Dinamiche della Politica Fiscale e del Debito Pubblico in Italia:1861-2009

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- Italy's nominal public debt is the third largest in the world after the United States and Japan. Italy's public debt-GDP ratio is the eleventh largest in the world after Liberia, Japan, St. Kitts and Nevis, Guinea-Bissau, Lebanon, the Democratic Republic of Congo, Jamaica, Seychelles, Grenada, and Antigua and Barbuda (IMF 2010)
- Debt and deficits in Italy have sharply increased following the Great Recession started in 2007.
- Did Italy's fiscal policy makers react to debt accumulation in the past? Is Italy's public debt on a sustainable path? In this paper we examine the historical dynamics of government debt in post-unification Italy, from 1861 to 2009.

Literature

- Bohn (1998, 2007) shows that, deriving sustainability tests from the government's intertemporal budget constraint, impose very weak econometric restrictions for testing the sustainability hypothesis.
- Chung, Davig and Leeper (2007), emphasized that the debt-GDP ratio can grow without limit and, at the same time, be perceived by economic agents as sustainable.
- Barro (1979,1986) shows the tax-smooting theory of primary-surplus policies

Description of the data

- The debt series is obtained: the end of period of central government nominal debt (Fratianni e Spinelli (2001) from 1861-1998; Bank of Italy, Relazione Annuale 1999-2009)
- Nominal GDP: Obstfeld and Jones (2001) from 1861 to 1889; Rossi, Sorgato, Toniolo (1993) from 1890-1970; Bank of Italy, Relazione Annuale, from 1971-2009.
- Primary surplus series: obtained by dividing a difference of central government nominal revenues and central government nominal outlays (Repaci (1962) from 1862 to 1952;Bank of Italy from 1953 to 2009.

Description of the data

- The real government spending series: obtained by dividing central government nominal outlays by the GDP deflator (Fratianni e Spinelli, 2001) from 1861 to 1998; ISTAT, Bollettino Statistico, from 1999 to 2009.
- The real GDP series: obtained by dividing central government nominal outlays by the GDP deflator
- The nominal interest: obtained dividing i_t interest payment at t over the average of stock of nominal debt at the end of period t and period $t-1$ (Bohn 2008)
- The inflation rate series: is the rate of variation of the GDP deflator.
- Growth rate series: is the rate of variation of real GDP.

