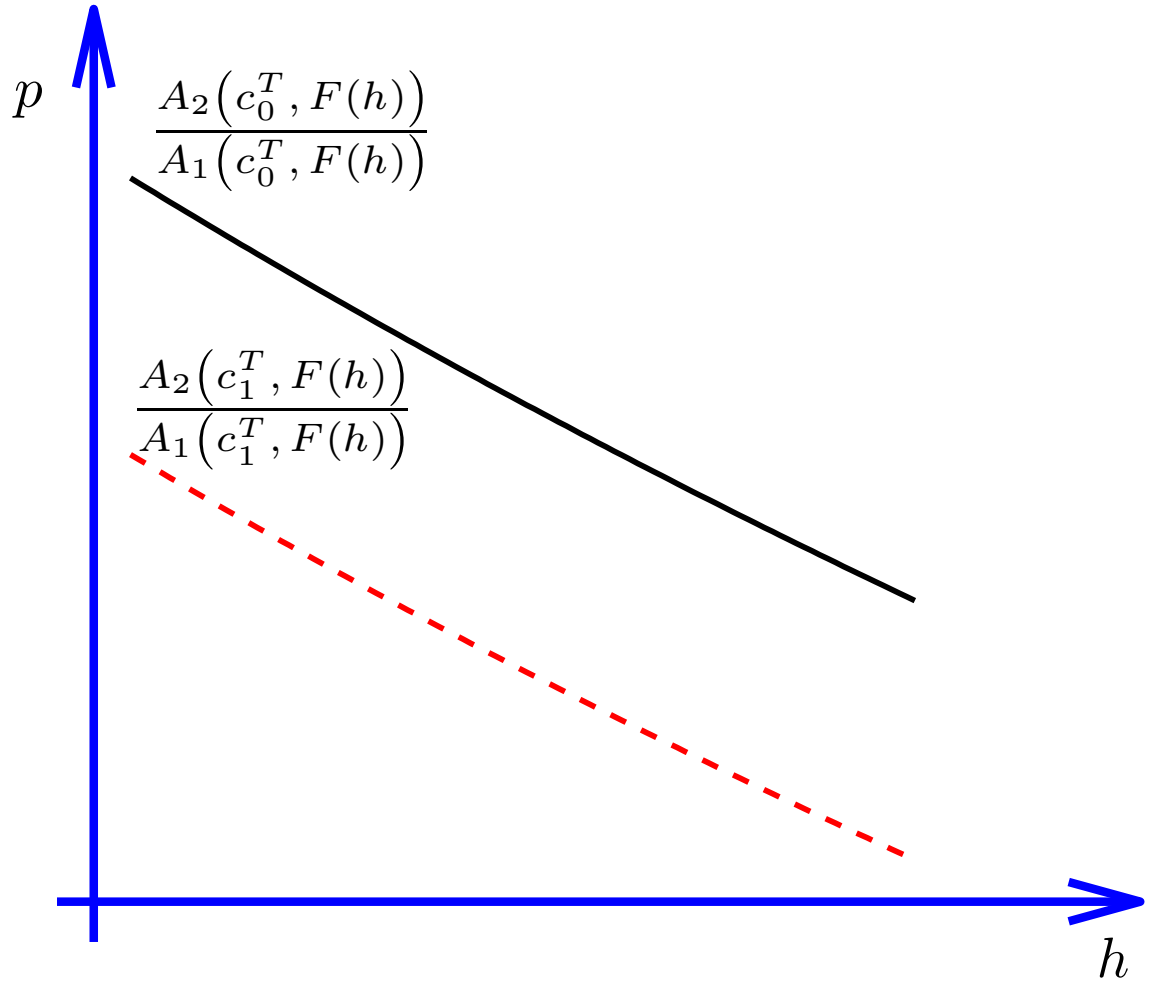
- One first-order condition (Demand for Nontradables):

$$\frac{A_2(c_t^T, c_t^N)}{A_1(c_t^T, c_t^N)} = p_t$$

The Demand for Nontraded Goods



$\mathbf{c_t^T \downarrow}$ Shifts the Demand Function Down



$(c_1^T < c_0^T)$

Disequilibrium in the Labor Market

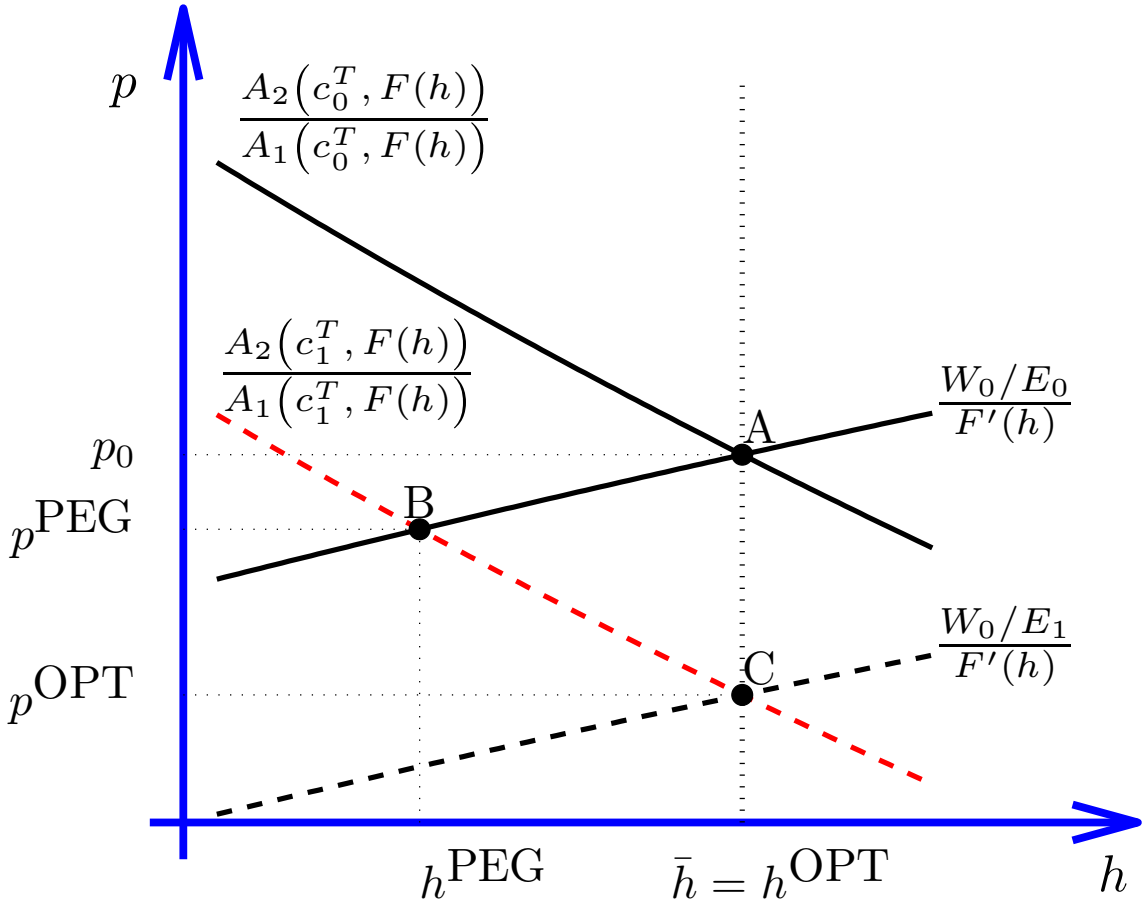
The following 3 conditions must hold at all times:

$$W_t \geq \gamma W_{t-1}$$

$$h_t \leq \bar{h}$$

$$(\bar{h} - h_t)\,(W_t - \gamma W_{t-1}) = 0$$

Currency Pegs and Unemployment



$c_1^T < c_0^T$ (negative shock) and $E_1 > E_0$ (optimal devaluation)

The Pecuniary Externality Created by Currency Pegs

Expansions in aggregate demand drive up real wages, putting the economy in a vulnerable situation. For in the contractionary phase of the cycle, downward wage rigidity and a fixed exchange rate prevent real wages from falling to the level consistent with full employment. Agents understand this mechanism, but are too small to internalize that their individual expenditure decisions collectively cause inefficiently large increases in wages during expansions and hence unemployment during contractions.

