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Public Debt and Economic Growth in Italy

Fabrizio Balassone, Maura Francese and Angelo Pace*

Abstract

In this paper we investigate the link between government debt-to-GDP ratio and real per capita income growth in Italy over 1861-2009. We model our regression analysis on a standard production function. Our results support the hypotheses of a negative relation between public debt and growth and of a stronger effect of foreign debt compared to domestic debt before World War I. The effect of public debt on growth appears to work mainly through reduced investment. These results help explain the different reaction of per capita GDP growth to the debt-ratio over 1880-1914 (when the negative correlation between the two variables is particularly strong) and 1985-2007 (when the correlation appears to break down when debt starts declining). A descriptive analysis of fiscal policy in these two periods suggests that differences in the timing of fiscal consolidation as well as in the size and composition of the budget are additional explanatory factors.

JEL Classification: H63, E60, N0
Keywords: public debt, economic growth, Italian economic history

Contents

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For debt/GDP ratios […] above 90 percent, median growth rates fall by one percent, and average growth falls considerably more. (Reinhart and Rogoff, Growth in a Time of Debt, 2009, p. 1)

There is no compelling reason to believe the most frequently cited claim from Growth in a Time of Debt that gross debt of about 90% will necessarily lead to slower economic growth. (Irons and Bivens, Government Debt and Economic Growth, 2010, p. 8)

If public debt is not lowered to pre-crisis levels, potential growth in advanced economies could decline by over ½ percent annually. (IMF Fiscal Monitor, May 2010, p. 6)

1. Introduction[§]

The surge in public debt across industrial countries during and after the recent global crisis has made it a prominent policy issue whether high debt levels have a negative impact on growth. The debate on this issue has become lively with several contributions published over the last two years.

From a theoretical point of view, a negative relationship between debt and growth is not unexpected. There is a large literature on the potential adverse effects of high government debt via higher long-term interest rates, and expectations of higher future distortionary taxation (Elmendorf and Mankiw 1999). Also, high debt may increase macroeconomic uncertainty and discourage investment (Servén 1997). Finally, it may reduce the scope for counter-cyclical fiscal policy, resulting in higher output volatility and lower growth (Aghion and Kharroubi 2007; Woo 2009).

Reinhart and Rogoff (2009) provide evidence of a negative link between public debt and growth. They examine economic growth at different levels of government debt in a sample of forty-four countries spanning about two hundred years and find that when the debt-to-GDP ratio is above 90 percent, median growth rates fall by one percent, and average growth falls considerably more, for both advanced and emerging economies. But the

§ The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banca d'Italia. We thank colleagues in the Public Finance Division of our department, Giorgio Albareto, Alberto Baffigi, Alfredo Gigliobianco, Pasqualino Montanaro, Patrizio Pagano, Paolo Sestito and Gianni Toniolo for help in retrieving some of the data used in this work and for providing many constructive suggestions. We are also indebted for helpful insights to the participants in the Workshop on Public Debt and Economic Growth (European Commission, DG ECFIN, Bruxelles, December 3, 2010), in the Banca d'Italia Workshop on Italy's International Economic Position, 1861-2011 (Banca d'Italia, Perugia, 10-11 December 2010), in the 67th Annual Congress of the International Institute of Public finance (University of Michigan, Ann Arbor, 8-11 August, 2011), and in the European Center for the Study of Public Choice conference on New Perspectives on Public Debt (Sapienza University of Rome, 26-28 September 2011). All remaining errors are ours.

causality underlying the correlation between debt and growth could run either way: from low growth to high debt, rather than from high debt to lower growth.[1]

Kumar and Woo (2010) study a panel of advanced and emerging economies over 1970-2007. They address the issue of causality by regressing per capita real GDP growth against lagged values of the debt-to-GDP ratio. Their empirical results suggest an inverse relationship between initial debt and subsequent growth: on average, a 10 percentage point increase in the initial debt-to-GDP ratio is associated with a slowdown in annual real per capita GDP growth of around 0.2 percentage points per year, with the impact being somewhat smaller in advanced economies. In line with Reinhart and Rogoff (2009), higher levels of initial debt appear to have a proportionately larger negative effect on growth. The authors also control for other factors potentially affecting economic performance.[2] They run a growth accounting exercise whose outcome suggests that the adverse effect of debt on growth largely operates by reducing investment and hence slowing down labour productivity growth.

A similar work by Checherita and Rother (2010), covering a sample of 12 euro area countries over 1970-2008, also finds a non-linear impact of debt on per capita real GDP growth, with a turning point at about 90-100% of GDP, beyond which the government debt-to-GDP ratio has a deleterious impact on long-term growth.[3] The channels through which government debt (level or change) is found to have an impact on the rate of economic growth are: (i) private saving; (ii) public investment; (iii) total factor productivity (TFP) and (iv) sovereign long-term nominal and real interest rates.