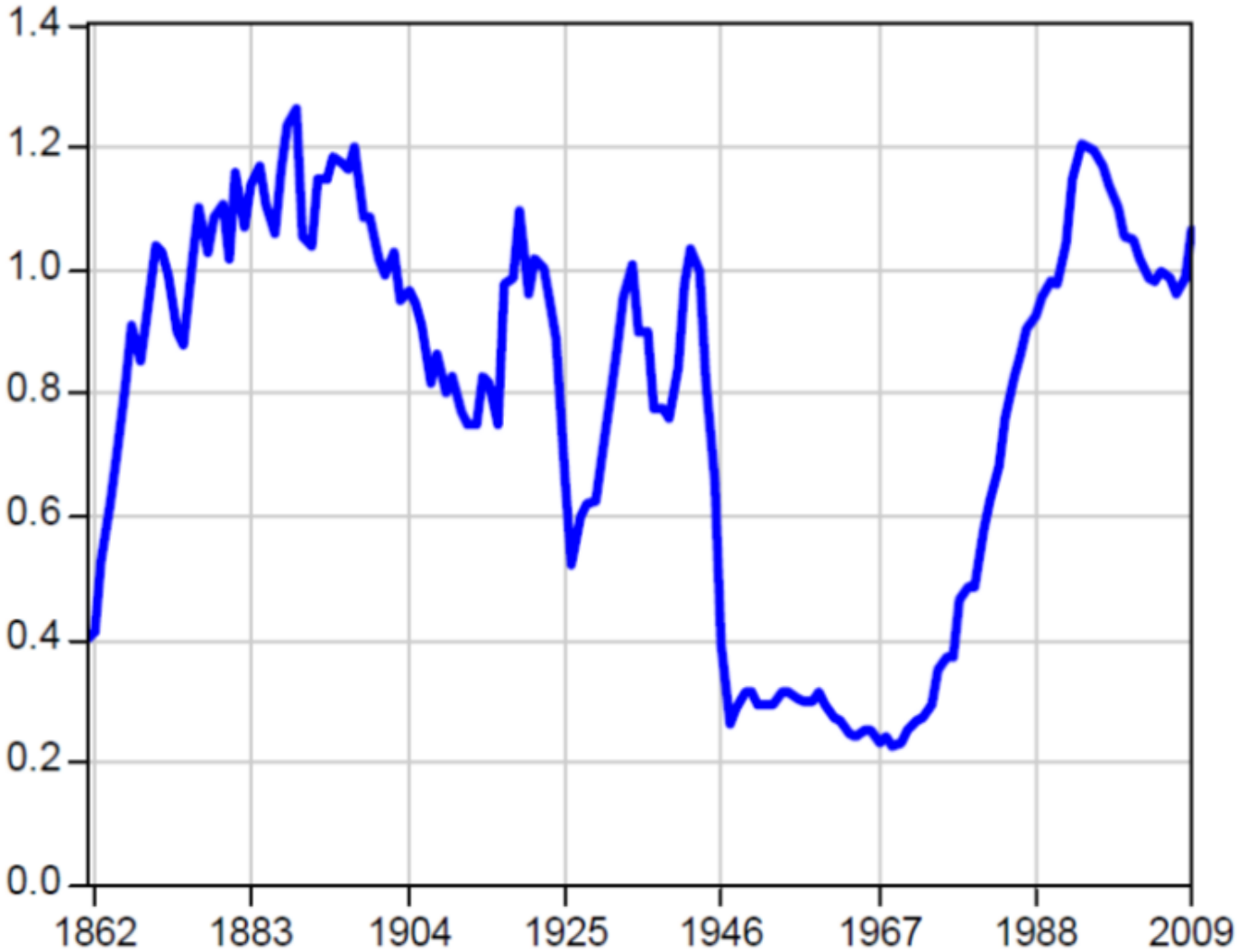

Figure: Debt to GDP ratio 1861-2009

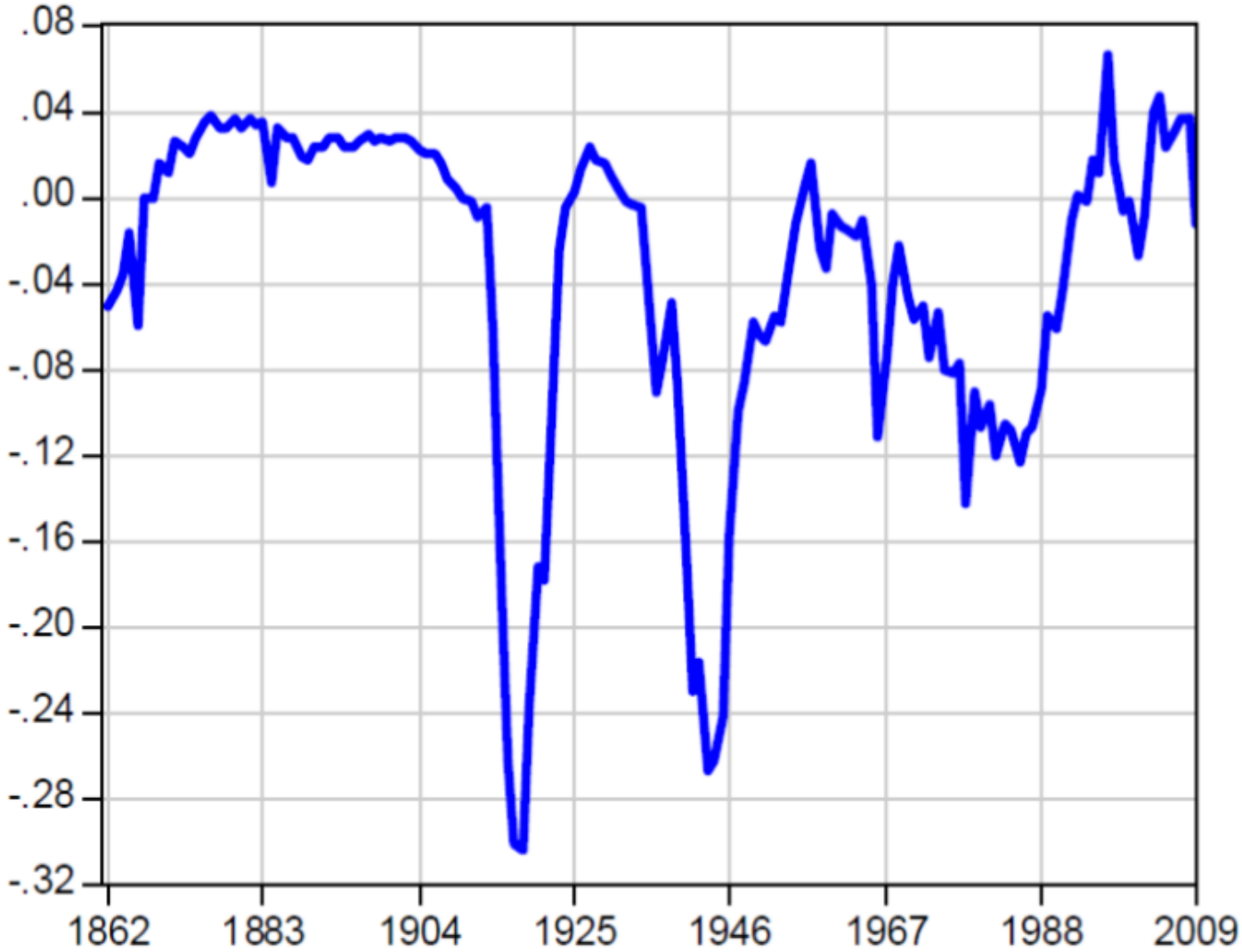

Figure: Primary surplus to GDP ratio 1862-2009

Unit Root Tests for Italy's debt-GDP ratio

- The ADF and PP tests examine the null HP of unit root against the alternative HP of stationarity, KPSS test is the opposite: the results are puzzling.
- ADF and PP tests suggests absence of corrective measures by fiscal policy maker with potential sustainability problem; KPSS suggest no potential sustainability problems

Table 1: Unit root tests for the debt-GDP ratio.

Sample	ADF	PP	KPSS
(1) 1861-2009	−1.914	−1.884	0.347
	(−3.475)	(−3.475)	(0.739)
	[−2.881]	[−2.881]	[0.463]
(2) 1861-2009	−2.056	−2.141	0.319
excl. 14-19, 39-47	(−3.480)	(−3.480)	(0.739)
	[−2.883]	[−2.883]	[0.463]
(3) 1861-1913	−2.878	−2.883	0.294
	(−3.563)	(−3.563)	(0.739)
	[−2.919]	[−2.919]	[0.463]
(4) 1861-1938	−2.923	−2.967	0.262
	(−3.518)	(−3.518)	(0.739)
	[−2.900]	[−2.900]	[0.463]
(5) 1861-1990	−1.847	−1.792	0.759
	(−3.482)	(−3.482)	(0.739)
	[−2.884]	[−2.884]	[0.463]
(6) 1861-1990	−1.973	−2.029	0.660
