Prudential Policy For Peggers

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May 20, 2012

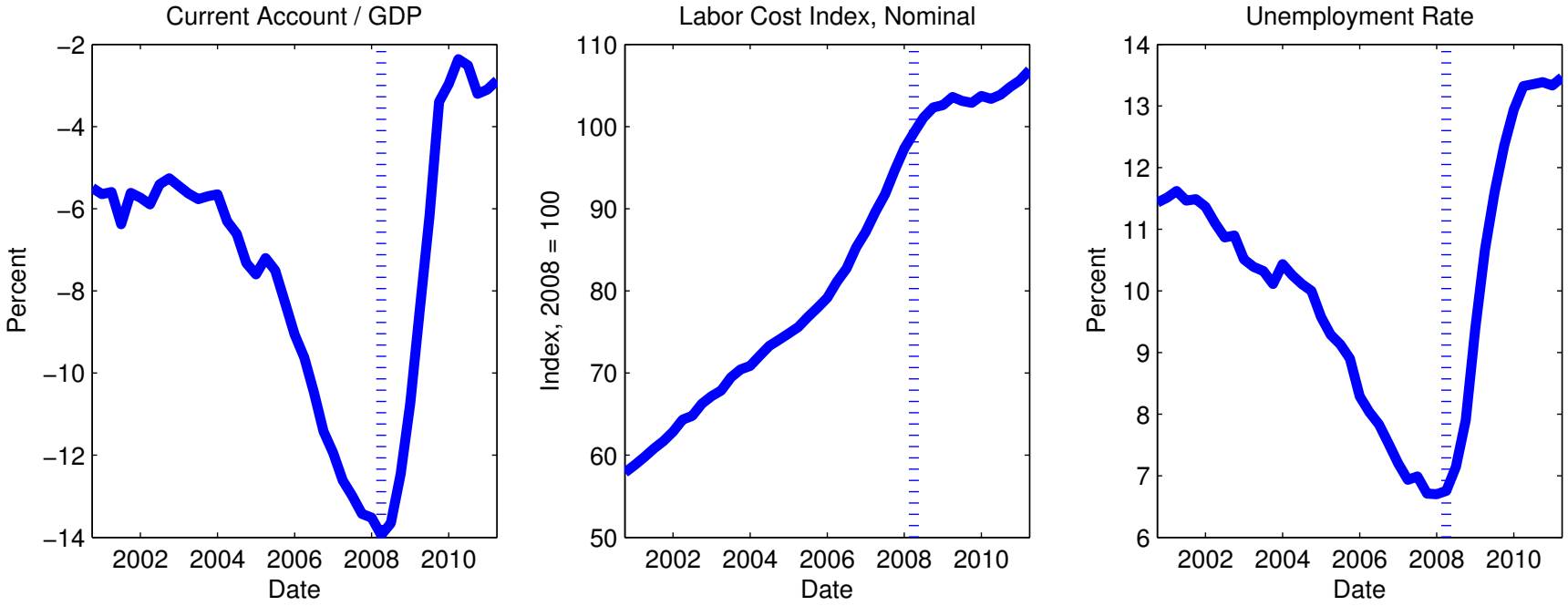
Motivation

- Typically, currency pegs are part of broader reform packages that include free capital mobility.

- For many countries, the combination of a fixed exchange rate and free capital mobility has been a mixed blessing.

- Example: The periphery of the eurozone. In the early 2000s, capital inflows fueled large increases in aggregate demand and real wages. After the crisis of 2008, capital inflows dried up, aggregate demand collapsed, but wages did not fall quickly enough, causing massive involuntary unemployment.

Boom-Bust Cycle in Peripheral Europe: 2000-2011



Data Source: Eurostat. Arithmetic mean of Bulgaria, Cyprus, Estonia, Greece, Lithuania, Latvia, Portugal, Spain, Slovenia, and Slovakia

Four Questions

(1) Are capital controls desirable?

(2) Is the optimal capital control policy prudential?

(3) How large are the welfare gains associated with the optimal capital control policy?

(4) What are the cyclical and long-run effects of optimal capital controls?

Goal of This Paper

Address these questions within an optimizing, dynamic, stochastic, quantitative model of an emerging economy with downward nominal wage rigidity.

Preview of Main Findings

• Downward wage rigidity and a fixed exchange rate call for **taxing capital Inflows.** The optimal tax rate on external debt can be as high as 2% per quarter on average.

• The **optimal capital control policy is prudential**: Capital inflows are taxed in good times and subsidized in bad times.

• **Large gains from capital controls**: they lower the average unemployment rate by 10 percentage points and increase welfare by an amount equivalent to 7 percent of consumption per period.

• **Peggers overborrow**: Under free capital mobility, the average level of external debt is twice as large as under optimal capital controls.

A Disequilibrium Model

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

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

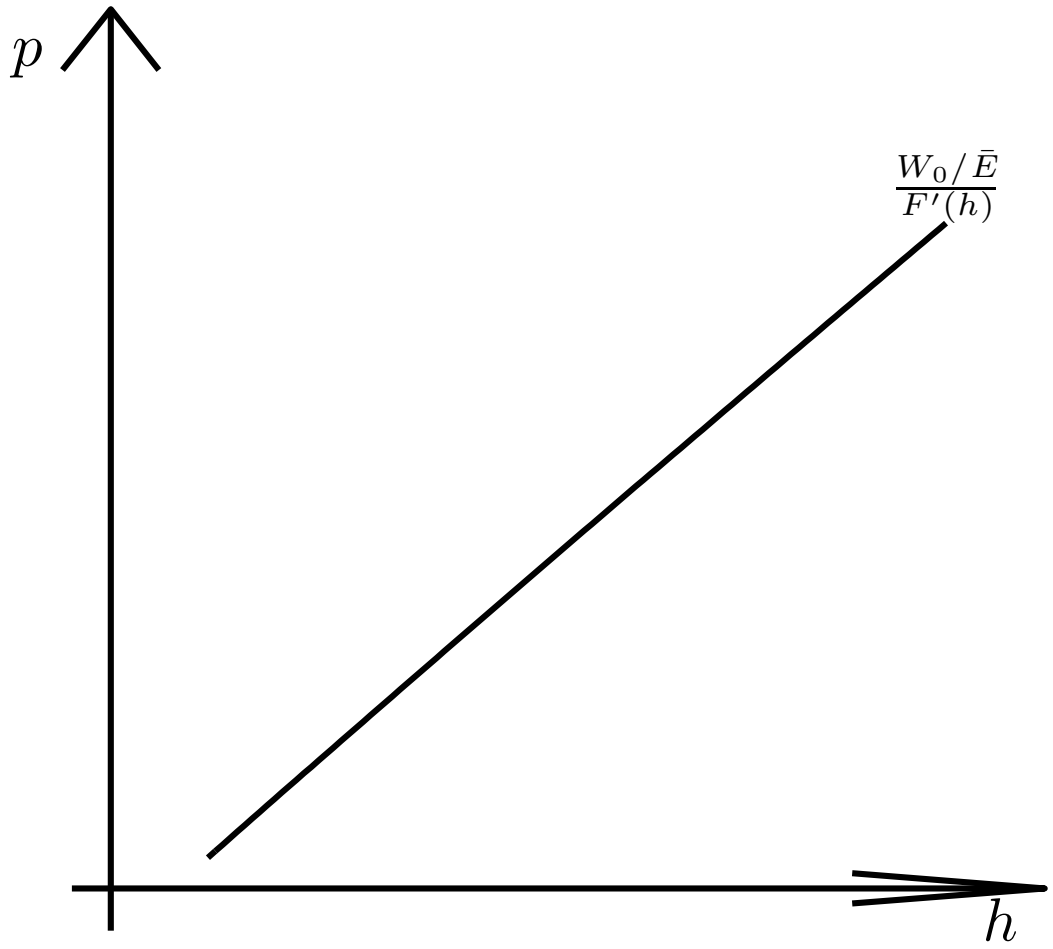
taking as given p_t and w_t.