In this paper we investigate the link between government debt, as a share of GDP, and real per capita income growth in Italy over 1861-2010. Italy is an interesting case study since it has experienced high levels of debt for a significant part of its history even excluding the years from the beginning of World War I to the end of World War II. The period as a whole is characterized by a strong negative correlation between the two variables, but there are also instances where such correlation appears to break down, such as over 1995-2007, when both debt and per capita growth are falling. Our research question is: is there more than a correlation? We address this issue taking as a reference a standard production function from which we derive the specification for our regression analysis.

The rest of the paper is organized as follows. Section 2 provides a concise description of debt and economic developments in Italy since 1861 and highlights the different pattern of growth at the two turns of centuries included in the sample (1880-1914 and 1985-2007), in the face of similar debt developments. Section 3 describes the model used for the analysis of the relationship between debt and growth. Section 4 presents the empirical investigation (data, estimation strategy, and results). Section 5 briefly discusses the behaviour of debt and

[1] On this point see for instance Irons and Bivens (2010).

[2] Kumar and Woo (2010) use both OLS and GMM estimation. Control variables are a standard set from the empirical growth literature (Aghion and Durlauf 2005) including: average years of secondary schooling, as a proxy for human capital; initial government size as measured by the government consumption share of GDP; initial trade openness (the sum of export and import as a share of GDP); initial financial market depth (quasi-liquid liabilities as a share of GDP); initial inflation; terms of trade growth rates; and a measure of banking crises.

[3] The authors use a similar set of control variables as Kumar and Woo (2010) and use both 2SLS and GMM estimation techniques.

growth over 1880-1914 and 1985-2007 in light of the econometric results. Section 6 offers a descriptive analysis of fiscal policy over these two periods. Section 7 summarizes the main conclusions.

2. Debt and Growth in Italy: a Concise Description and a Puzzle

As mentioned above, a significant part of Italy's history is marked by relatively high levels of public debt. This is true also excluding the period between the two world wars (fig. 1).

The period as a whole is characterized by a strong negative correlation between public debt (as a ratio to GDP) and real per capita income growth (fig. 2 and 3). Excluding the years between the start of World War I and the first parliamentary elections after the end of World War II (1915-1948), the correlation coefficient is -0.61. It is lower before 1915 (-0.15) than after 1948 (-0.72).

In particular two distant periods in time, 1880-1914 and 1985-2007,[4] share some features that are of particular interest to the analysis in this paper: (a) they include two local peaks of the debt to GDP ratio in our sample (1894 and 1994); (b) they coincide with expansionary cycles in world GDP and trade. Both periods are characterised by relatively fast growth in the rest of the world. For Western Europe and the USA the average rate of growth was 2.7 per cent both over 1880-1914 and 1985-2007. In both cases the path of external growth was not much different before and after the local peak in Italy's debt to GDP ratio: the average rate of growth of Western Europe and the USA did not change much between 1880-1894 (2.6 per cent) and 1895-1914 (2.7), nor between 1985-1994 (2.6 per cent) and 1995-2007 (2.7).

During the period from unification to Word War I Italy's public debt to GDP ratio reached its peak in 1894, at almost 126 per cent. Between 1880 and 1894 the debt ratio posted an increase of 33 percentage points. Thereafter it declined to reach just below 74 percent in 1913, more than 50 percentage points lower than the peak.[5] Real per capita GDP growth averaged at 0.8 percent over 1880-1894 and at 1.5 over 1895-1913 (fig. 4). This pattern appears in line with the proposition that higher and increasing debt is associated with subdued growth.

After World War II public debt peaked at almost 122 per cent of GDP in 1994. Between 1985 and 1994 the debt ratio increased by about 41 percentage points. Thereafter it declined to reach just above 103 per cent in 2007, less than 20 percentage points lower than the peak. In this case, however, average growth is higher while debt increases (2.2 percent on average over 1985-1994) than while it declines (1.2 on average over 1995-2007).[6]

During both 1880-1894 and 1985-1994, the periods of debt accumulation, the GDP growth rate is falling. What appears to differentiate the two episodes is the fact that growth picks up once debt start declining in 1895-1914 but it does not in 1995-2007. The developments at the end of last century and the beginning of the current one seem somewhat

[4] We cut the second period in 2007 to exclude the years affected by the recent financial and economic crisis.

[5] From 1914 the debt ratio starts growing again.

[6] Similar indications are found if one considers trend GDP growth instead of per capita GDP growth.

in contrast with a simple negative relationship between debt and growth. We will come back to discussing these issues in light of the results of our empirical analysis later in the paper.