excl. 14-19, 39-47	(−3.489)	(−3.489)	(0.739)
	[−2.887]	[−2.887]	[0.463]
(7) 1948-2009	−0.622	−0.406	0.844
	(−3.540)	(−3.540)	(0.739)
	[−2.909]	[−2.909]	[0.463]

Fiscal Feedback Policy and Debt Dynamics

- Consider first the government's budget identity: $B_t = B_{t-1} + G_t - T_t$,
- Define the government's primary surplus as: $S_t = T_t - (G_t - i_t B_{t-1})$
- Then divide both sides of the budget identity by the nominal GDP Y_t to get the law of motion of the debt-GDP ratio,

$$b_t = (1 + r)\, b_{t-1} - s_t, \tag{1}$$

where $b_t = B_t / Y_t$, $s_t = S_t / Y_t$, and $r = (1 + i_t) / (1 + n_t) - 1$ is the nominal interest rate deflated by the nominal GDP growth rate, $n_t = (Y_t - Y_{t-1}) / Y_{t-1}$

Fiscal Feedback Policy and Debt Dynamics

- Consider a policy function of the form:

$$s_t = \rho b_{t-1} + \alpha' \mathbf{z}_t + \varepsilon_t, \tag{2}$$

where $\rho > 0$ captures the degree of reactiveness of the primary surplus to debt, $\mathbf{z}_t$ is a vector of additional determinants of the primary surplus, α is a vector of parameters, and ε_t is a mean-zero error term.