$w_t \equiv W_t/E_t$ is the real wage in terms of tradables.

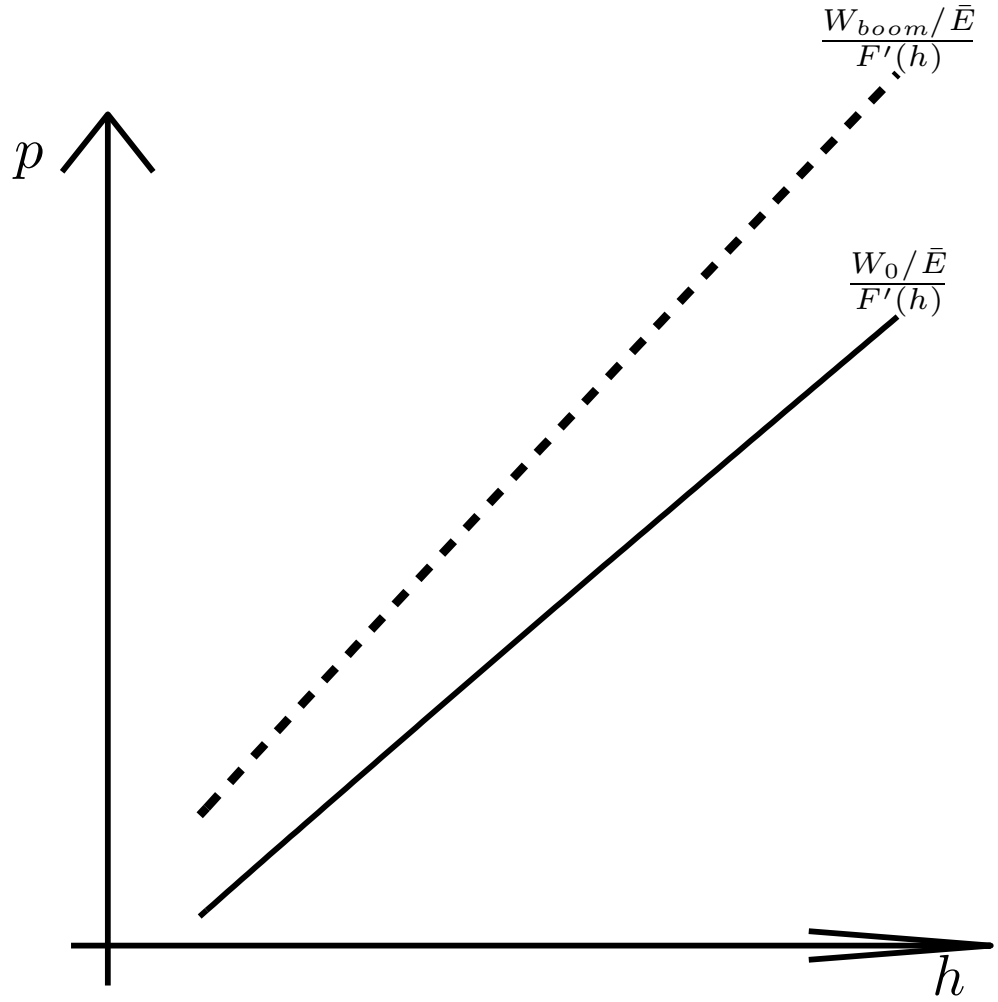
Optimality condition (or the Supply of Nontradables):