3. The Model

The model is based on the framework described by Rao (2010) which allows joint consideration of both an exogenous and an endogenous component in GDP growth[7]. We start by considering the following production function:

$$(1) \qquad Y_t = Ae^{f(t,X_{it})}K_t^{\alpha}L_t^{1-\alpha}$$

where A is a constant, Y output, K capital and L labour. Output growth depends on an exogenous component captured by the time trend t and a number of economic factors X_{it} (i= *1, ..., J*). We assume that $f(t, X_{it})$ can be written as a linear relationship with coefficients γ and δ and that $J=1$ for simplicity:

$$(2) \qquad f(t, X_t) = \gamma t + \delta X_t$$

Rewriting (1) in per capita terms (small letters indicate per capita values) and taking logs we get:

$$(3) \qquad \ln y_t = \ln A + \gamma t + \delta X_t + \alpha \ln k_t$$

or in first differences:

$$(4) \qquad \Delta \ln y_t = \gamma + \delta \Delta X_t + \alpha \Delta \ln k_t$$

In the long run, when per capita capital stock converges to its long run equilibrium value (k_t *, so that $\Delta \ln k_t^* \to 0$), output growth converges to:

$$(5) \qquad \Delta \ln y_t^* = \gamma + \delta \Delta X_t$$

Since actual observations are not equilibrium ones, choice of the steady state specification (5) is not appropriate for time series studies (in other words, omitting the key variable of the production function – i.e. per capita capital – from the specification would give unreliable estimates of the growth-effects of X). This calls for the use of the non-steady state specification (4) in the empirical analysis.

Moreover, since many time-series are likely to be nonstationary in their levels, specifications in first differences may yield unreliable and inefficient estimates because valuable information on the levels is lost (Bottazzi and Peri 2004; Kamps 2005; Bronzini and Piselli 2006; Rao 2010).

Assuming that variables in (3) are I(1) in levels, I(0) in their first differences, and that there exists a cointegrating vector, we can combine (3) and (4) to write a model in error correction form augmented by distributed lags (Rao, 2007 and 2010):

[7] For exogenous and endogenous growth models see respectively Solow (1957), Mankiw et al. (1992) and Romer (1986, 1990), Lucas (1988), Grossman and Helpman (1991) and Barro (1991).

$$\Delta \ln y_t = -\lambda\left(\ln y_{t-1} - \ln A - \gamma t - \delta X_{t-1} - \alpha \ln k_{t-1}\right) + \gamma + \delta \Delta X_t + \alpha \Delta \ln k_t$$
$$+ \sum_{i=1}^{n} \beta_{yi} \Delta \ln y_{t-i} + \sum_{i=1}^{m} \beta_{ki} \Delta \ln k_{t-i} + \sum_{i=1}^{p} \beta_{Xi} \Delta X_{t-i} \quad (6)$$

and obtain the following estimating equation:

$$\Delta \ln y_t = \beta_0 + \beta_1 t + \beta_2 \ln y_{t-1} + \beta_3 X_{t-1} + \beta_4 \ln k_{t-1} + \beta_5 \Delta X_t + \beta_6 \Delta \ln k_t$$
$$+ \sum_{i=1}^{n} \beta_{yi} \Delta \ln y_{t-i} + \sum_{i=1}^{m} \beta_{ki} \Delta \ln k_{t-i} + \sum_{i=1}^{p} \beta_{Xi} \Delta X_{t-i} + \varepsilon_t \quad (7)$$

where ε_t is a white noise error term.

From estimates of the coefficients in (7) it is possible to recover the parameters of equation (6):

$$\begin{aligned}
\beta_0 &= \lambda \ln A + \gamma \\
\beta_1 &= \lambda\gamma \\
\beta_2 &= -\lambda < 0 \\
\beta_3 &= \lambda\delta \quad \text{same sign as } \beta_5 \\
\beta_4 &= \lambda\alpha > 0 \\
\beta_5 &= \delta \\
\beta_6 &= \alpha > 0
\end{aligned} \quad (8)$$

Note that there are no a priori sign expectations concerning the coefficients of the ARDL terms ($\beta_{yi}, \beta_{ki}, \beta_{Xi}$), the constant ($\beta_0$) and the time trend coefficient (β_1). On the contrary, the coefficients of the level and first difference of X (β_3 and β_5) are required to have the same sign. Finally, the coefficient of per capita income must be negative ($\beta_2 = -\lambda < 0$) as required for convergence of the equation and the coefficients of per capita capital and of its growth rate must be positive (since $\alpha > 0$, then $\beta_4 = \lambda\alpha > 0$ and $\beta_6 = \alpha > 0$).

Given (8) and sign restrictions the parameters of the model are recovered as follows:

$$A = e^{-\frac{1}{\beta_2}\left(\beta_0 + \frac{\beta_1}{\beta_2}\right)}; \quad \gamma = -\frac{\beta_1}{\beta_2}; \quad \lambda = -\beta_2; \quad \delta = -\frac{\beta_3}{\beta_2} = \beta_5; \quad \alpha = -\frac{\beta_4}{\beta_2} = \beta_6 \quad (9)$$

and the following restrictions on the estimated coefficients apply:

$$-\frac{\beta_3}{\beta_2} = \beta_5; \quad -\frac{\beta_4}{\beta_2} = \beta_6 \quad \text{and} \quad \beta_2 < 0; \quad \beta_4, \beta_6 > 0 \quad (10)$$

4. Empirical Analysis

4.1 Data

In our baseline version of equation (7), X is the nominal debt to nominal (trend) GDP ratio[8]. Basic data for the analysis are as follows:

1) *GDP* (nominal and real), Baffigi (2011);

2) *Labour force and Capital stock*, Broadberry, Giordano and Zollino (2011);

3) *Government debt*, Francese and Pace (2008), updated for the most recent years based on latest releases by Banca d'Italia.[9]

These data, except for the debt series, were produced and released within a research project promoted by the Bank of Italy as part of the celebrations for the 150th Anniversary of Italy's National Unification. They provide a new integrated set of accounts covering the whole 1861-2010 period. Further details on sources are provided in the Appendix.