Fiscal Feedback Policy and Debt Dynamics

- $$\Delta b_t = (r - \rho)\, b_{t-1} + \beta' \mathbf{z}_t + v_t, \tag{3}$$

  where $\beta = -\alpha$ and $v_t = -\varepsilon_t$. Assume that $\mathbf{z}_t$ is stationary. Then the debt-GDP ratio is mean-reverting if $r - \rho < 0$. According to (3), standard unit root tests can easily fail to detect mean-reversion in the debt-GDP ratio for two reasons.
- First, if $r - \rho$ is strictly below zero - but not much below zero - unit root tests can easily lead to accept the unit root null hypothesis. Second, unit root tests are misspecified since they omit $\mathbf{z}_t$, that is, the non-debt determinants of the primary surplus

Fiscal Feedback Policy and Debt Dynamics

- Standard tax smooting theory (Barro,1979,1986) implies an empirical specification for the change in debt-GDP ratio:

$$\Delta b_t = \gamma b_{t-1} + \beta_0 + \beta_1 \tilde{g}_t + \beta_2 \tilde{y}_t + v_t, \tag{4}$$

where $\tilde{g}_t$ is a measure of temporary government spending, $\tilde{y}_t$ is a measure of temporary output, and $(\gamma, \beta_0, \beta_1, \beta_2)$ are regression coefficients (Table.2)