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

The Supply of Nontraded Goods



$W_t \uparrow$: A Wage Increase Shifts The Supply Schedule Up



$(W_{boom} > W_0)$

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

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

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

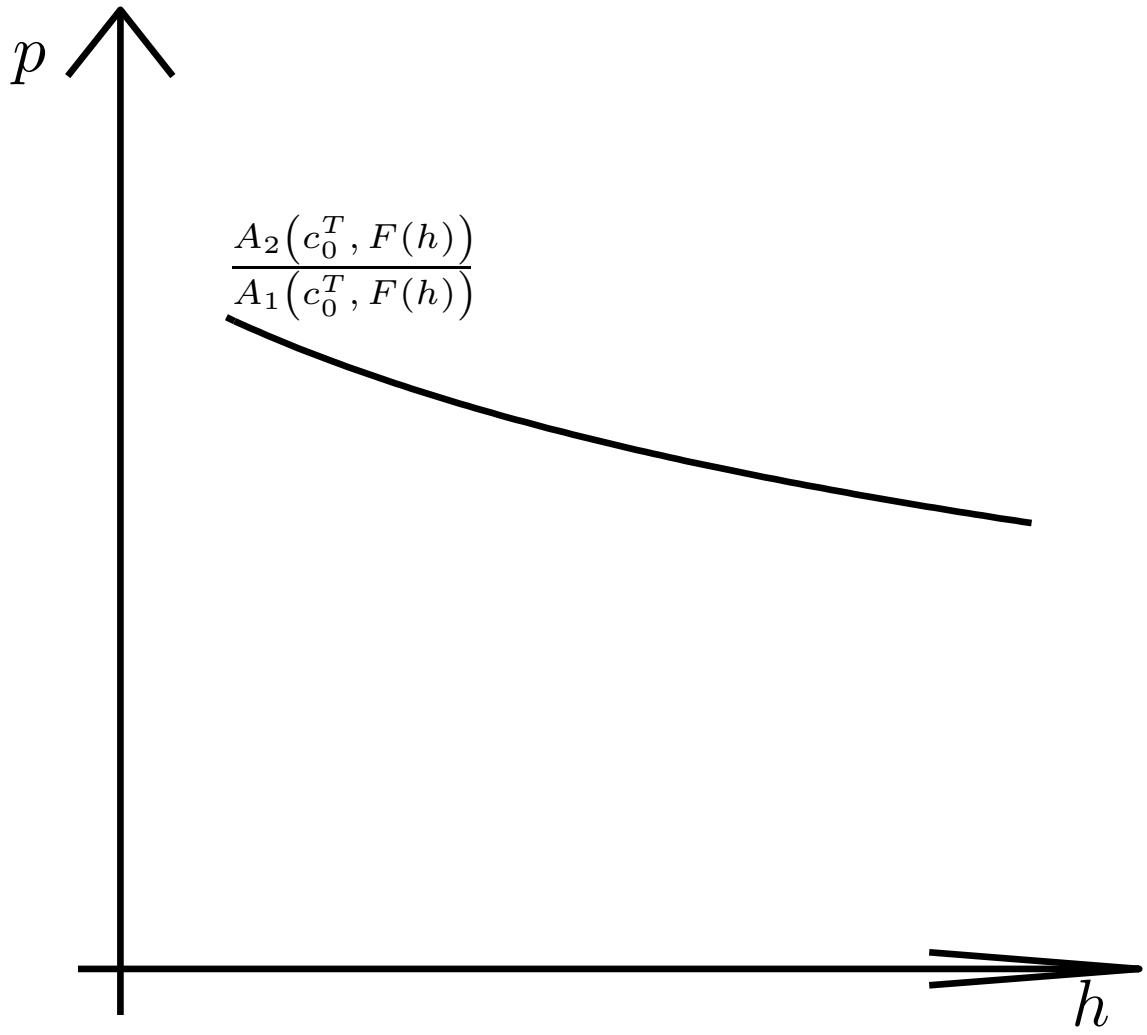
$$d_{t+1} \leq \bar{d}$$

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

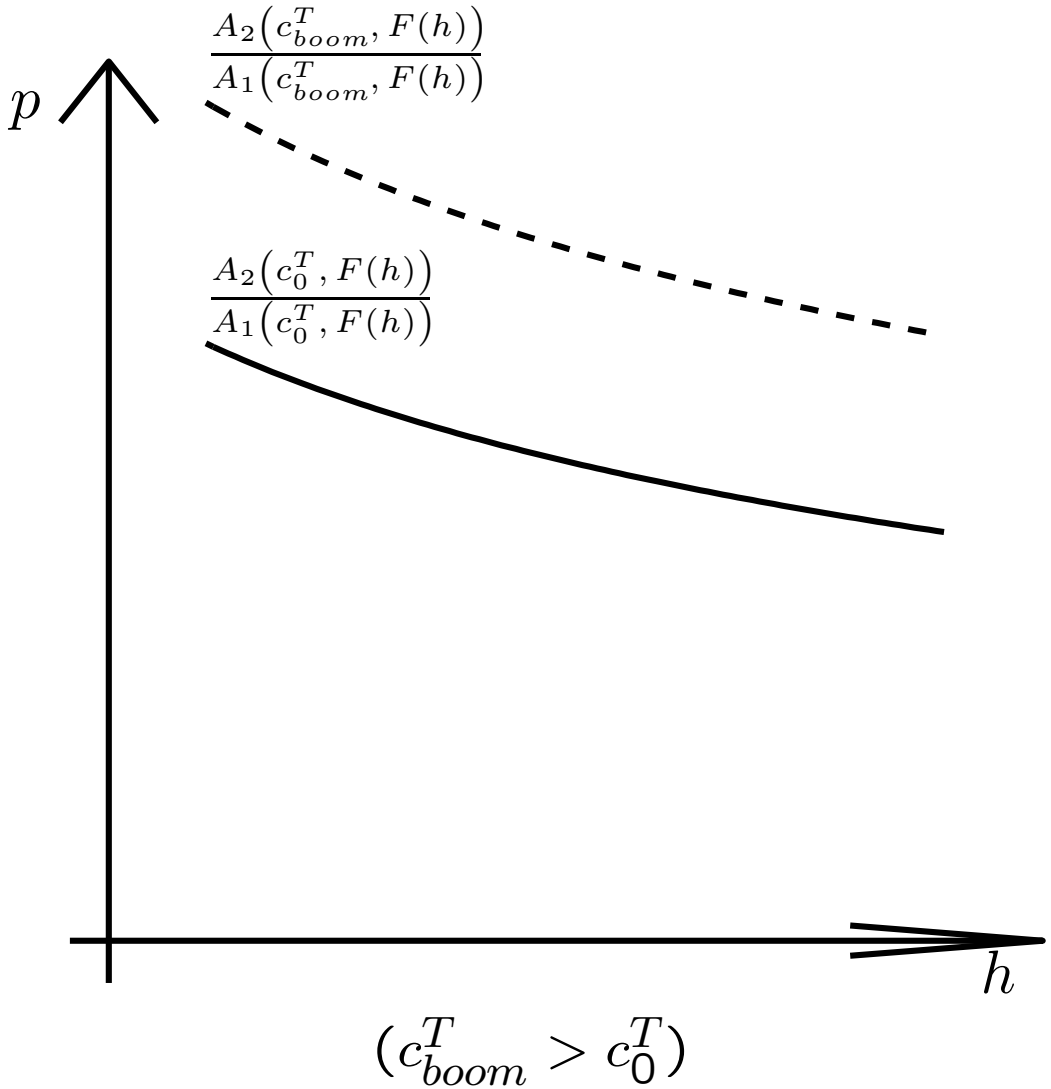
• One first-order condition (Demand for Nontradables):

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

The Demand for Nontraded Goods



$\mathbf{c_t^T \uparrow}$ Shifts the Demand Function Up



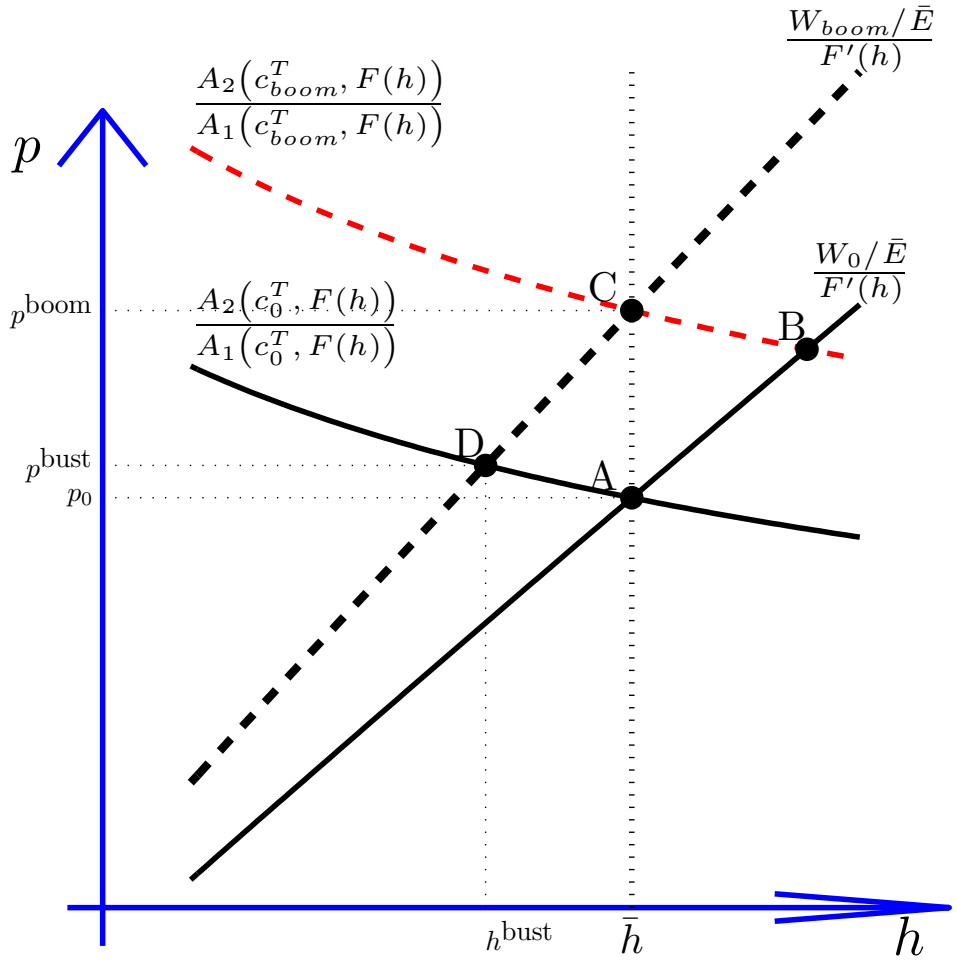
Disequilibrium in the Labor Market

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

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

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

Inefficient Boom-Bust Dynamics



$c^T_{boom} > c^T_0$ and $W_{boom} > W_0$

The Pecuniary Externality

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.