Calibration and Functional Forms

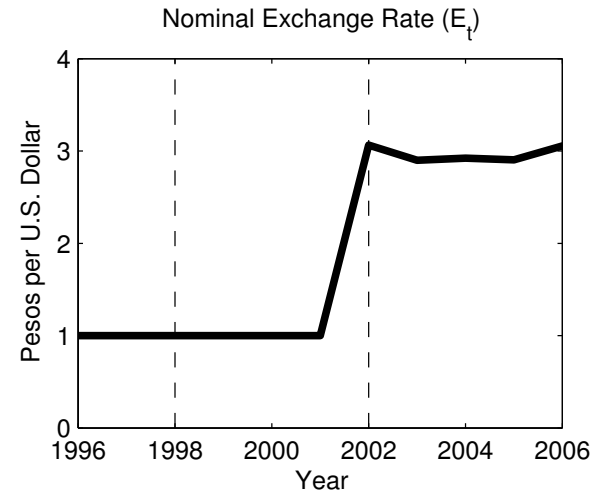
$$U(c) = \frac{c^{1-\sigma} - 1}{1 - \sigma}$$

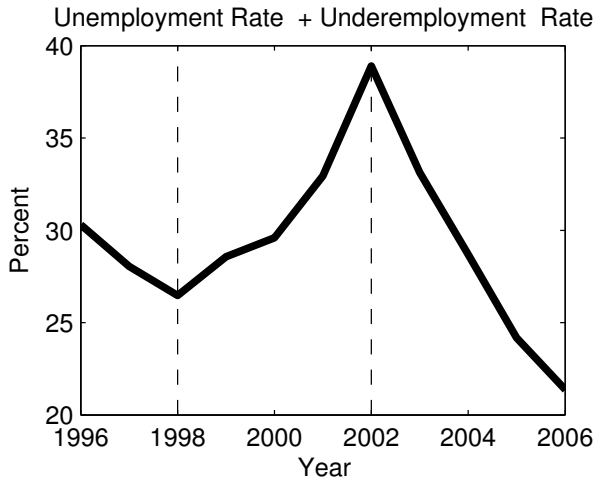
$$A(c^T, c^N) = \left[a(c^T)^{1-\frac{1}{\xi}} + (1-a)(c^N)^{1-\frac{1}{\xi}} \right]^{\frac{\xi}{\xi-1}}$$

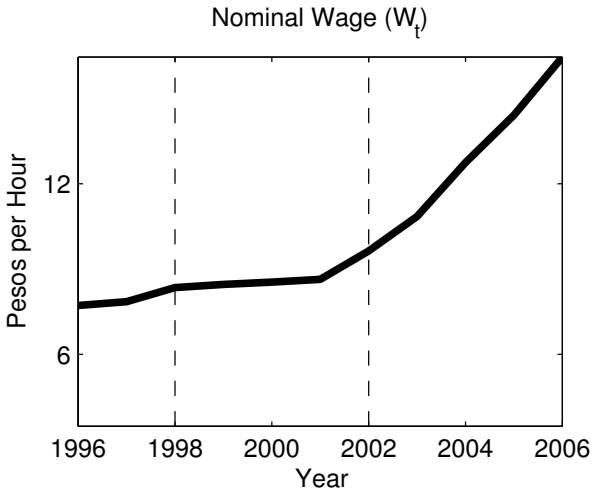
$$F(h) = h^{\alpha}$$

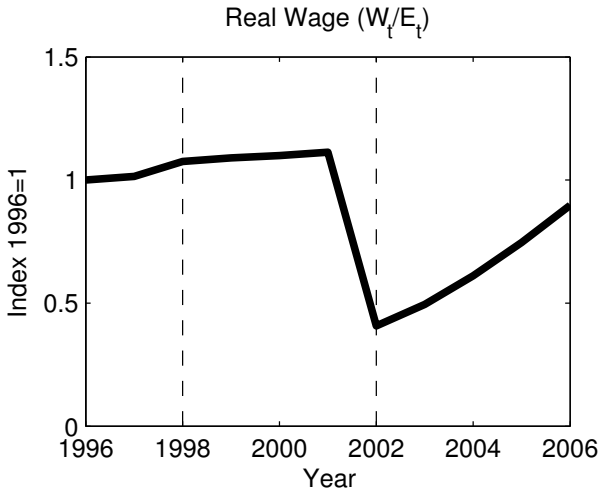
Parameter	Value	Description
γ	0.99	Degree of downward nominal wage rigidity
σ^{-1}	1/5	Intertemp. elast. subst. (Reinhart and Végh, 1995)
a	0.26	Share of tradables
ξ	0.44	Intratemp. elast. subst. (González-Rozada et al., 2004)
α	0.75	Labor share in nontraded sector
$\bar{h}$	1	Labor endowment
β	0.9375	Quarterly subjective discount factor

Argentina 1996-2006









Memo: Average annual CPI inflation 1998-2001: -0.86%

Unemployment, Nominal Wages, and γ Evidence from the Eurozone

Country	Unemployment Rate 2008Q1 (in percent)	Unemployment Rate 2011Q2 (in percent)	Wage Growth $\frac{W_{2011Q2}}{W_{2008Q1}}$ (in percent)	Implied Value of γ
Bulgaria	6.1	11.3	43.3	1.028
Cyprus	3.8	6.9	10.7	1.008
Estonia	4.1	12.8	2.5	1.002
Greece	7.8	16.7	-2.3	0.9982
Lithuania	4.1	15.6	-5.1	0.996
Latvia	6.1	16.2	-0.6	0.9995
Portugal	8.3	12.5	1.91	1.001
Spain	9.2	20.8	8.0	1.006
Slovenia	4.7	7.9	12.5	1.009
Slovakia	10.2	13.3	13.4	1.010

Note. W is an index of nominal average hourly labor cost in manufacturing, construction, and services. Unemployment is the economy-wide unemployment rate. Source: EuroStat.

The Driving Process:

Estimate the following AR(1) system using Argentine data over the period 1983:Q1—2001:Q3:

$$\begin{bmatrix} \ln y_t^T \\ \ln \frac{1+r_t}{1+r} \end{bmatrix} = A \begin{bmatrix} \ln y_{t-1}^T \\ \ln \frac{1+r_{t-1}}{1+r} \end{bmatrix} + \epsilon_t,$$

Summary Statistics

Statistic	y^T	r
Std. Dev.	12%	6%yr
Serial Corr.	0.95	0.93
Corr(y_t^T, r_t)	-0.86	
Mean	1	12%yr

The Welfare Cost of Autarky ($c_t^T = y_t^T$)

$$\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \frac{\left[c_{t+s}^{aut|opt}(1+\lambda^{aut|opt}(s_t))\right]^{1-\sigma}}{1-\sigma} = \mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \frac{\left[c_{t+s}^{bond|opt}\right]^{1-\sigma}}{1-\sigma}$$

$s_t = (y_t^T, r_t, d_t) \equiv (\mathbb{E}y^T, \mathbb{E}r, 0)$ Initial State of the Economy

	Initial Debt
	$d_0 = 0$
Welfare Cost of Autarky (percent of c_t)	1.0

Result: The cost of financial autarky is significant.