The sample used in the regression analysis excludes the years 1914-1949 to prevent distortions from the extreme values recorded for most variables over that period because of the two world wars, and the years 2008-2010 to avoid including the effect of the recent global crisis.

4.2 Results

In our empirical specification $\ln y_t$ is log real GDP per worker (full time equivalent units), $\ln k_t$ is log real capital per worker and X_t is log debt to trend GDP ($\ln d_t$).Descriptive statistics for the variables of interest over the whole period and specific sub-periods are reported in table 1.

We start by checking the order of integration of the variables in (3) and the existence of a cointegrating vector. Based on results of both the augmented DF test (table 2) and the modified DF test (not reported here) on the level variables we cannot reject the hypothesis that all three variables have a unit root. The same tests support the hypothesis that their first differences are I(0). Finally, the Johansen cointegration test supports the existence of a single cointegrating vector among the three variables (table 3).

We start by estimating the model without ARDL terms with OLS and robust standard errors. Parameters' signs are as expected, all coefficients are statistically significant and the restrictions on coefficients suggested by the model are not rejected (table 4, col. 1).

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[8] Trend GDP is computed using with the Hodrick-Prescott filter on the real GDP time series and setting the smoothing parameter equal to 30. To account for end point bias, the series is augmented including official estimates for GDP for the years 2011-2012. Nominal trend GDP is obtained from real trend GDP using the implicit deflator from real and nominal GDP series in Baffigi (2011).

[9] Besides an overview of public debt developments since national unification, Francese and Pace (2008) offer a discussion of the methodology used to reconstruct the time series and its breakdowns. Data for Italian nominal debt for the general government sector are regularly updated and downloadable from Banca d'Italia's website. Methodological notes on the historical time series for public debt are available at http://www.bancaditalia.it/statistiche/quadro_norma_metodo/metodoc/sb7308/en_suppl_73_08.pdf.

We then proceed to estimate (7) with ARDL(4) terms with OLS and robust standard errors (table 4, col. 2) and gradually drop all coefficients that are not significant at the 5% confidence level. In this way we select a specification (table 4, col. 3) where there are ARDL(1) terms for all variables and an ARDL(3) term for income per worker.

The coefficients for the "structural" part of the equation all have the expected sign and maintain it throughout the specification selection process. Also their magnitude is reasonably stable. They are all significant at the 1% confidence level. Coefficient restrictions implied by the model are not rejected. Moreover, estimating the equation by imposing such restrictions returns similar results (table 4, col. 4).

The significance of the error correction term in our model supports the hypothesis of long-run Granger causality between the variables we consider. Short-run causality is supported by the significance of lagged differentiated variables (Bronzini and Piselli, 2006 and Hendry, 1995).

Our results provide some support to the hypothesis of a negative relation between public debt and growth.[10]

Diagnostic tests on the residuals from the regression are all favourable. Concerning normality, a plot of residual suggests broad consistency of the actual distribution with the corresponding normal hypothesis and formal tests do not reject the hypothesis of normality. Concerning autocorrelation, the correlogram does not suggest any particular problem, and formal tests are also favourable.[11]

As a check against a possible endogeneity bias, we run 2SLS estimation of the selected specification where we instrument income and capital per worker and the debt-to-GDP ratio with their lagged values (table 4, col. 5): in this case the sign of estimated coefficients is unaltered and the change in their magnitude remains modest; only the constant term and the trend coefficient lose statistical significance.[12] The negative impact of debt on growth is also confirmed by impulse response functions from the estimation of a vector error correction model (fig. 5, panel a). This exercises also confirms the positive effect of capital on growth (fig. 5, panel b).

Since the correlation between debt and growth from fig. 2 and 3 appears different between the pre-1915 and the post-1949 periods, we test for a structural break between the two by introducing both intercept and slope dummies. Results support the hypothesis and we therefore re-estimate the equation separately over the two sub-periods (table 4, cols. 6 and 7). The structural break mainly affects estimates for the constant and the trend coefficient. Also, over 1950-2007 the coefficient of the lagged level of debt looses significance, while

[10] The order of magnitude of the negative effect of debt on growth in our sample is about the same as the one reported by Kumar and Woo (2010): a 10 percentage point increase in the initial debt-to-GDP ratio is associated with a slowdown in annual real per capita GDP growth of around 0.2 percentage points.

[11] We use robust standard errors in the regressions reported in table 4. A Breusch-Pagan test rejects the hypothesis of homoskedastic disturbances. However, the significance of the coefficients does not change using non robust standard errors. We also ran a portmanteau test for white noise residuals with favourable results.

[12] When instrumenting the debt ratio by debt per capita or per worker, we obtain similar results. However the coefficient of the change in debt loses statistical significance.

the negative effect of the change in debt is confirmed. The absolute magnitude of the other coefficients is generally larger over 1861-1913 than over 1950-2007.