Optimal Capital Controls As A Ramsey Problem

$$\max \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(A(c_t^T, F(h_t)))$$

subject to

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

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

$$\frac{A_2(c_t^T, F(h_t))}{A_1(c_t^T, F(h_t))} F'(h_t) = w_t$$

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

$$w_t \geq \gamma w_{t-1}$$

Evidence on Downward Nominal Wage Rigidity

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

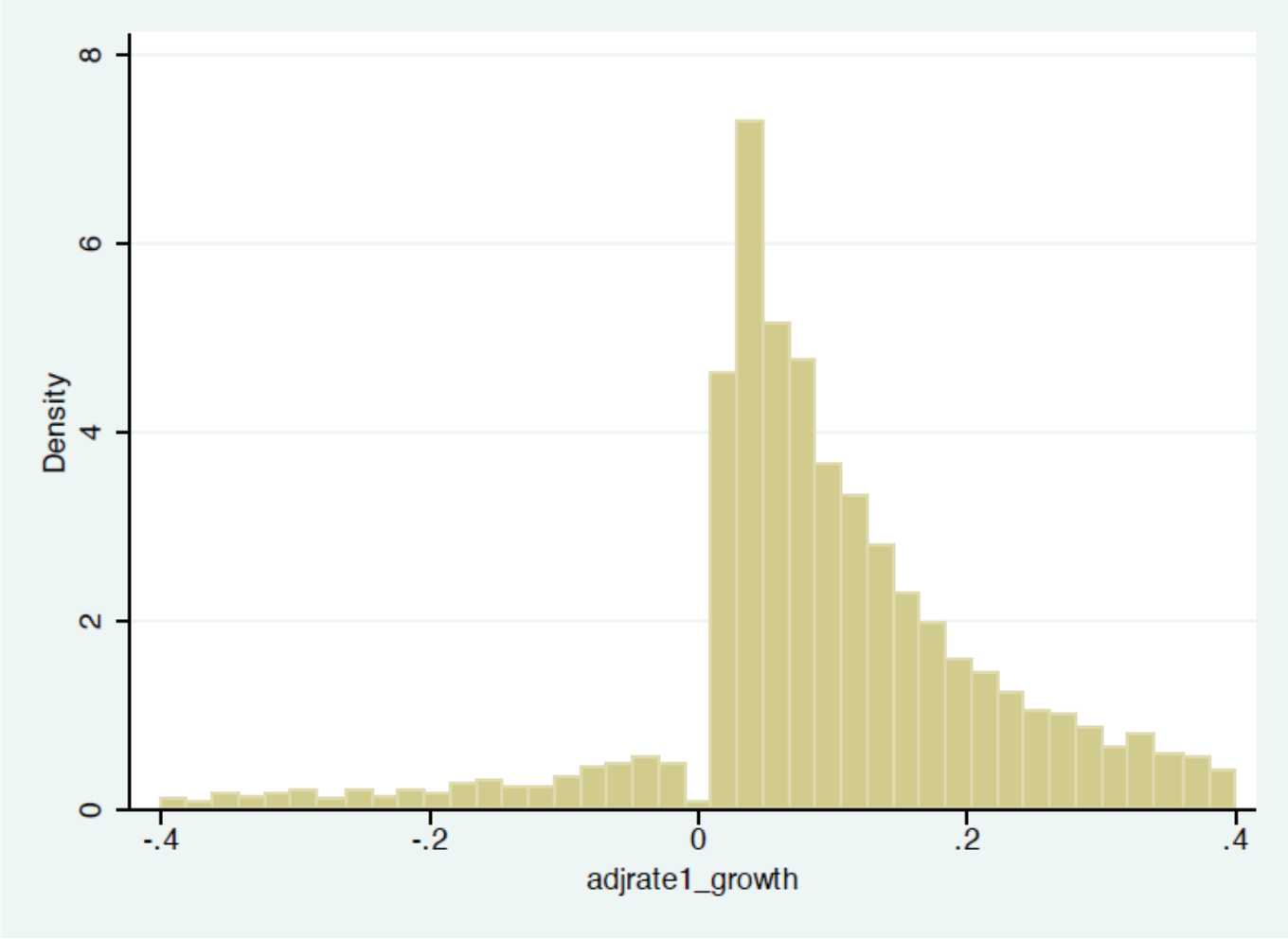
U.S. data, SIPP panel 1986-1993, within-job changes

	Interviews One Year apart	
	Males	Females
Decline	5.1%	4.3%
Constant	53.7%	49.2%
Increase	41.2%	46.5%

Source: Gottschalk (2005)

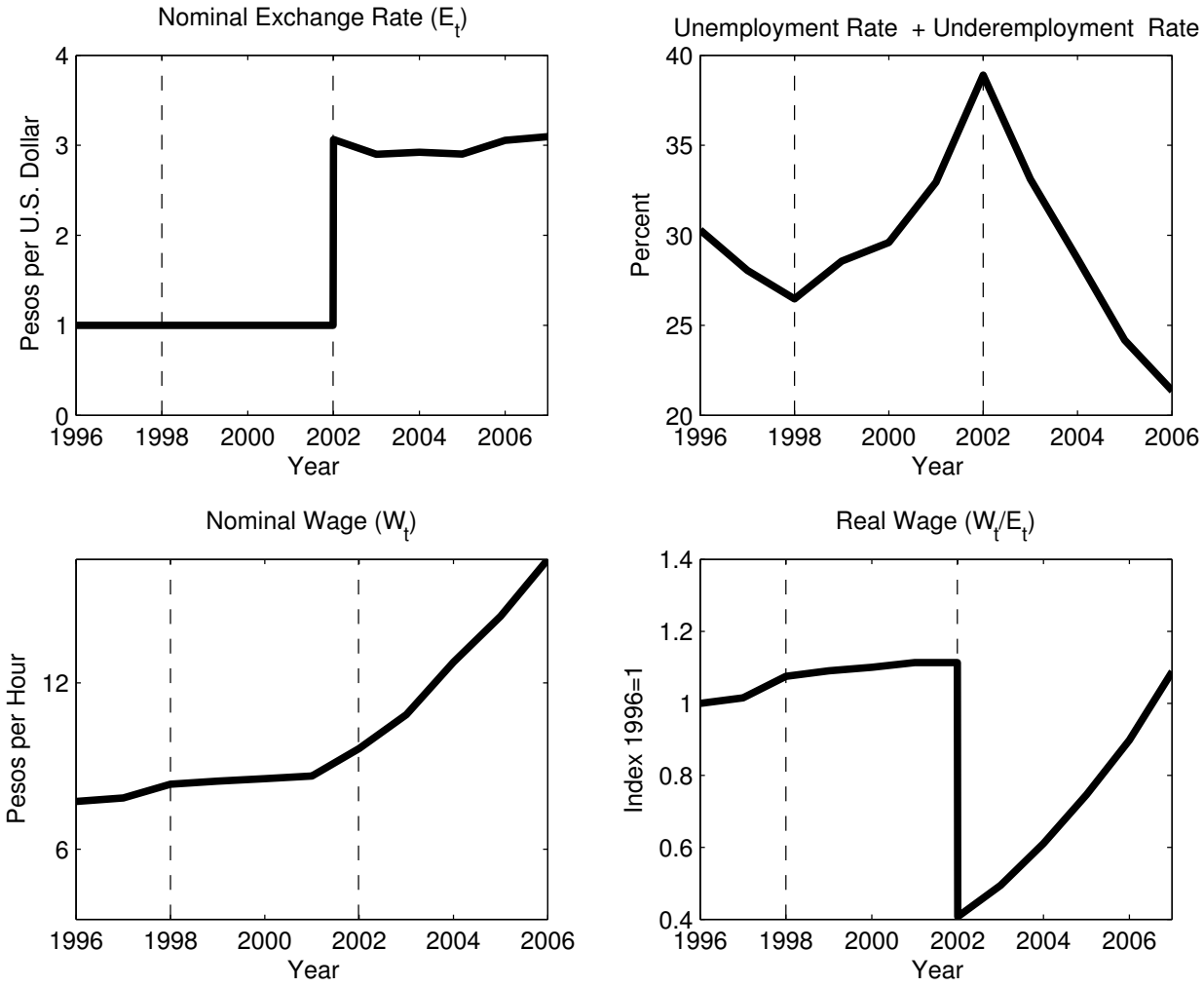
Note. Male and female hourly workers not in school, 18 to 55 at some point during the panel. All nominal-wage changes are within-job wage changes, defined as changes while working for the same employer.