The Welfare Cost of Autarky for Peggers

$$\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \frac{\left[c_{t+s}^{aut,peg}(1+\lambda^{aut|peg}(s_t))\right]^{1-\sigma}}{1-\sigma} = \mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \frac{\left[c_{t+s}^{bond,peg}\right]^{1-\sigma}}{1-\sigma}$$

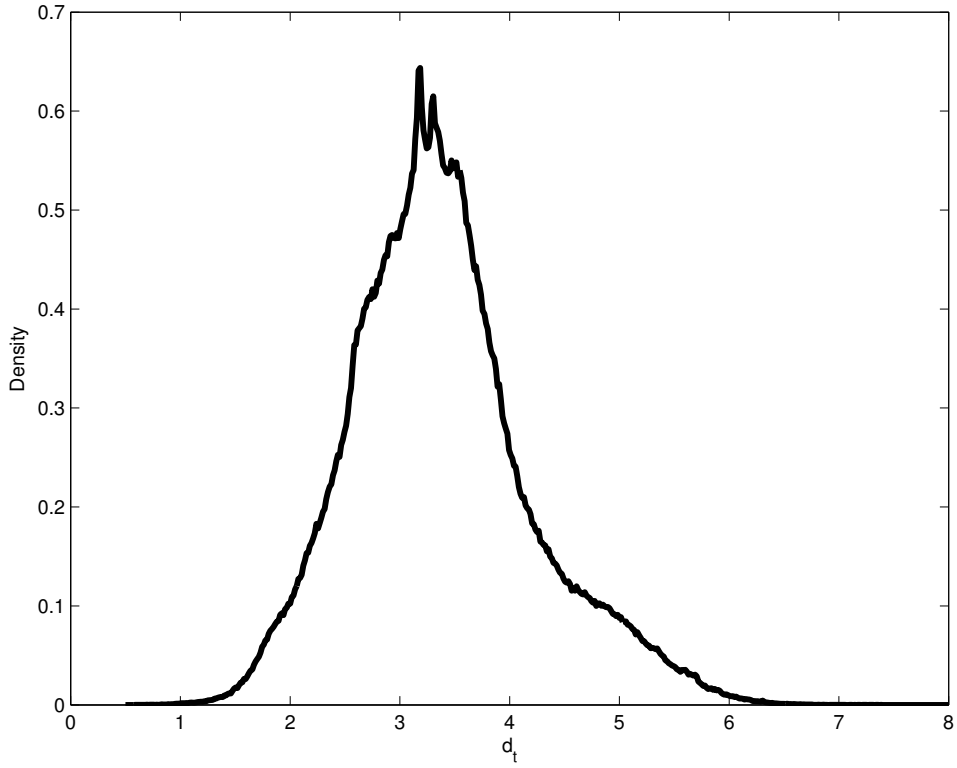
$s_t \equiv (y_t^T, r_t, d_t, w_{t-1}) = (\mathbb{E}y^T, \mathbb{E}r, 0, w^{flex})$ Initial State of the Economy

	Initial Debt
	$d_0 = 0$
Welfare Cost of Autarky for Peggers (percent of c_t)	-0.7

Result: Peggers might be better off closing the current account.

Why Are Peggers Better Off in Autarky?

Distribution of External Debt Under a Currency Peg



Answer: Because debt exacerbates the pecuniary externality.

The Welfare Cost of Autarky for Indebted Peggers
Should Indebted Peggers Restrict Capital Flows?

Redefinition of Autarky

$$c_t^T = y_t^T - \frac{r_t}{1+r_t}\bar{d} \quad (\Rightarrow \text{ current account} = 0 \text{ for all } t)$$

Set $\bar{d} = \mathbb{E}d_t^{bond,peg} = 3.38$

	Initial Debt	
	$d_0 = 0$	$d_0 = \mathbb{E}d_t^{bond,peg}$
Welfare Cost of Autarky for Peggers (percent of c_t)	-0.7	0.9

Result: Indebted Peggers might be better off opening the current account.

The Welfare Costs of Pegs Vis-à-Vis The Optimal Policy

	Welfare Cost (percent of c_t)		
Financial Structure	Unconditionally	$d_0 = 0$	$d_0 = \mathbb{E}(d_t^{bond,peg})$
Autarkic Economy	6.5	3.7	10.0
One-Bond Economy	12.3	5.4	9.6

Results

• The welfare costs of currency pegs vis-à-vis the optimal policy are enormous.

• Central banks have greater incentives to abandon a peg in financially open economies than in financially closed economies.

Conclusions

- Currency pegs create negative pecuniary externalities

- Low-debt peggers might be better off closing the current account.

- High-debt peggers might be better off opening the current account.

- The welfare costs of currency pegs vis-à-vis the optimal policy are enormous.

- Central banks have greater incentives to abandon a peg in financially open economies than in financially closed economies.

EXTRAS

Optimal Exchange-Rate Policy

Set the (gross) devaluation rate, $\epsilon_t = E_t/E_{t-1}$, to eliminate unemployment:

$$\epsilon_t \equiv \max\left\{1, \frac{\gamma W_{t-1}/E_{t-1}}{\omega(c_t^T)}\right\}$$

where $\omega(c_t^T)$ denotes the full-employment real wage:

$$\omega(c_t^T) \equiv \frac{A_2(c_t^T, F(\bar{h}))}{A_1(c_t^T, F(\bar{h}))} F'(\bar{h}); \quad \omega'(c_t^T) > 0$$

Dynamics Under Optimal Exchange Rate Policy

$$v^{OPT}(y_t^T, r_t, d_t) = \max_{\{d_{t+1}, c_t^T\}} \left\{U(A(c_t^T, F(\bar{h})) + \beta \mathbb{E}_t v^{OPT}(y_{t+1}^T, r_{t+1}, d_{t+1})\right\}$$

subject to $d_{t+1} \leq \bar{d}$ and

$$y_t^T + \frac{d_{t+1}}{1 + r_t} = d_t + c_t^T$$

Currency Pegs

Set the (gross) devaluation rate to unity:

$$\epsilon_t = 1.$$

- **Implied labor allocation**

$$h_t \begin{cases} = & \bar{h} & \text{if } \omega(c_t^T) \geq \gamma \frac{W_{t-1}}{E_{t-1}} \\ \text{solves} & \frac{A_N(c_t^T, F(h_t))}{A_T(c_t^T, F(h_t))} F'(h_t) = \gamma \frac{W_{t-1}}{E_{t-1}} & \text{if } \omega(c_t^T) < \gamma \frac{W_{t-1}}{E_{t-1}} \end{cases}$$

  - **Disequilibrium dynamics** cannot be expressed as the solution to a Bellman equation.

  - **Solution Method:** Iteration of disequilibrium conditions over the (discretized) 4-dimensional state space $\{y_t^T, r_t, d_t, w_{t-1}\}$.

Nominal Wage Rigidity and the Great Depression:

The Gold Standard Hypothesis (Eichengreen and Sachs, 1985)

Countries that left gold early enjoyed much more rapid recoveries than those that stayed on gold. This difference in performance was associated with earlier reflation of price levels in the countries leaving gold

Gold Bloc: France, Belgium, Netherlands, Italy

Sterling Bloc (left gold early, 1931) : United Kingdom, Denmark, Finland, Sweden, Norway