We ran a number of alternative regressions to check the robustness of our results. First, we tested for threshold effects and found no supporting evidence.[13] In order to account for other factors affecting growth, we augmented the model with further explanatory variables. We did so along the lines of Kumar and Woo (2010) and Checherita and Rother (2010).

We included among regressors the rate of growth in the rest of Europe and in the USA (to capture the effect of the world business cycle on domestic growth), the degree of openness (ratio of imports plus exports to trend GDP), a proxy for human capital formation (percentage of students in population aged 5-14), government size (expenditure-to-GDP ratio), the old-age dependency ratio (percentage of population aged 65 or more), foreign public debt (as a share of GDP), the ratio of bank deposits to GDP (as a measure of financial development), the interest rate differential between Italian bonds and those of other countries (UK, USA and Germany), and the real exchange rate of the national currency.

The introduction of these variables does not significantly affect estimates for the other coefficients in the model. However, of all these additional variables, only foreign debt[14] turns out to add some explanatory power to the model, and its effect is only significant before 1914.[15]

Finally we ran a regression of investment (public and private) both as a share of GDP and in per capita terms against the stock of capital, the debt ratio and its rate of growth and found a significant negative relationship between investment and debt (both level and growth). The negative impact of debt on capital growth is also confirmed when looking at the impulse response function from our vector error correction model (fig. 5, panel c). In line with Kumar and Woo (2010) and Checherita and Rother (2010), these results suggest that the channel through which debt affects growth is reduced investment.

5. A Tentative Solution to Our Puzzle

The empirical results described in the previous section can help solving the puzzle concerning debt and growth dynamics at the turns of the last two centuries that was briefly discussed in section 2. In particular the analysis of growth determinants included in our specification can shed some light on why growth picked-up when the debt ratio was reduced over 1895-1913 but it did not over 1995-2007.

First, the regressions confirm a positive link between capital and growth. After decreasing in 1880-1894, the rate of capital accumulation increased over 1895-1913. On the

[13] In previous work, using the same specification but different GDP, labour and capital data, we found that the negative coefficient of debt was significantly stronger (by more than 10%) when the debt ratio was above 100%.

[14] Foreign debt is defined as debt issued abroad (either government bonds issued on foreign financial markets or loans from non domestic banks). This choice reflects the lack of historical data for debt held by non residents. It should also be considered that over 1950-1990 there were formal restrictions to the acquisition by non residents (residents) of debt issued domestically (abroad). For a more precise description of foreign debt and the adopted definition, see Francese and Pace (2008).

[15] On the link between foreign debt and growth in developing countries, see, for instance, Krugman (1988) and Sachs (1989).

contrary, it was decreasing throughout 1985-2007 (table 5). The differential in the growth stimulus from capital was therefore significant.

Second, the decline in the debt ratio over the years 1895-1913 was large and fast, with the ratio falling by more than it had increased over 1880-1894. The reduction in debt that started at the end of the twentieth century was much smaller and slower (the average value of the debt ratio is higher in 1995-2007 than in 1985-1994).

Third, we found that foreign debt has a stronger effect on growth than domestic debt, in particular before 1914. Almost half of the large debt reduction over 1895-1913 is due to foreign debt, which played no role in the reduction of the debt ratio over 1995-2007.[16]

6. Fiscal Policy and Growth

One final consideration concerns a factor, and an important one, whose impact we cannot check against the results of the previous section, that is the level and composition of the budget balance. Collinearity among regressors is an obstacle to a thorough econometric investigation of the impact of fiscal policy on growth in our model. We therefore resort to a descriptive analysis of budgetary developments during the two periods under investigation: there are important differences with respect to both the initial deficit level and the composition of the budget.

In the 19th century, fiscal consolidation started much earlier than the debt-ratio reached its peak: the budget was close to balance over most of the 1890s (it then was in balance on average over 1900-13).[17] In the 20th century, instead, fiscal consolidation had only just began when the debt ratio peaked in 1994. The General Government deficit amounted to 9.1 percent of GDP in 1994, after averaging at 11.3 over the previous decade; it went down to 2.7 percent in 1997, and averaged at about that level thereafter, until the global recession in 2008. Thus, while it can be safely assumed that the budget exerted no negative impulse on GDP growth during debt reduction over 1895-1913, a significant fiscal contraction marked the start of debt reduction after 1994 (fig. 6). The change in deficit between the debt peak in 1894 and 1913 is almost nil, with both revenue and expenditure declining by about 3 percentage points of GDP; between the debt peak 1994 and 2007, the deficit declined by more than 7 percentage points, of which about 5 from lower expenditure (interests) and 2 from higher revenue.

Until World War I Italy's State budget was small (revenues and expenditure averaged at around 10 and 11 percent of GDP, respectively) but its composition was growth-friendly, with investment amounting on average to 13 percent of total expenditure over 1866-1913. About 80% of debt accumulation until 1894 can be accounted for by public investment. The size and composition of the budget were radically different over 1960-2007. Revenues and expenditure averaged at around 40 percent of GDP and investment amounted on average to 6 percent of total expenditure. The average deficit was more than twice investment spending.