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



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

Argentina 1996-2006



Implied Value of γ: Around unity.

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.

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

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

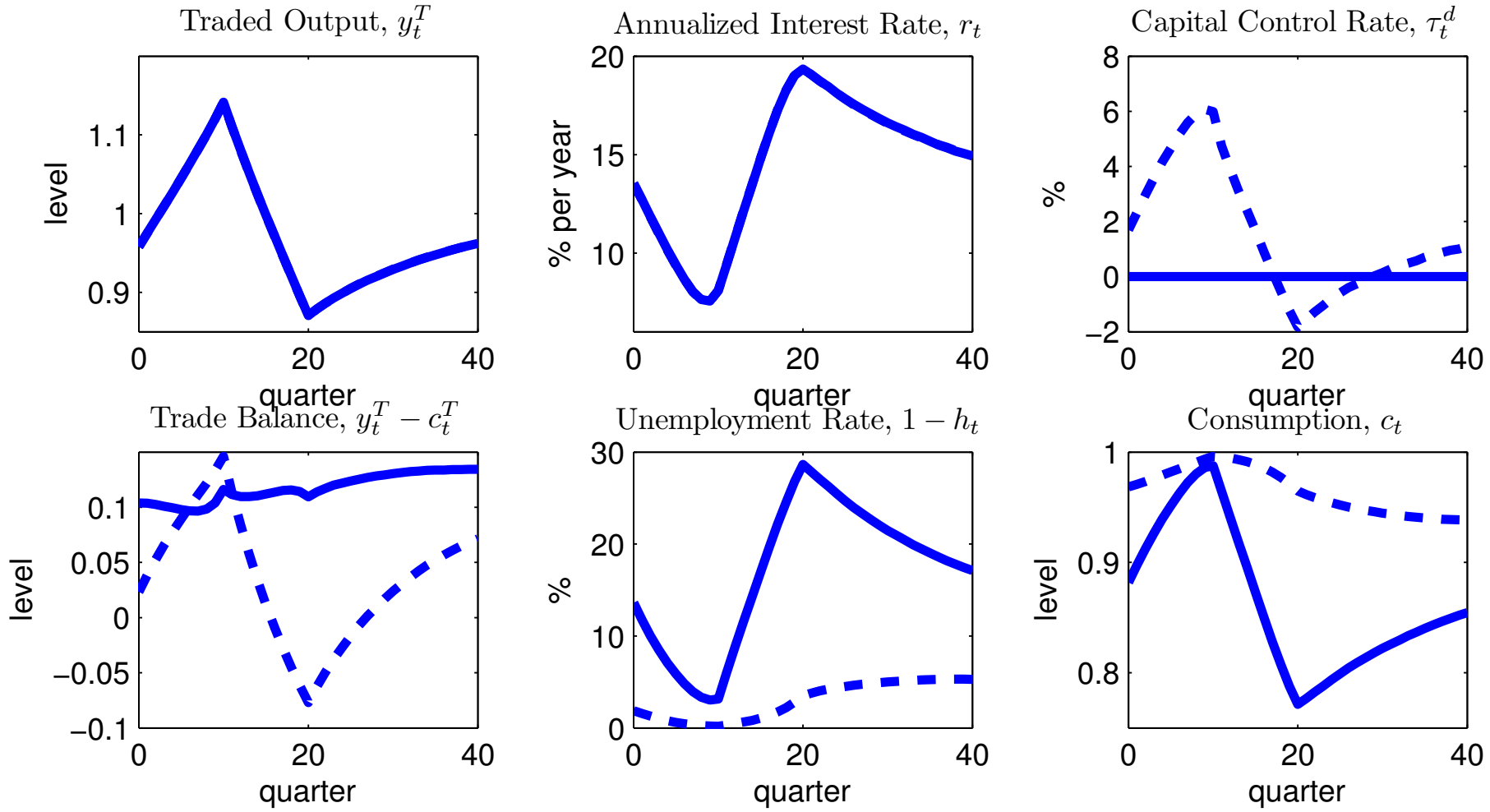
Solution Algorithms

- **Free Capital Mobility:** Policy function iteration.

- **Optimal Capital Control Policy:** Value function iteration.

- **Discretization of state space** $\{d_t, w_{t-1}, y_t^T, r_t\}$:
  - **External Debt,** d_t**:** 501 points.
  - **Real Wage,** w_{t-1}**:** 500 points.
  - **Traded Output,** y_t^T**:** 21 points.
  - **Interest Rate,** r_t**:** 11 points.

Boom-Bust Cycles With and Without Optimal Capital Controls



No Capital Controls

Optimal Capital Controls

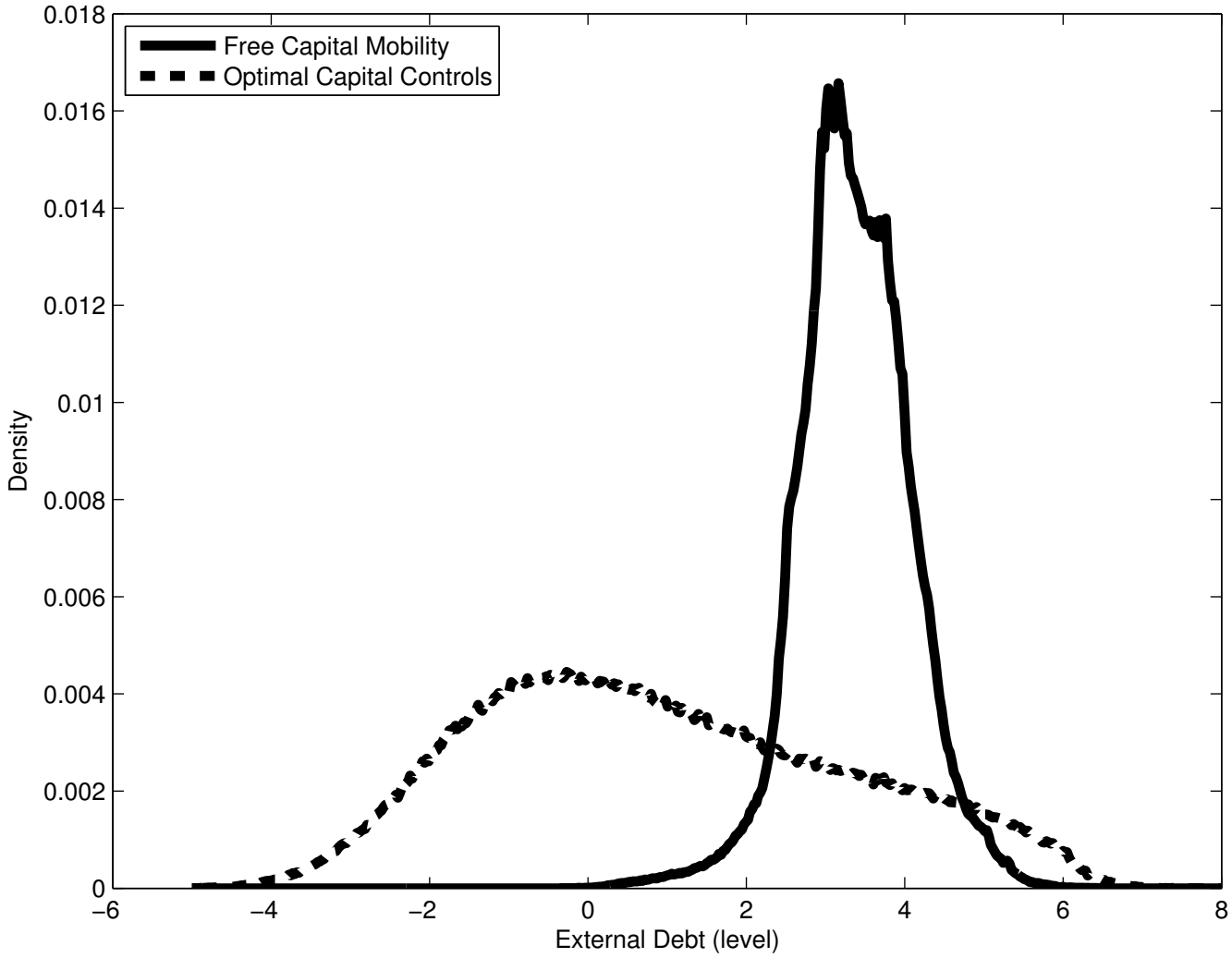
The Prudential Nature of Optimal Capital Controls