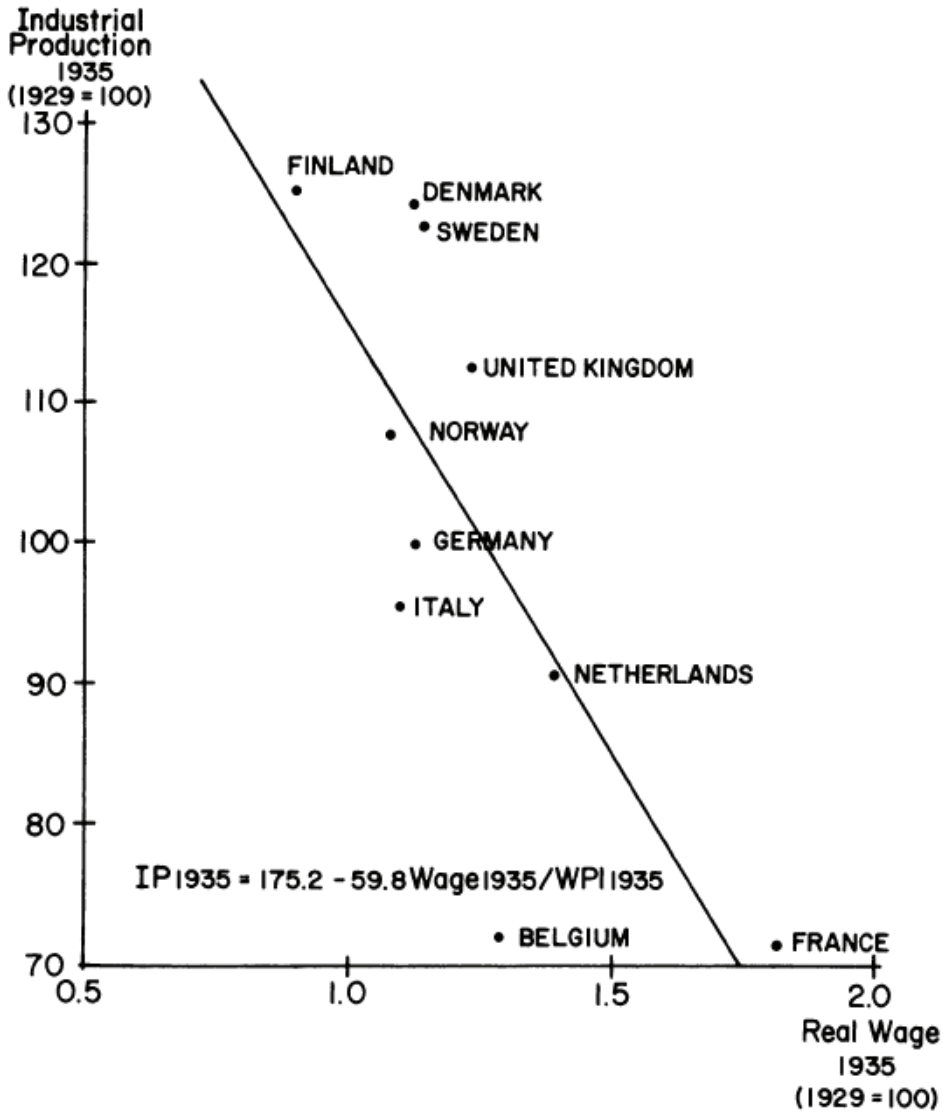


FIGURE 2
CHANGES IN REAL WAGES AND INDUSTRIAL PRODUCTION, 1929–1935

Probability of Decline, Increase, or No Change in Nominal Wages Between Interviews

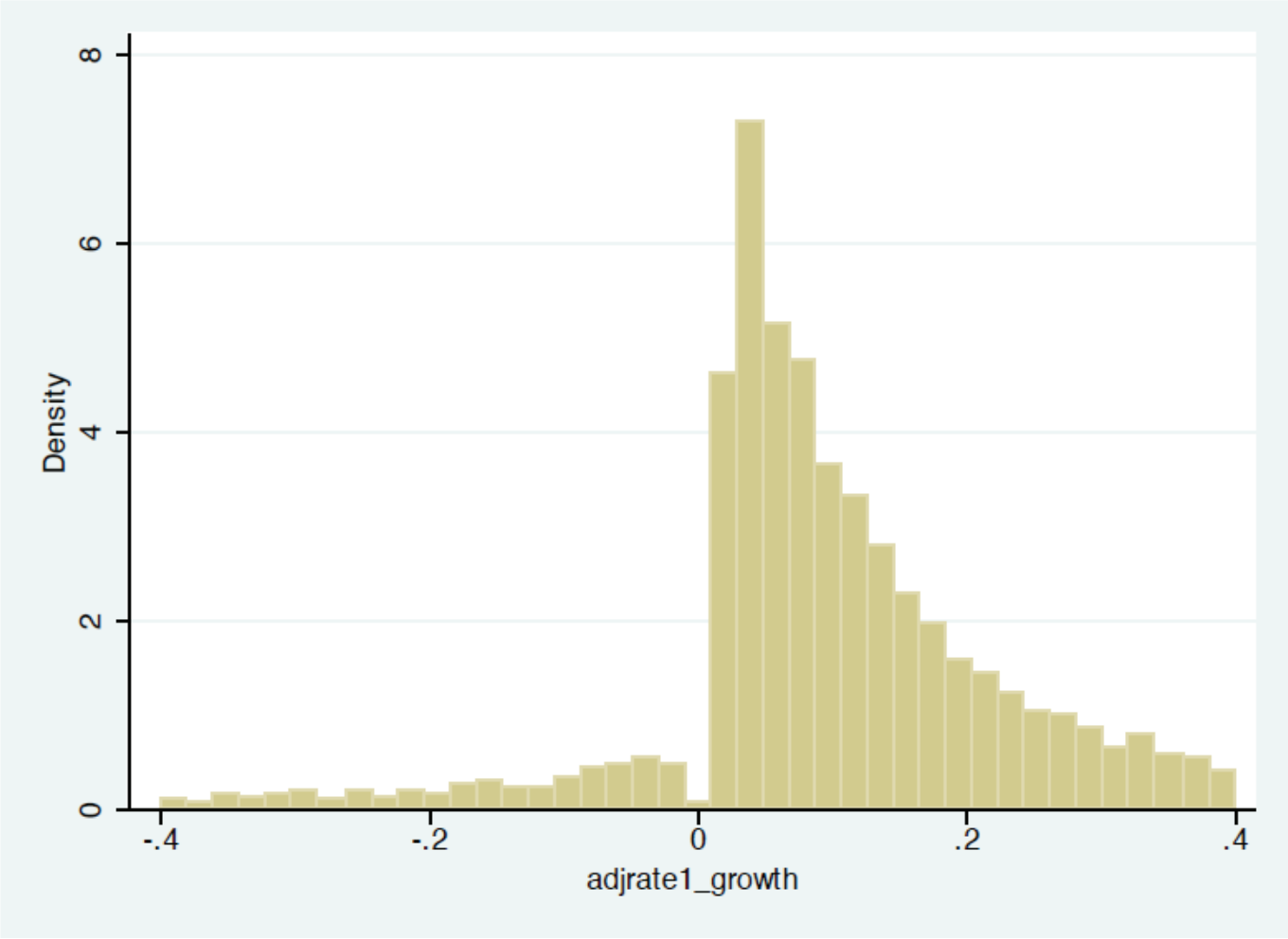
U.S. data, SIIP panel 1986-1993, within-job changes

	Interviews 1 Year apart		Interviews 4 months apart	
	Males	Females	Males	Females
Decline	5.1%	4.3%	2%	1.5%
Constant	53.7%	49.2%	85.8%	84.9%
Increase	41.2%	46.5%	12.3%	13.6%

Source: Gottschalk (2005)

Note. Male and female hourly workers not in school, 18 to 55 at some point during the panel. All nominal-wage changes are within-job wage changes, defined as changes while working for the same employer.