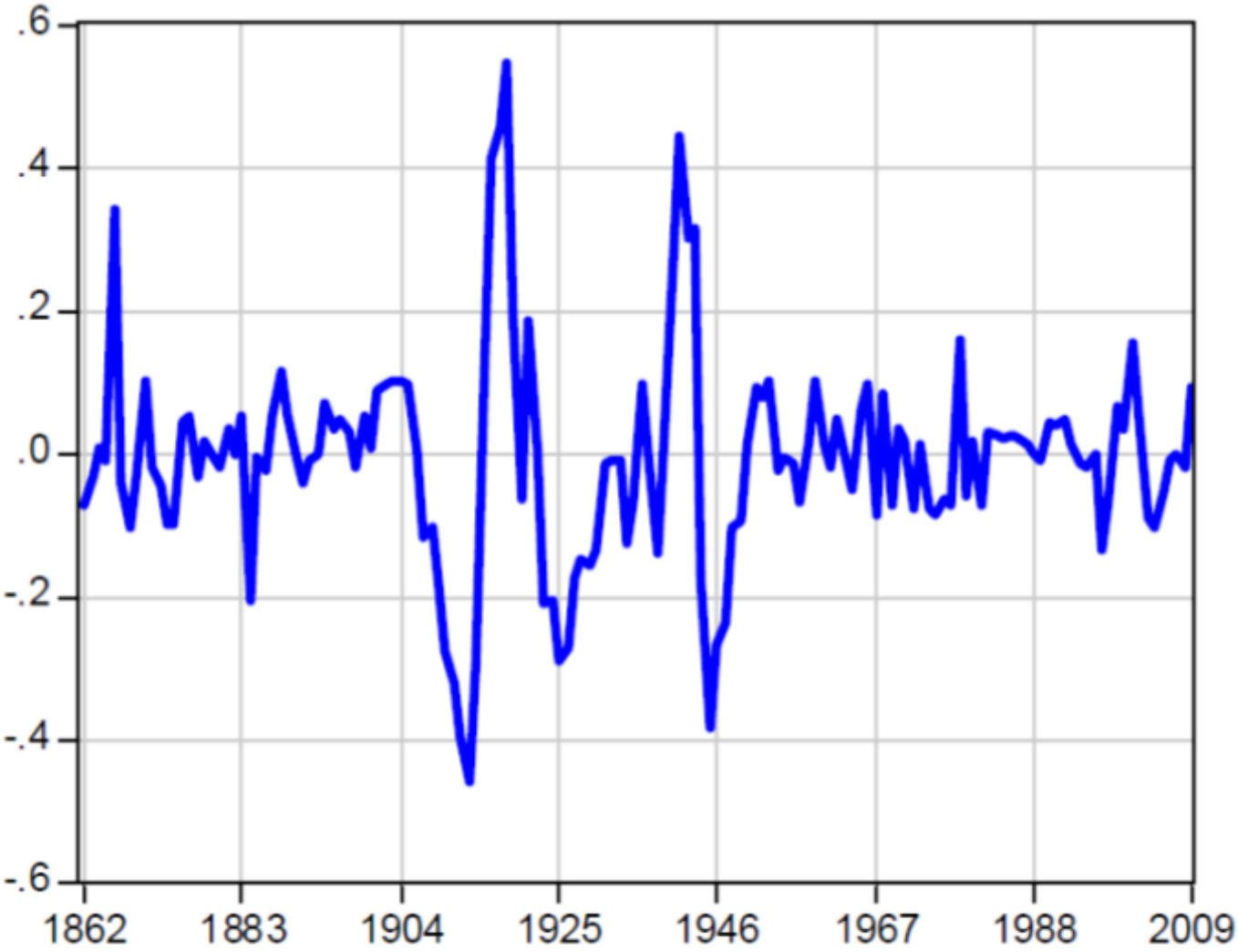

Figure: Temporary Government Spending 1862-2009

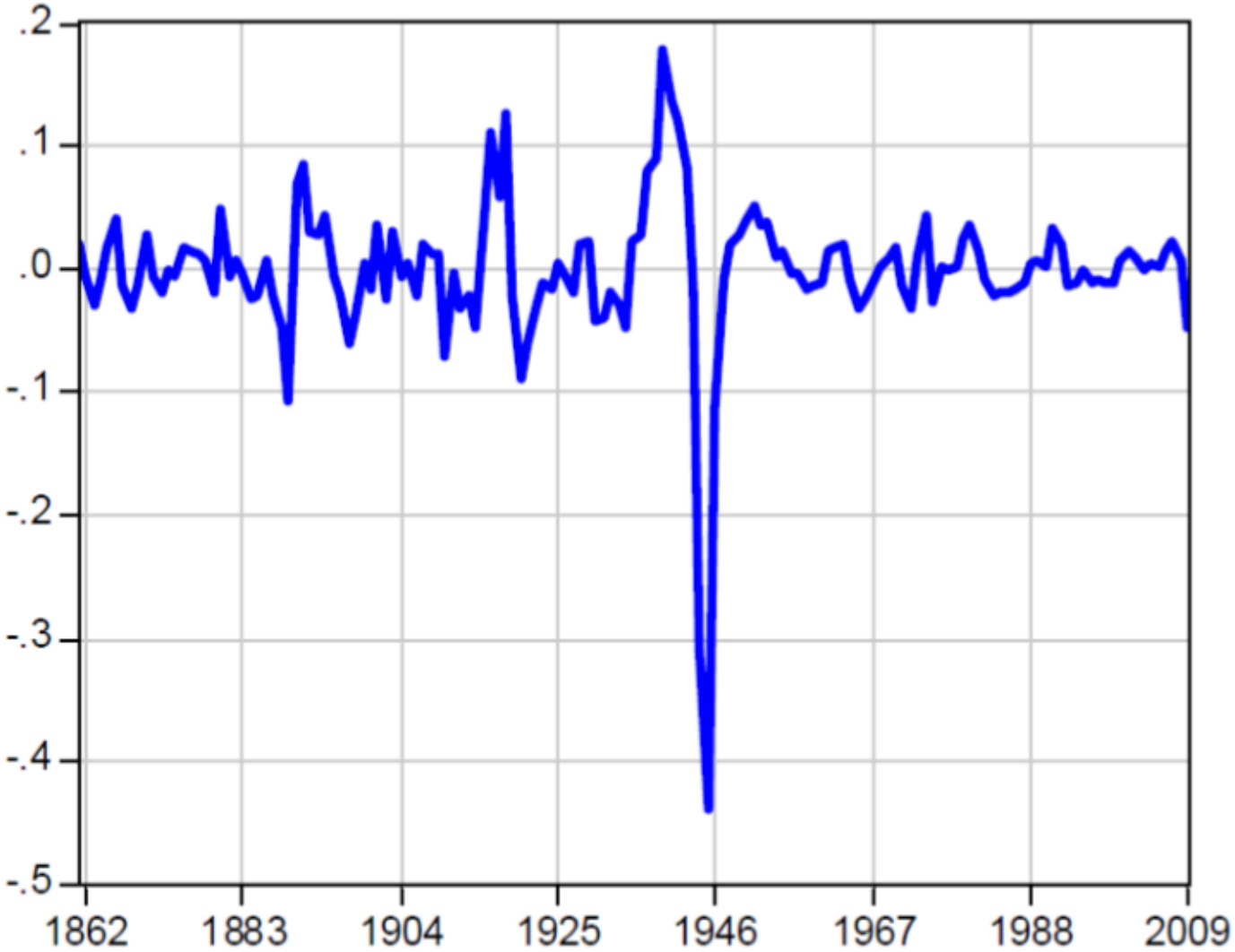

Figure: Temporary Output 1861-2009

Table 2: Regression results for the change in the debt-GDP ratio, using $\tilde{g}_t$ and $\tilde{y}_t$.