- Mean tax on external borrowing is 2.4% per quarter. This lowers the average level of external debt to half the value under free capital mobility.

- Corr(τ_t^d,y_t^T) = 0.5 $\Rightarrow$ capital control policy is prudential. This reduces the volatility of tradable absorption and the average level of unemployment.

- Mean unemployment is 13.5% under free capital mobility, but only 3.1% under optimal capital controls.

Peg-Induced Overborrowing



- Currency Pegs Cum Free Capital Mobility ⇒ <u>Overborrowing</u>

Welfare Costs of Free Capital Mobility For Peggers

Question: What is the compensation demanded by a household living in the economy with free capital mobility to be as well off as the household living in the economy with optimal capital controls?

Formally, find the random process $\lambda(y_t^T, r_t, d_t, w_{t-1})$ that solves

$$\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s U(c_{t+s}^{FCM}(1 + \lambda(y_t^T, r_t, d_t, w_{t-1}))) = \mathbb{E}_t \sum_{s=0}^{\infty} \beta^s U(c_{t+s}^{OCC}),$$

FCM=free capital mobility, and OCC=Optimal capital controls.

Answer: 7.5 percent of consumption per period.

$\Rightarrow$ For peggers, the welfare costs of free capital mobility are enormous.

Conclusions

- The combination of a currency peg and downward nominal wage rigidity creates a negative pecuniary externality.

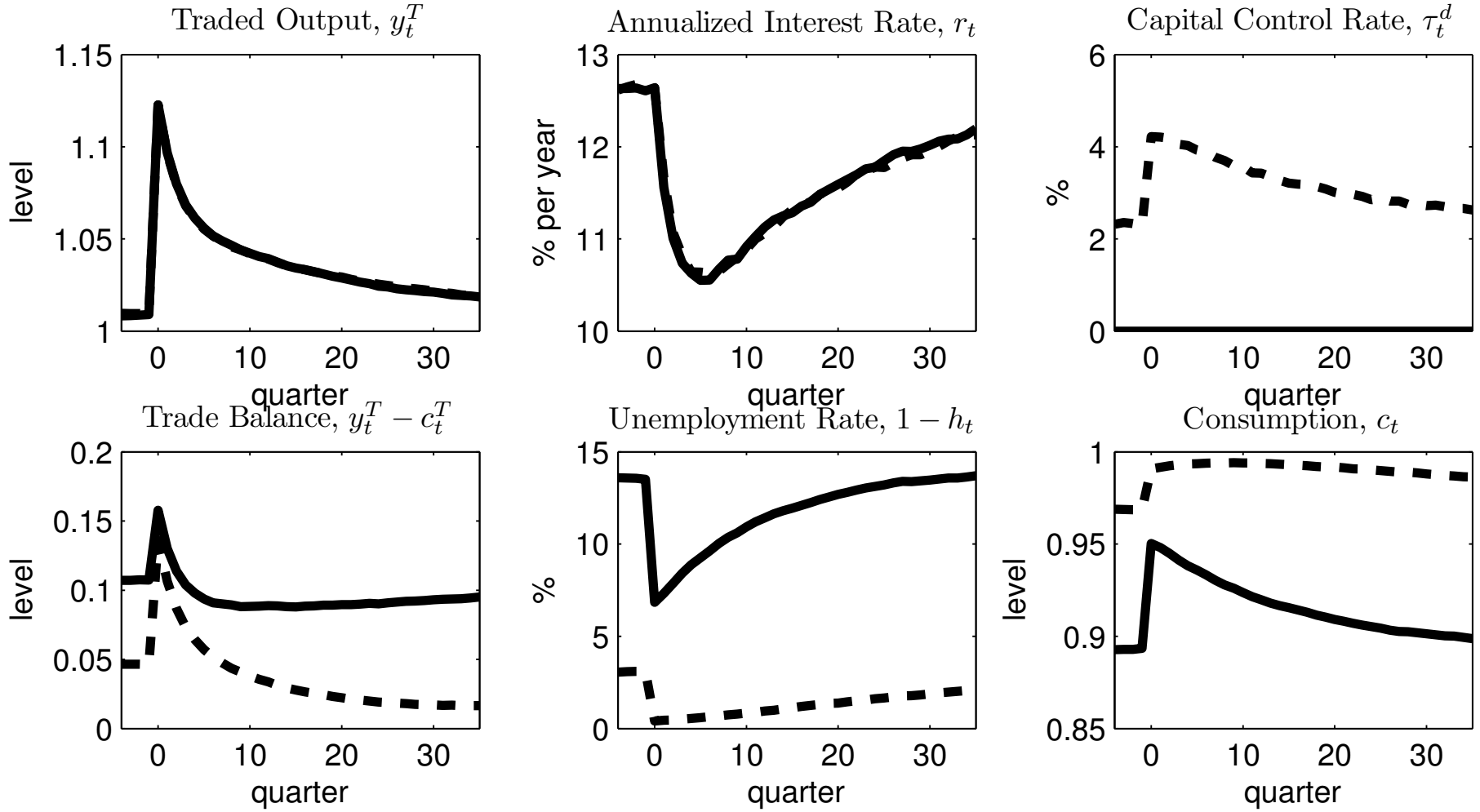
- Optimal capital control policy is prudential: Capital inflows are taxed in good times and subsidized in bad times.

- Large gains: Capital controls lower the average unemployment rate by 10 percentage points and increase welfare by an amount equivalent to 7 percent of consumption per period.