Distribution of Non-Zero Wage Changes, Hourly Workers, 1996 F

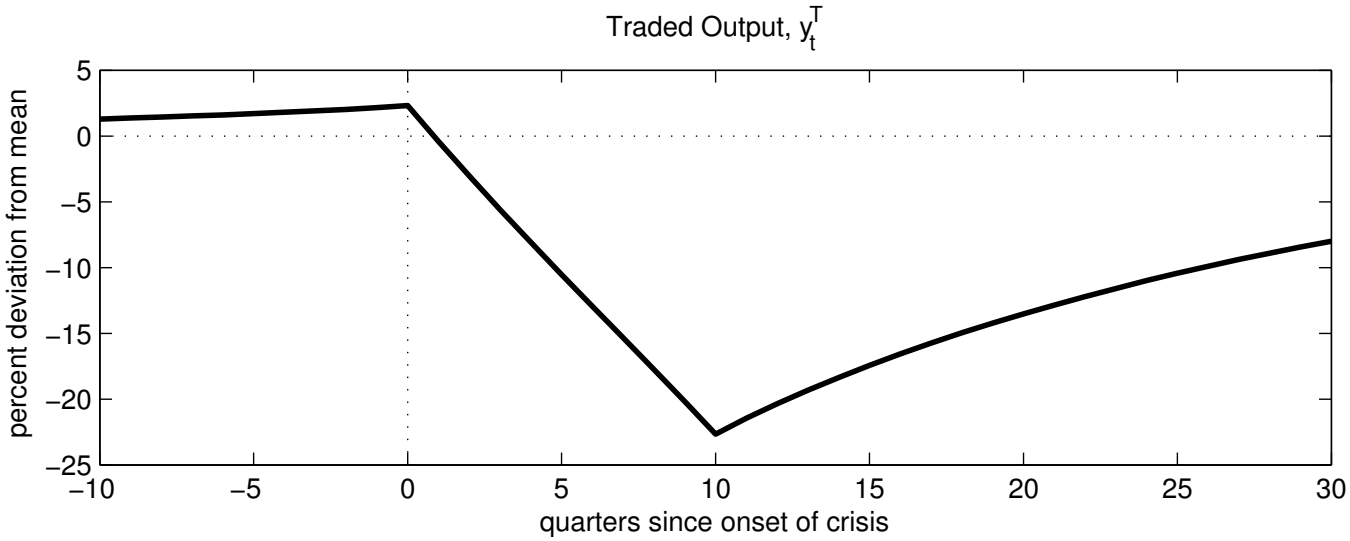


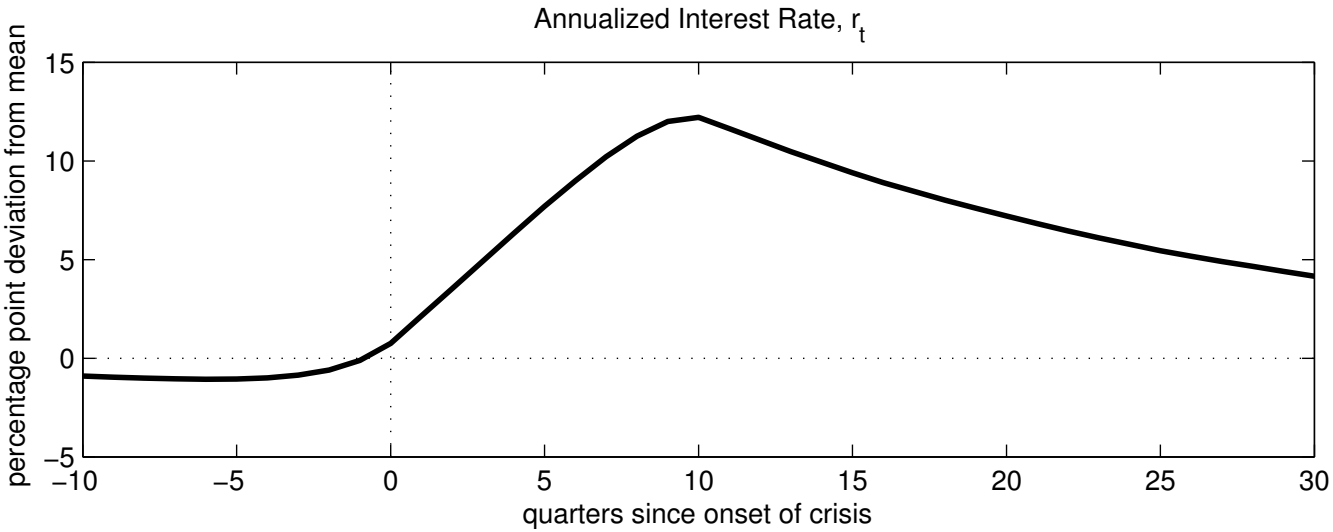
Quarterly, 1996-99. Source: Barattieri, Basu, and Gottschalk (2010)

Traded Output in Argentina 1983:Q1-2008:Q3

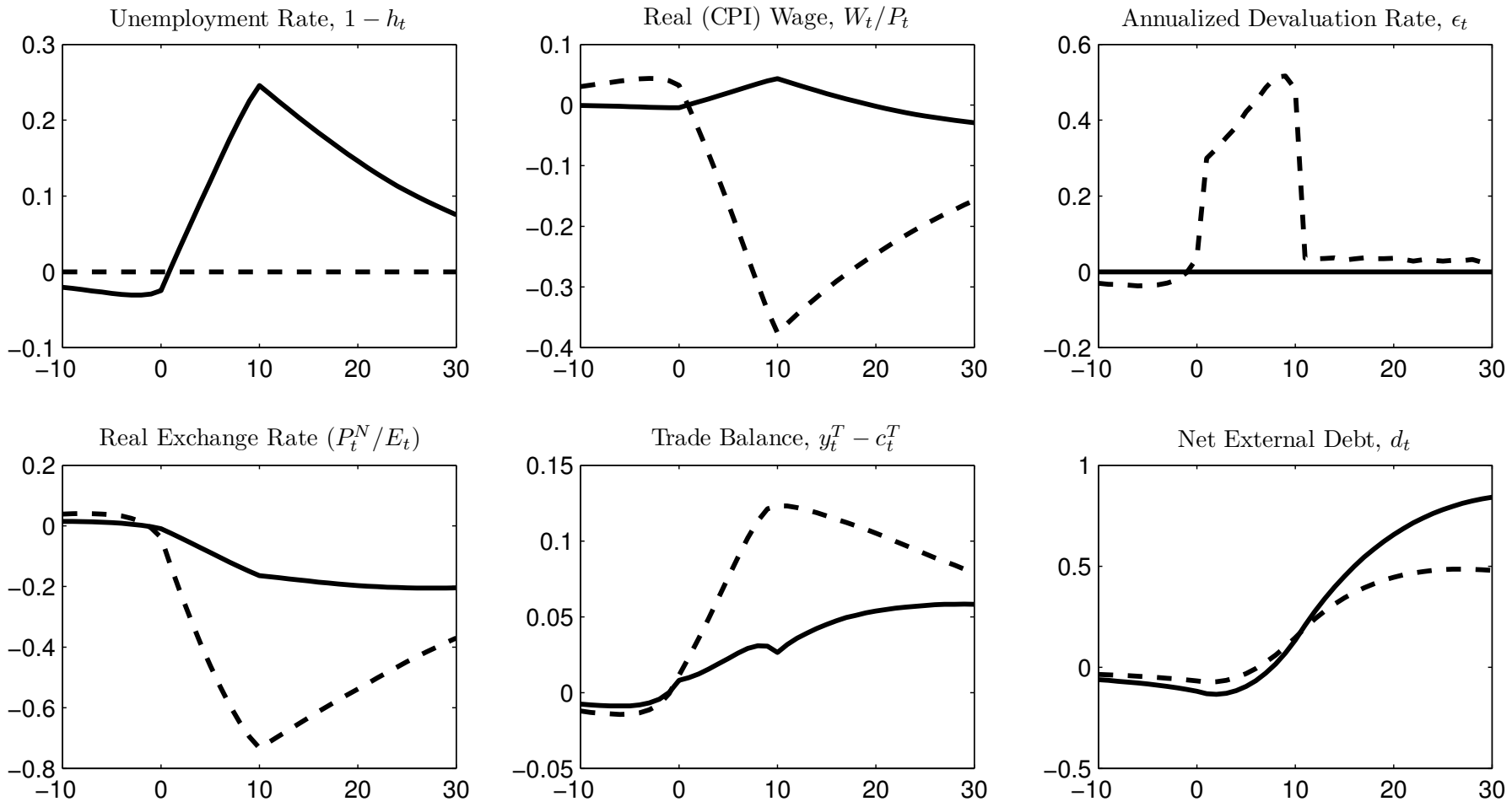
Note. Detrended and seasonally adjusted.