Equation for Δb_t						
Sample	Const.	b_{t-1}	$\tilde{g}_t$	$\tilde{y}_t$	R^2	DW
(1) 1861-2009	0.035	−0.036	0.198	0.041	0.188	1.652
	(2.323)	(−2.059)	(4.730)	(0.397)		
	[2.116]	[−2.087]	[3.439]	[0.205]		
(2) 1861-2009	0.043	−0.042	0.208	−0.529	0.195	1.459
excl. 14-19, 39-47	(3.320)	(−2.735)	(4.440)	(−3.119)		
	[2.536]	[−2.229]	[3.314]	[−2.504]		
(3) 1861-1913	0.193	−0.186	0.262	−0.538	0.347	1.870
	(4.193)	(−4.054)	(3.708)	(−1.988)		
	[4.389]	[−4.281]	[4.473]	[−2.225]		
(4) 1861-1938	0.193	−0.196	0.282	−0.772	0.377	1.749
	(4.924)	(−4.782)	(5.457)	(−3.746)		
	[6.139]	[−5.613]	[4.694]	[−3.247]		
(5) 1861-1990	0.036	−0.039	0.199	0.049	0.197	1.706
	(2.241)	(−1.999)	(4.451)	(0.452)		
	[2.162]	[−2.153]	[3.302]	[0.252]		
(6) 1861-1990	0.044	−0.044	0.210	−0.512	0.197	1.524
excl. 14-19, 39-47	(3.131)	(−2.538)	(4.142)	(−2.805)		
	[2.502]	[−2.184]	[3.165]	[−2.323]		
(7) 1948-2009	0.017	−0.004	0.062	−0.512	0.103	0.710
	(2.000)	(−0.336)	(0.948)	(−2.418)		
	[1.393]	[−0.202]	[0.942]	[−2.463]		

Fiscal Feedback Policy and Debt Dynamics

- Another empirical specification for the change in debt-GDP ratio based on the closed-form solution of Barro (1986) tax-smoothing:

$$\Delta b_t = \gamma b_{t-1} + \beta_0 + \beta_1 GVAR_t + \beta_2 YVAR_t + v_t. \tag{5}$$

The two measures are referred as $GVAR_t$ for government spending and $YVAR_t$ for output, and are given by $GVAR_t = \left(g_t - g_t^T\right) / y_t$ and $YVAR_t = \left(g_t^T / y_t\right) \left[\left(y_t^T - y_t\right) / y_t^T\right]$, where g_t is real government spending, y_t is real output, and g_t^T and y_t^T are corresponding trend values (Table.3)