[16] With the monetary union, our definition of foreign debt as debt issued abroad is less satisfactory. However, holdings of Italian government securities by foreign investors, if anything, increased over the period considered.

[17] Data on the State budget are from Pedone (1967) and Ragioneria Generale dello Stato (2011), GDP is from Baffigi (2011).

The government budget over 1861-1913. – The size of government before World War I was small by today's standard: State expenditure amounted to 11.4 percent of GDP on average during 1862-1913 and revenue to 10.2 percent (the corresponding figures for general government were 16.8 and 13.5).[18] There was no strong upward trend in expenditure over the whole period.[19] The revenue ratio grew gradually from 5.2 percent in 1862 to peak at 12.4 in 1894; it averaged at 11.0 percent thereafter (fig. 7). Thus the State budget posted large imbalances only in the early years after the unification (the average deficit over 1862-66 amounted to 5.0 percent of GDP).

A close to balance budgetary position was reached in 1874 (0.5 percent of GDP). After the mid-1860s spending was kept below the peak level recorded in the early years of the new State. The ratio reached a minimum under the Right government, in 1874. This was mainly the effect of reduced military spending, which accounted for about two thirds of the total reduction between the expenditure peak in 1866 and 1874. Revenue increases also contributed to rebalancing the budget: between 1862 and 1874 the tax ratio at the State level rose from 5.2 to 8.7 percent, reaching close to 11 percent by the end of the decade (also in connection with favorable macroeconomic conditions, with both prices and trade growing).

The close to balance position was maintained until 1884 (the average deficit over this period amounted to 0.4 per cent of GDP). It has been argued that such result was precarious in nature and based on creative accounting (see e.g., Plebano 1900, and Pedone 1967). Indeed, the difference between the change in general government debt and the State budget deficit is suspiciously large in 1876, 1881 and 1882 (fig. 8): the former is a measure of the cash deficit while the state budget is based on accruals; moreover the change in debt takes into account debt assumptions which may or may not be accounted for in the State budget. But similar differences between the two indicators were also recorded in previous years and, overall, the State deficit and the change in debt follow the same declining pattern.

A surge in expenditure reopened the imbalance in the second half of the 1880s, when the average deficit was 2.6 per cent of GDP, with a peak at 4.1 in 1888. Under the government of the Left the composition of spending changed. According to Plebano (1900), most expenditure in the early years of the Kingdom of Italy related to military needs, public works and to building the administration of the new State. Brosio and Marchese (1986) add to this list the service of debts inherited from pre-unitary states. Over the 1880s, instead, the most dynamic component of the budget was investment, which reached 3.7 percent of GDP in 1888, 26 per cent of non-military general government spending and 21 percent of total outlays (Brosio and Marchese 1986, p. 53).

The deficit was again about 1 percent of GDP in the first half of the 1890s; the budget was in balance in the second part of that decade; small surpluses were recorded from 1898 to

[18] However, the expenditure-to-GDP ratio was higher in Italy than in other European countries at that time: the average general government expenditure ratio over 1872-1912 was 17.0 per cent in Italy (using GDP data from Baffigi, 2011), 14.5 in Germany, 13.8 in France and 10.6 in Great Britain (Brosio and Marchese 1986).

[19] "Expenditure growth was rather limited during 1866-1914 […] set to 100 [the value of expenditure] in 1866, it was equal to 485 in 1918, after over 50 years, notwithstanding the acceleration due to World War I" (Brosio and Marchese 1986, p. 52). The average real growth rate over the period was about 2 percent. Over 1900-13, as a share of GDP, both State and General Government expenditure were broadly on the same level as in the 1860s.

1908; noticeable deficits emerged again only just before World War I (the average over 1911-1913 was 1.6 percent of GDP). Between 1899 and 1907, during the economy's "take off", as a share of GDP, total public spending declines and so does public revenue (both by about 2 percentage points; the reduction in primary outlays amounts to ½ percentage point). Giolitti's policy reduced the share of government in the economy at a time when private investment spending was buoyant and this benefited the economy. A balanced budget and regressive taxation provided favorable conditions for an increase in savings and for channeling it to industry (Brosio and Marchese 1986, p. 54).[20]

Overall the composition of public expenditure over 1862-1913 was relatively "growth-friendly". Public investment averaged at about 2 per cent of GDP over the whole period, with peaks at around 4 percent in the late 1880s (the average for that decade is 3 percent). The share of investment in total expenditure, on average, was close to 13 percent (15 percent of non-military outlays). Over 1866-1894, the sum of budget deficits is two thirds of the sum of investment spending; the latter accounts for about 80 percent of the increase in debt over the same period.