The Origin of a Crisis

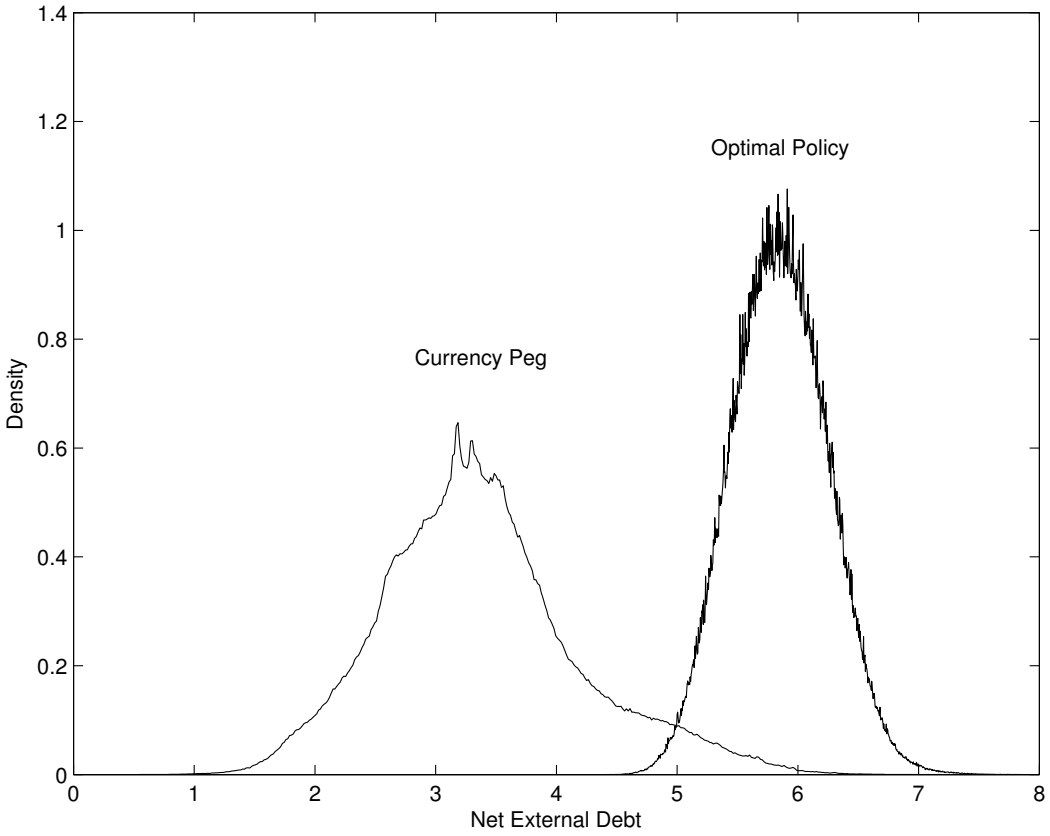




The Dynamics of a Crisis



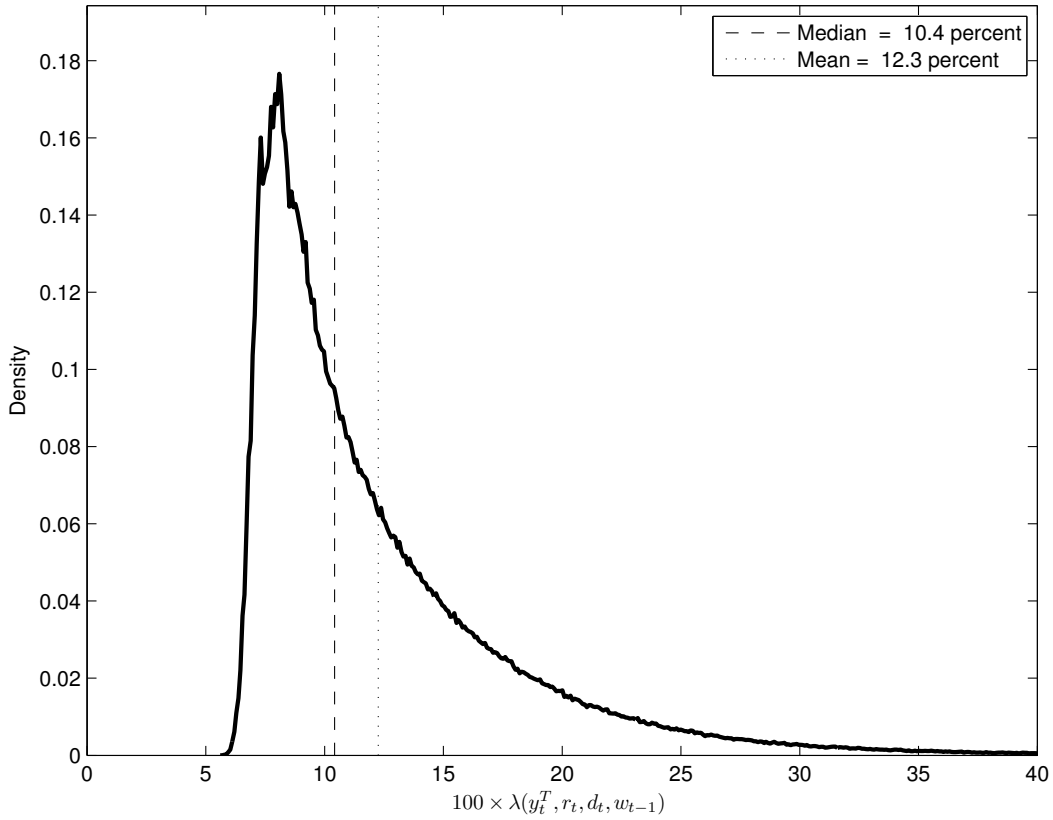
The Distribution of External Debt



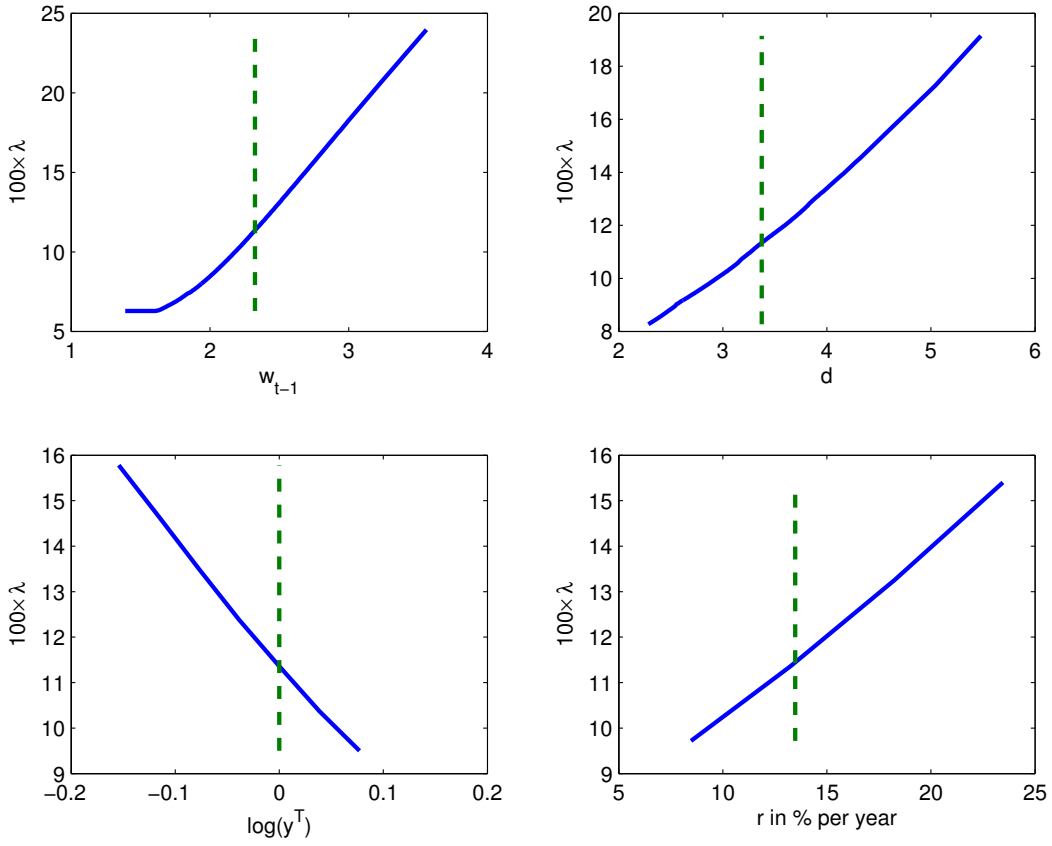
The Welfare Cost of Currency Pegs

$$\mathbb{E}\left\{\sum_{t=0}^{\infty}\beta^t U\left(c_t^{\text{peg|bond}}(1+\lambda^{\text{peg|bond}}(s_0))\right)\middle| s_0\right\} = \mathbb{E}\left\{\sum_{t=0}^{\infty}\beta^t U\left(c_t^{\text{opt|bond}}\right)\middle| s_0\right\}$$

where $s_0 = \{y_0^T, r_0, d_0, w_{-1}\}$.