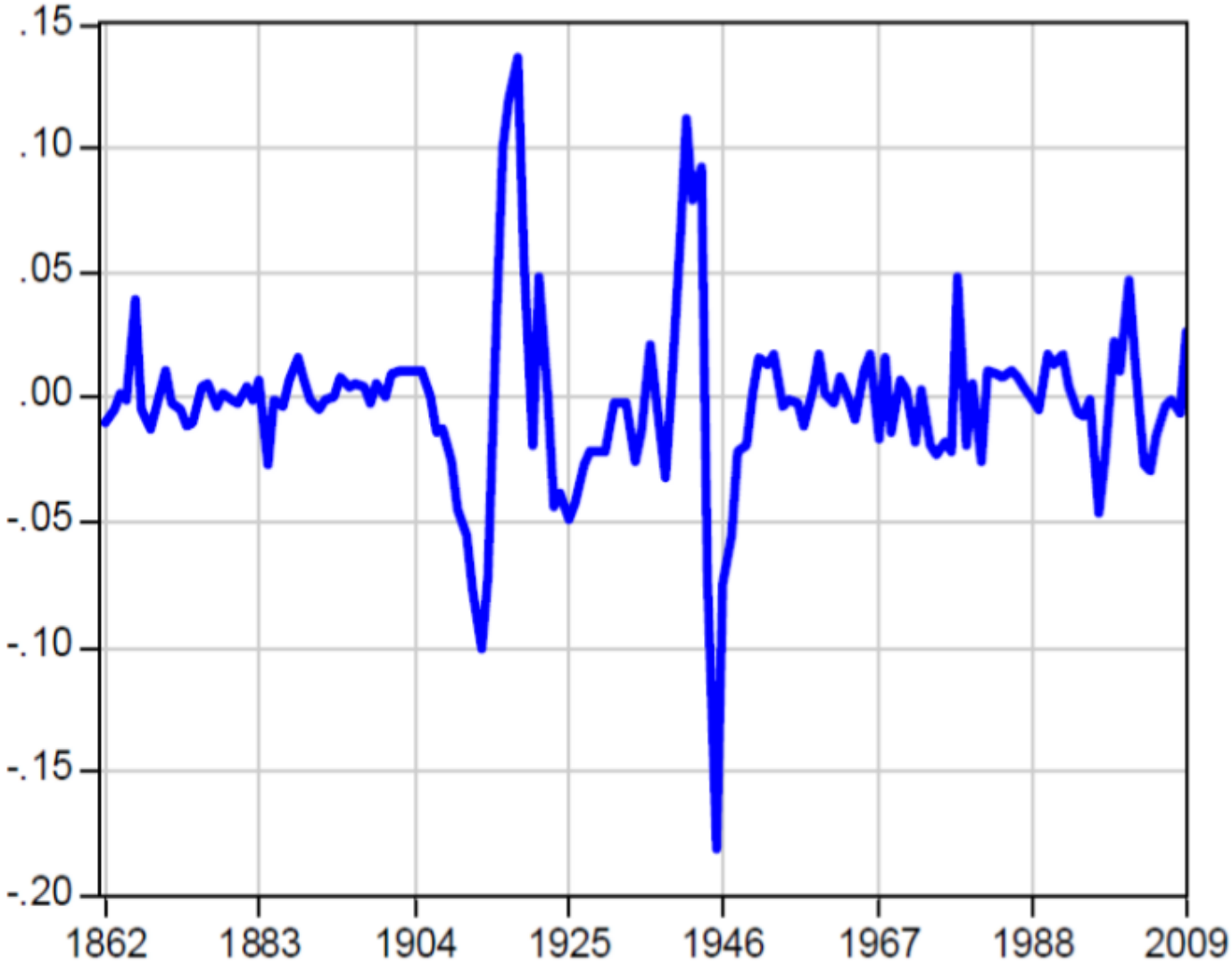

Figure: Temporary spending 1862-2009 (Barro Style)

Figure: Temporary Output 1861-2009 (Barro style)

Table 3: Regression results for the change in the debt-GDP ratio, using $GVAR_t$ and $YVAR_t$.

Equation for Δb_t						
Sample	Const.	b_{t-1}	$GVAR_t$	$YVAR_t$	R^2	DW
(1) 1861-2009	0.034	−0.035	0.819	−0.125	0.197	1.747
	(2.282)	(−2.033)	(4.393)	(−0.406)		
	[2.244]	[−2.179]	[3.275]	[−0.373]		
(2) 1861-2009	0.042	−0.041	0.912	2.161	0.155	1.535
excl. 14-19, 39-47	(3.104)	(−2.606)	(3.696)	(2.501)		
	[2.551]	[−2.302]	[2.952]	[1.746]		
(3) 1861-1913	0.194	−0.187	1.439	4.013	0.313	1.881
	(4.053)	(−3.931)	(3.293)	(1.943)		
	[4.090]	[−4.010]	[3.664]	[2.323]		
(4) 1861-1938	0.181	−0.186	1.289	3.867	0.326	1.735
	(4.481)	(−4.387)	(4.783)	(3.441)		
	[5.779]	[−5.565]	[3.951]	[2.312]		
(5) 1861-1990	0.035	−0.039	0.842	−0.123	0.207	1.803
	(2.077)	(−1.952)	(4.055)	(−0.765)		
	[2.309]	[−2.261]	[3.086]	[−0.367]		
(6) 1861-1990	0.042	−0.044	0.979	2.076	0.156	1.599
excl. 14-19, 39-47	(2.961)	(−2.448)	(3.473)	(2.136)		
	[2.522]	[−2.292]	[2.720]	[1.489]		
(7) 1948-2009	0.016	−0.004	0.309	2.140	0.136	0.703
	(1.991)	(−0.344)	(1.291)	(2.696)		
	[1.425]	[−0.186]	[0.048]	[2.593]		

Mean reversion is detected?

- Following Bohn (2008), we calculate the nominal interest rate on debt i_t as the ratio of interest payments for period t over the average of the stock of nominal debt at the end of period t and at the end of period $t-1$.[1] For the whole sample, the average nominal interest rate on debt is 4.9 percent; the average nominal GDP growth rate is 10.2 percent, more than 3/4 due to inflation and less than 1/4 due to real GDP growth; thus, $r = (1+0.049)\,/\,(1+0.102) - 1 \approx -0.048 < 0$.
- This implies that the "nominal growth dividend" has exceeded the interest cost on public debt, preventing *per se* the debt-GDP ratio from embarking on unstable paths.

[1] Computing the nominal interest rate in this way enables us to take into account the fact that government debt is composed of a portfolio of securities with different interest rates.

Mean reversion is detected?