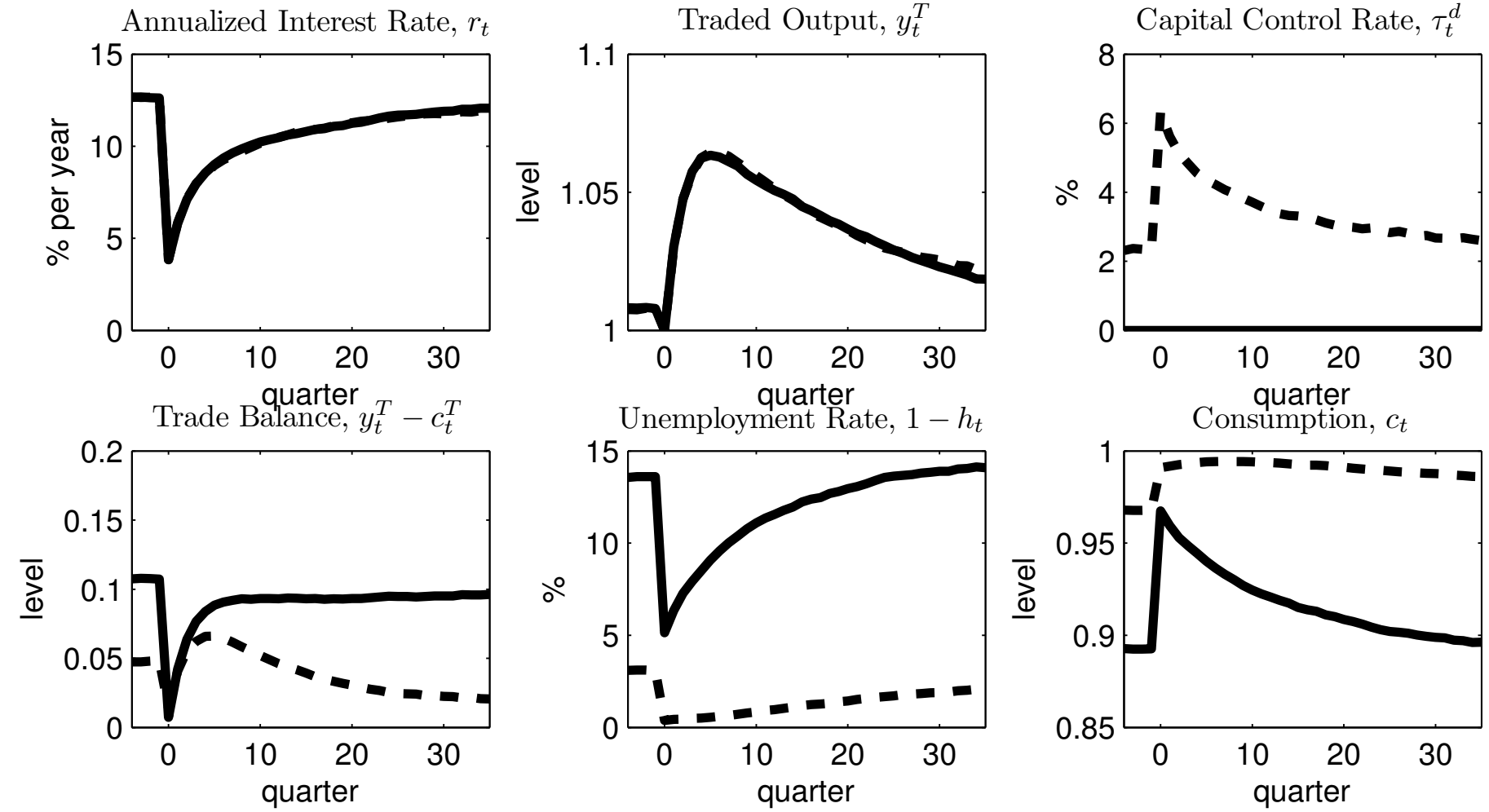
- Peggers overborrow. Under free capital mobility, the average level of external debt is twice as large as under optimal capital controls.