The government budget over 1960-2007. – The size of government increased steadily after World War II. General Government primary expenditure amounted to 27 percent of GDP 1960 and temporarily peaked at almost 44 percent in 1993 (fig. 9). Over two thirds of the increase come from social spending (pensions and health). Over three decades the provision of public services was widened in scope and extended to the whole population. The pension system gradually matured and expenses grew as benefits were claimed by cohorts with larger entitlements (see Franco, 1993). The increase in total expenditure was amplified by rising interest payments. Revenue followed with a lag: they remained below 30 percent of GDP until the mid-1970s and only reached the same level as primary expenditure in the early 1990s. Large and growing imbalances were recorded from the mid-1960s until the early 1990s. The deficit over 1960-64 averaged at just below 1 percent of GDP. It grew to almost 3 percent on average in the second part of the decade and then kept rising, posting average values of 7.6 percent in the 1970s, and 10.8 in the 1980s and early 1990s.

From the mid-1980s debt stabilisation became the main target of Italian fiscal policy. Initially, progress on the primary balance was offset by increasing interest expenditure. But then the deficit went down from 11.4 percent of GDP in 1989 to 2.7 in 1997 and to 1.7 in 1999. The revenue-to-GDP ratio increased by almost 6 percentage points over 1989-1999. Interest spending declined by 2½ points and capital outlays by slightly more than 1 point. Current primary spending, as a share of GDP, was unchanged.

"The consolidation process was characterised by a large resort to corrective measures with only temporary effects, which made it necessary to adopt sizeable budgetary manoeuvres repeatedly. The adjustment relied on significant increases in tax revenues and a sharp reduction in capital expenditure. The ratio of primary current outlays to GDP did not change significantly. The increasing expenditure trend of the previous decade was halted thanks to reforms of the pension system and to reductions in the resources transferred to local governments. The decline in the cost of servicing the debt, stemming from the

[20] Brosio and Marchese (1986) provide a classification of Italy's revenues over 1861-1913 according to the degree of regressivity. They find that regressive taxation accounted for about 50 per cent of total revenue on average in the period considered.

increasing confidence in the success of the consolidation effort and from the reduction of the inflation rate, significantly contributed to the outcome. The participation of Italy to EMU consolidated these results by further reducing the risk premium on Italian bonds. Notwithstanding the success of the adjustment, its characteristics may have been unapt to minimise its costs. The heavy reliance on tax increases and capital spending reduction may have hampered the growth performance of the economy. The recurrent corrective measures may have negatively affected expectations of households and companies. Emergency action frequently prevailed over long-term solutions. […] These factors may explain why, in spite of the large reduction in interest rate, the success of the consolidation effort has not lead to a significant acceleration in growth" (Balassone *et al*. 2002, pp. 779-780).

After 1999 the general government deficit averaged at just below 3 per cent of GDP. Total expenditure and revenue were broadly stable (at about 48 and 45 percent of GDP respectively). The further decline in interest outlays, by 1½ percentage points of GDP, was offset by an equal increase in primary current outlays.

7. Conclusions

The debate on the relationship between public debt and growth was revived in recent years by the surge in public debt across industrial countries in connection with the global crisis. We have put to test the proposition most often discussed in this context: that a higher public debt leads to lower growth.

Our main contribution to the debate is that we model our test on a standard production function. In addition, we work on deep time series for a single country rather than rely on panel analysis over a shorter time-span.

We find a sizeable negative influence of the debt-to-GDP ratio on per capita GDP growth, with the foreign component of debt exerting a stronger impact than the domestic one before 1914. As would be expected, we also find that capital accumulation has a positive and large effect on growth. The main results seem robust to different specifications and estimation techniques.

We augmented our baseline specification with several variables intended to take into account factors which, according to the literature on economic development, should have a bearing on growth. However, we found that only foreign debt adds explanatory power to the basic regression. This raises the question of whether better proxies could be used in future work.

Our empirical results help explaining why growth picked-up in Italy when the debt ratio was reduced over 1895-1913, but it did not over 1995-2007. In the first period capital accumulation was accelerating, the debt ratio was declining fast, with a significant contribution coming from foreign debt. In the second period capital accumulation was decelerating and the debt ratio declined slowly with little contribution from its foreign component.

We cannot account for the impact of fiscal variables (specifically the budget deficit) in our empirical analysis because of multicollinearity. However, a descriptive analysis of budgetary developments highlights additional important differences between the two periods under investigation with respect to both the initial deficit level and the composition of the budget.

First, in the 19th century, fiscal consolidation started much earlier than the debt-ratio reached its peak. In the 20th century, instead, fiscal consolidation had only just began when the debt ratio peaked in 1994. Thus, while the budget exerted no negative impulse on GDP growth during debt reduction over 1895-1913, a significant fiscal contraction, mostly based on revenue increases and cuts to investment spending, marked the start of debt reduction after 1994.

Second, the size of the budget before World War I was relatively small (revenues and expenditure averaged at around 10 and 11 percent of GDP, respectively) and its composition was growth-friendly, with investment amounting on average to 13 percent of total outlays over 1866-1913: about 80% of debt accumulation until 1894 can be accounted for by public investment. The size and composition of the budget were radically different over 1960-2007. Revenues and expenditure averaged at around 40 percent of GDP and investment amounted on average to 6 percent of total expenditure. The average deficit was more than twice investment spending.