- Table 4 shows estimates of the policy function

$$s_t = \rho b_{t-1} + \alpha_0 + \alpha_1 \tilde{g}_t + \alpha_2 \tilde{y}_t + \varepsilon_t, \tag{6}$$

  where $(\rho, \alpha_0, \alpha_1, \alpha_2)$ are regression coefficients. The ρ coefficient on the outstanding debt-GDP ratio is positive and highly significant in all Regressions.
- Table.5 shows a significantly positive value of ρ is also detected substituting measures $\tilde{g}_t$ and $\tilde{y}_t$ with $GVAR_t$ and $YVAR_t$.

Table 4: Regression results for the primary surplus-GDP ratio, using $\tilde{g}_t$ and $\tilde{y}_t$.

Equation for s_t						
Sample	Const.	b_{t-1}	$\tilde{g}_t$	$\tilde{y}_t$	R^2	DW
(1) 1861-2009	−0.099	0.076	−0.309	0.447	0.330	0.194
	(−6.826)	(4.472)	(−7.577)	(4.470)		
	[−4.456]	[3.032]	[−3.115]	[1.671]		
(2) 1861-2009	−0.082	0.079	−0.097	0.211	0.300	0.235
excl. 14-19, 39-47	(−8.438)	(6.985)	(−2.801)	(1.687)		
	[−5.063]	[4.617]	[−2.658]	[0.808]		
(3) 1861-1913	−0.080	0.097	−0.012	0.055	0.705	1.376
	(−8.598)	(10.488)	(−0.871)	(1.009)		
	[−5.058]	[6.468]	[−0.477]	[1.348]		
(4) 1861-1938	−0.146	0.135	−0.267	−0.069	0.385	0.238
	(−4.037)	(3.550)	(−5.586)	(−0.360)		
	[−2.837]	[2.831]	[−2.326]	[−0.229]		
(5) 1861-1990	−0.093	0.064	−0.307	0.442	0.309	0.187
	(−6.014)	(3.327)	(−7.021)	(4.161)		
	[−4.146]	[2.137]	[−3.125]	[1.686]		
(6) 1861-1990	−0.080	0.076	−0.086	0.209	0.263	0.209
excl. 14-19, 39-47	(−7.681)	(5.882)	(−2.269)	(1.541)		
	[−4.921]	[3.906]	[−2.198]	[0.777]		
(7) 1948-2009	−0.077	0.061	−0.201	0.188	0.264	0.189
	(−6.967)	(3.919)	(−2.359)	(0.681)		
	[−4.460]	[2.798]	[−2.847]	[0.589]		

Table 5: Regression results for the primary surplus-GDP ratio, using $GVAR_t$ and $YVAR_t$.

Equation for s_t						
Sample	Const.	b_{t-1}	$GVAR_t$	$YVAR_t$	R^2	DW
(1) 1861-2009	−0.099	0.080	−1.583	−2.192	0.443	0.249
	(−7.530)	(5.171)	(−9.532)	(−7.998)		
	[−4.624]	[3.369]	[−3.937]	[−4.361]		
(2) 1861-2009	−0.083	0.081	−0.578	−1.515	0.332	0.216
excl. 14-19, 39-47	(−8.765)	(7.272)	(−3.328)	(−2.490)		
	[−5.037]	[4.662]	[−3.135]	[−0.939]		
(3) 1861-1913	−0.079	0.097	−0.059	−0.458	0.705	1.394
	(−8.444)	(10.355)	(−0.688)	(−1.127)		
	[−4.995]	[6.434]	[−0.464]	[−1.510]		
(4) 1861-1938	−0.140	0.130	−1.506	−0.296	0.479	0.241
	(−4.238)	(3.747)	(−6.829)	(−0.322)		
	[−3.113]	[3.096]	[−2.679]	[−0.145]		
(5) 1861-1990	−0.095	0.071	−1.614	−2.216	0.429	0.240
	(−6.761)	(4.058)	(−8.920)	(−7.564)		
	[−4.323]	[2.518]	[−3.971]	[−4.484		
(6) 1861-1990	−0.082	0.078	−0.508	−1.684	0.294	0.205
excl. 14-19, 39-47	(−7.992)	(6.173)	(−2.534)	(−2.437)		
	[−4.882]	[4.029]	[−2.527]	[−0.937]		
(7) 1948-2009	−0.078	0.062	−0.865	−0.866	0.291	0.186
	(−7.207)	(4.066)	(−2.771)	(−0.836)		
	[−4.613]	[2.953]	[−3.483]	[−0.590]		

Conclusions

- We have found significant evidence of mean-reversion in the debt-GDP ratio
- We have shown how mean reversion reflects nominal growth dividend and a positive response of primary surpluses to increases in a debt
- We found long term sustainability in Italy's fiscal policy making.