EXTRAS

Impulse Response To A One-Standard-Deviation Increase in Traded Output



Impulse Response To A One-Standard-Deviation Decline in The Interest Rate



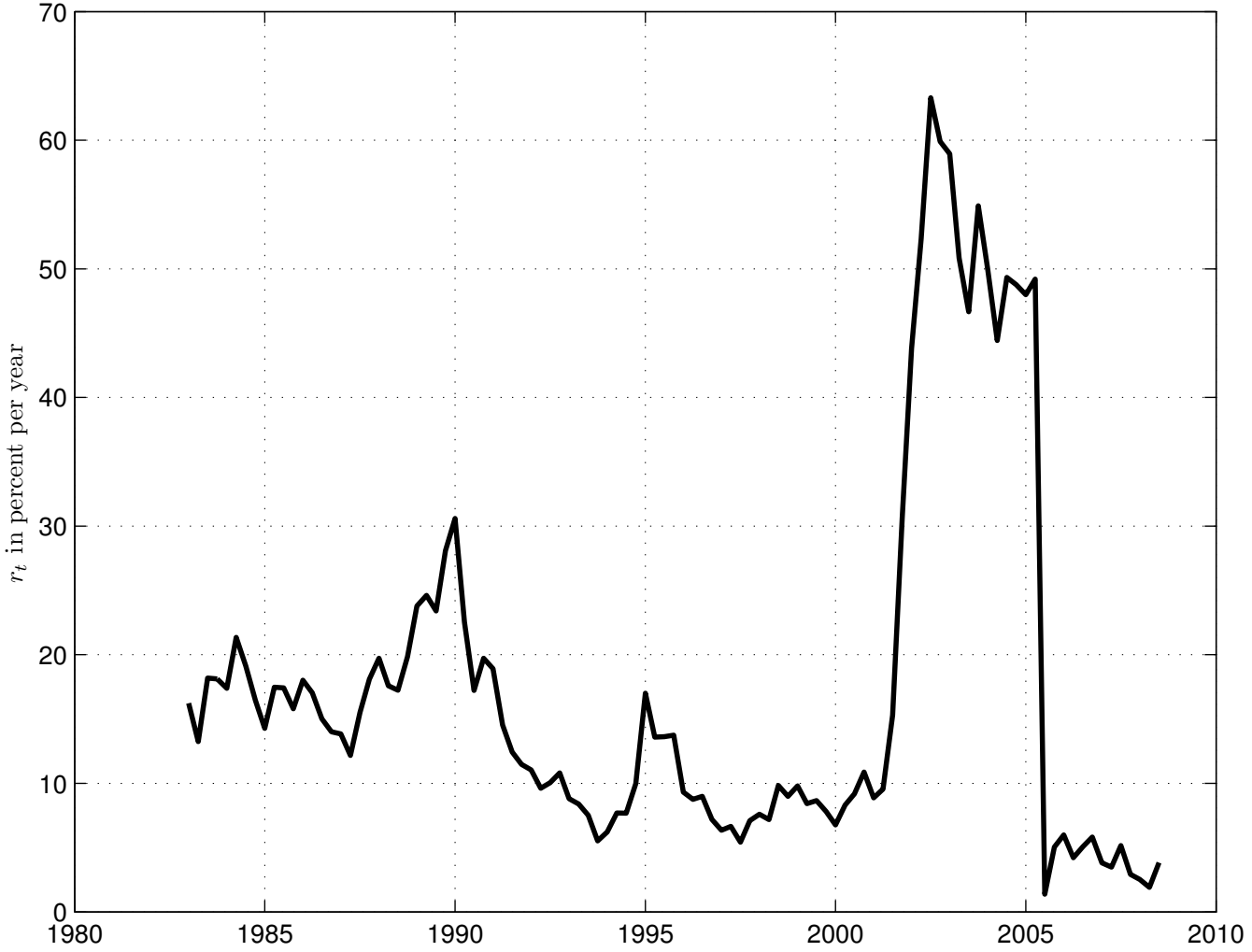
No Capital Controls

Optimal Capital Controls

Traded Output in Argentina 1983:Q1-2008:Q3

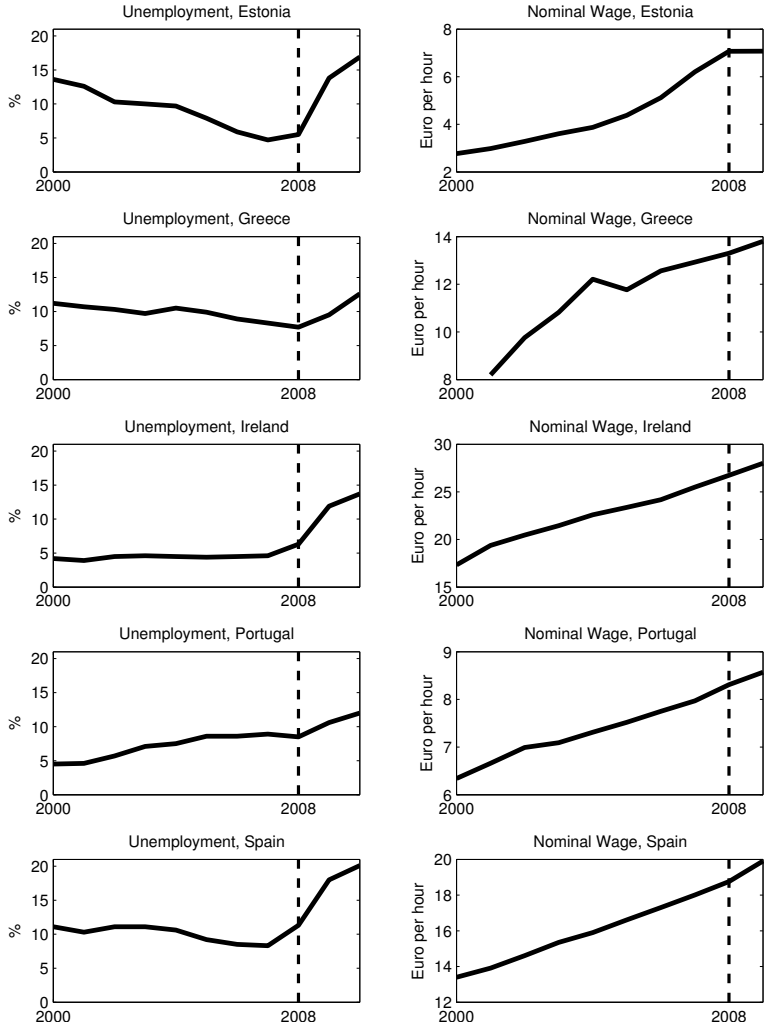
Note. Detrended and seasonally adjusted.

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



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

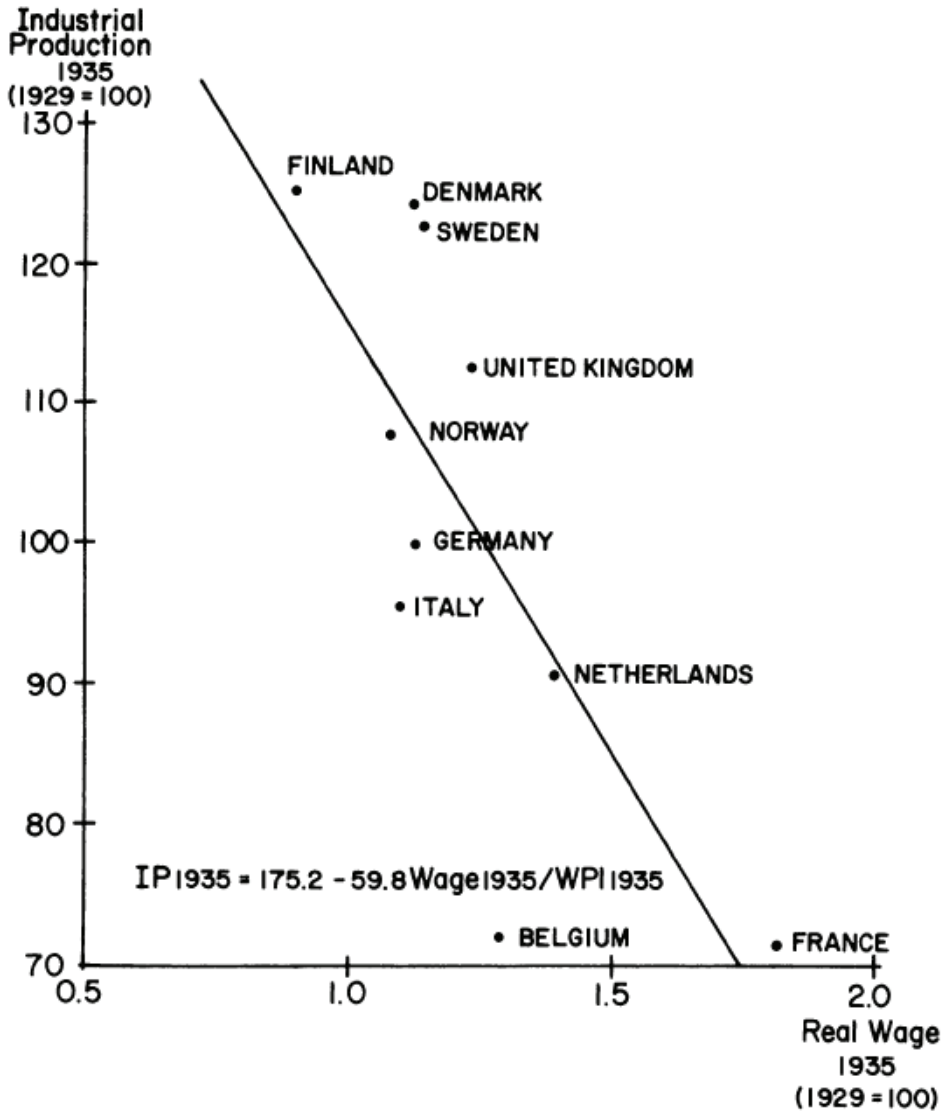


FIGURE 2
CHANGES IN REAL WAGES AND INDUSTRIAL PRODUCTION, 1929–1935

Implied Optimal Capital Control Policy Given processes $\{c_t^T, h_t\}$ derived from the solution to the Ramsey planner's problem, construct

$$\lambda_t = U'(A(c_t^T, F(h_t))A_1(c_t^T, F(h_t))$$

Then, the optimal tax rate on external debt, τ_t^d, satisfies

$$\lambda_t = \frac{1 + r_t}{1 - \tau_t^d} \beta \mathbb{E}_t \lambda_{t+1}$$

• Since 2008:Q1, all countries have been either on or pegged to the Euro with the exeption of Slovakia who appreciated against the Euro.

– Bulgaria, not on the Euro, but fixed exchange rate since June 2004.

– Cyprus, on the Euro since 2008, fixed exchange rate since 1999.

– Estonia, on the Euro since 2011, fixed exchange rate since 1999.

– Greece, Portugal, and Spain on the euro.

– Lithuania: not on the Euro, but fixed exchange rate since Feb 2002

– Latvia: not on the Euro, but fixed exchange rate since Jan. 2005.

– Slovenia: on the Euro since 2007, pegged to Euro since june 2004

– Slovakia: on the Euro since Jan 2009, but no depreciation between 2008:Q1 and 2009.