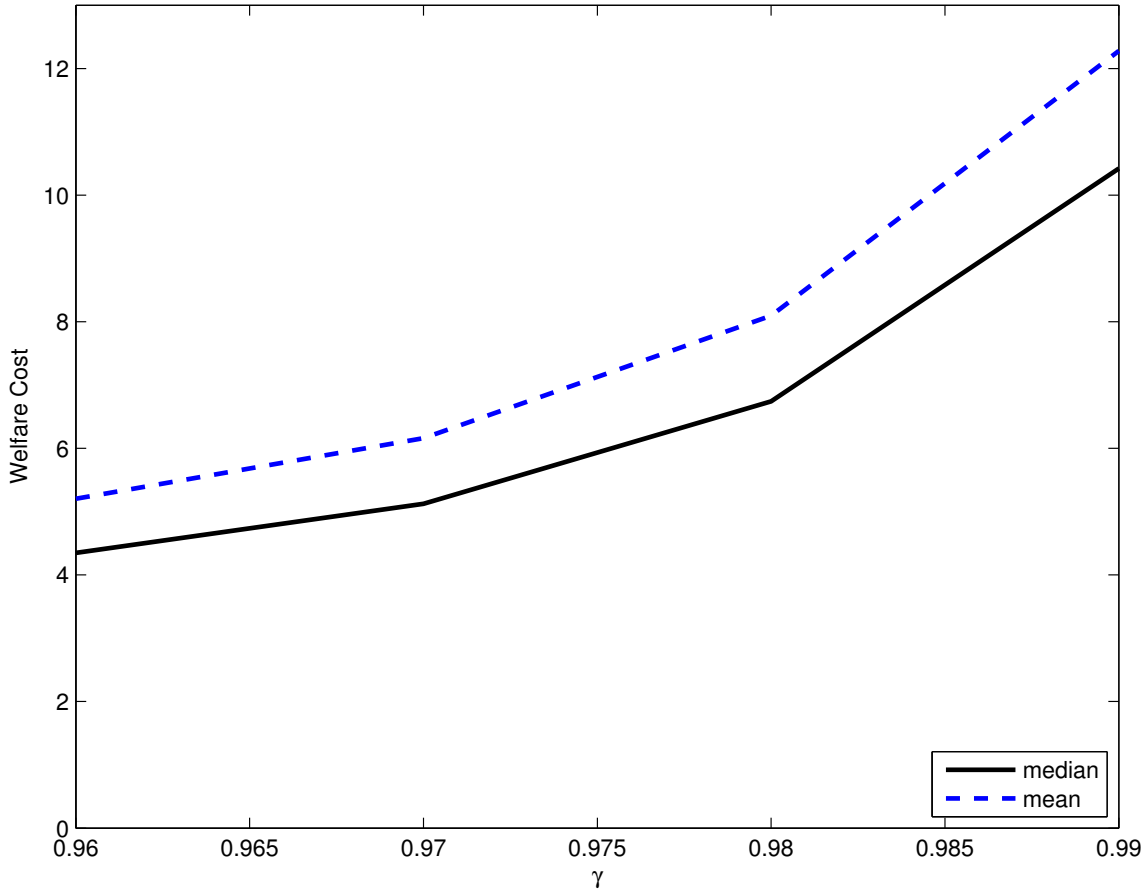


Welfare Cost of Currency Pegs as a Function of the State Variables



Note. All states except the one shown on the horizontal axis are fixed at their unconditional means. Dashed lines indicate the mean of the state displayed on the horizontal axis.

Sensitivity Analysis (I)
The Welfare Costs of Pegs As a Function of γ



Sensitivity Analysis (II)
Endogenous Labor Supply

$$U(c_t, h_t) = \frac{c_t^{1-\sigma} - 1}{1-\sigma} + \varphi \frac{(\bar{h} - h_t)^{1-\theta} - 1}{1-\theta}$$

		Welfare Cost	
θ	$E\frac{\bar{h}-h_t}{h_t\theta}$	Median	Mean
1.001	3.1	4.5	6.2
6	0.20	6.8	8.6

$\bar{h} = 3$, $\varphi = 4.4$.

Sensitivity Analysis (III)

Parameterization	Welfare Cost of a Peg	
	Median	Mean
Baseline	10.4	12.3
Higher patience ($\beta = 0.945$)	8.0	9.2
Higher intratemp. elast. subst. ($\xi = 0.88$)	8.6	10.8
Higher intertemp. elast. subst. ($\sigma = 2$)	9.9	10.8

Inducing the Efficient Allocation Through Fiscal Policy

- Maintain the peg (i.e., set $\epsilon_t = 1$).

- Subsidize wages at the rate, τ_t, when real wage is 'too high':

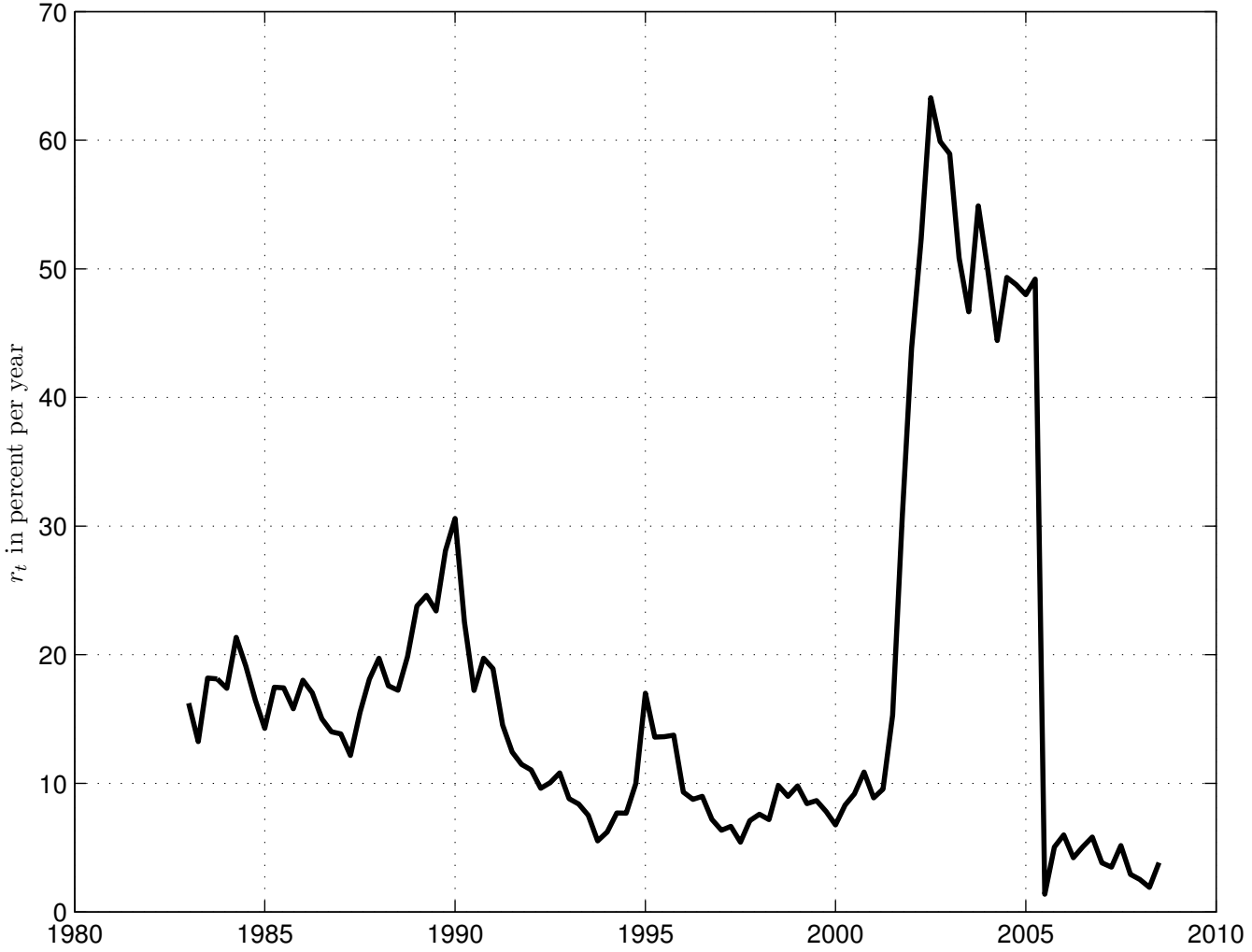
$$\tau_t = \max\left\{0, 1 - \frac{\omega(c_t^T)}{\gamma w_{t-1}}\right\},$$

$\omega(c_t^T)$ = flexible-wage real wage
$(1-\tau_t)w_t$ = wage rate faced by firms

- Observation I : The optimal policy calls for fiscal expansion (not austerity).

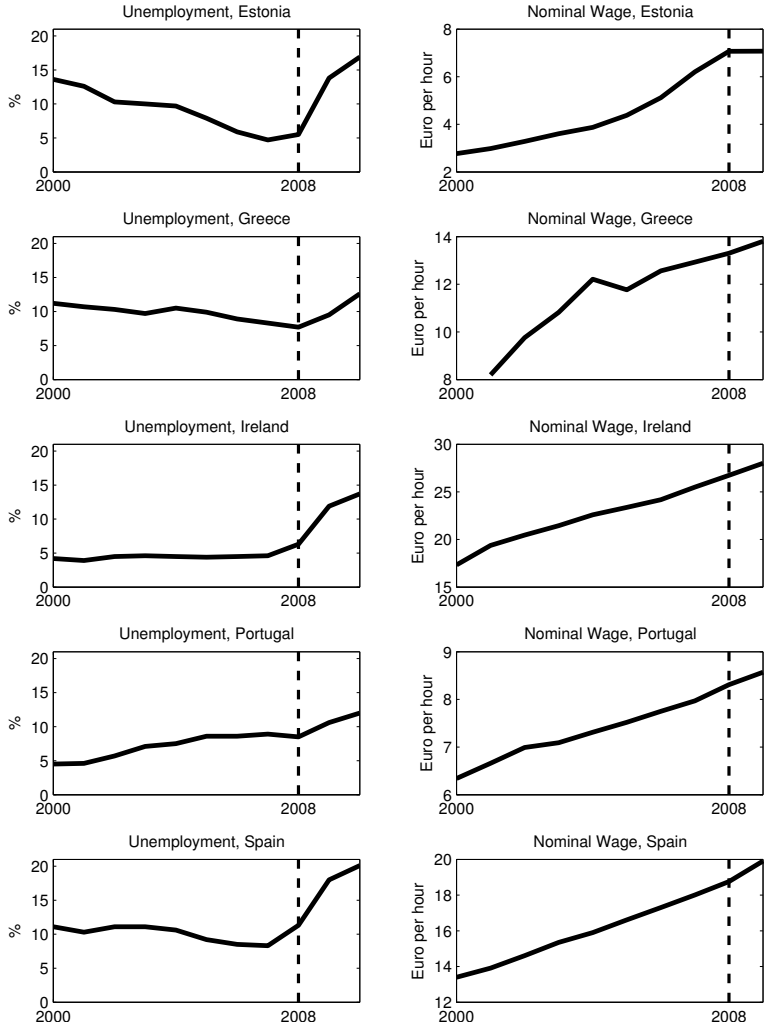
- Observation II: The optimal policy calls for facilitating the expenditure switch, not for widespread increases in public spending. (e.g., it would be counterproductive to expand public absorption of tradables).

Interest Rate in Argentina 1983:Q1-2008:Q3

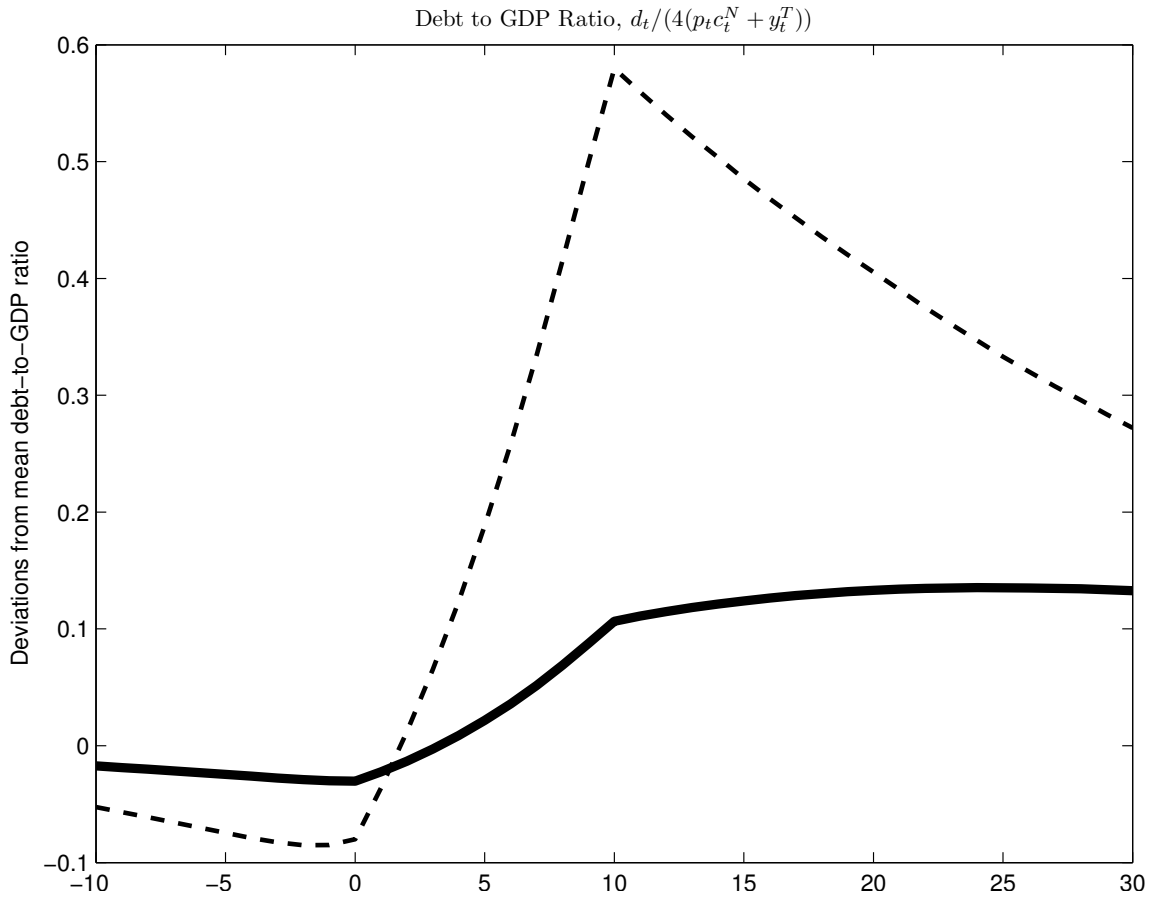


Note. EMBI+ plus US treasury rate minus US expected inflation. Percent per year

Unemployment and Nominal Wages in Peripherical Europe



The Debt-to-GDP Ratio During a Crisis



Currency Peg _ _ _ Optimal Exchange-Rate Policy