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Figures and Tables

Fig. 1 – Italy's Public Debt: 1861-2010
(% of GDP)

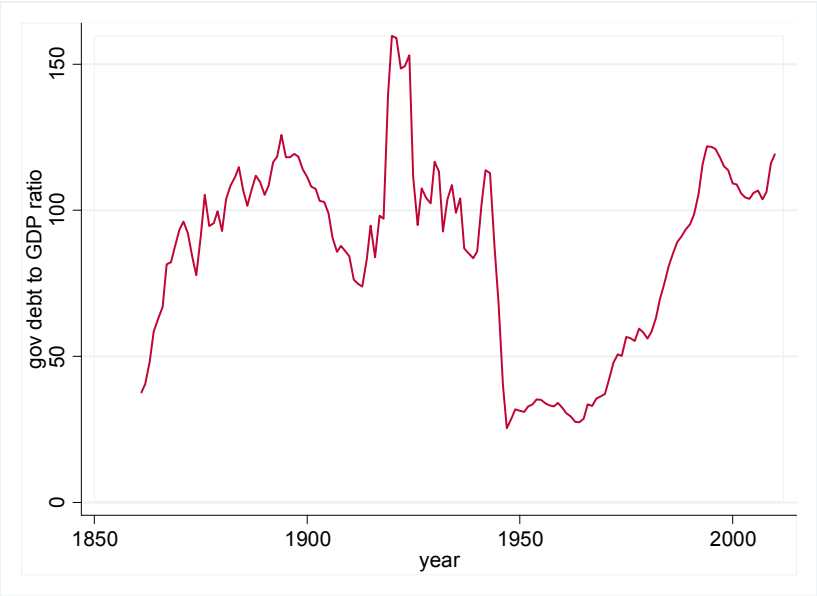


Fig. 2 – Correlation between Public Debt-to-GDP Ratio and Real Per Capita Income Growth in Italy

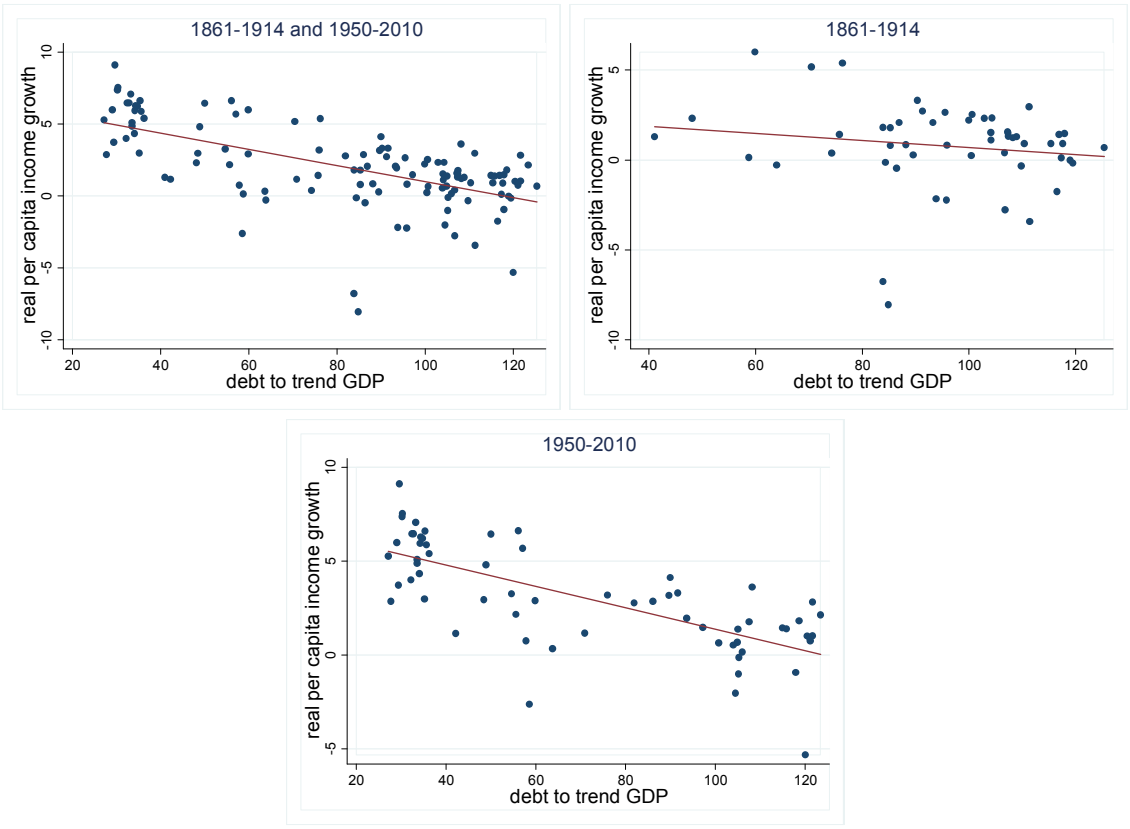


Fig. 3 - Public Debt-to-GDP Ratio and Real Per Capita Income Growth in Italy

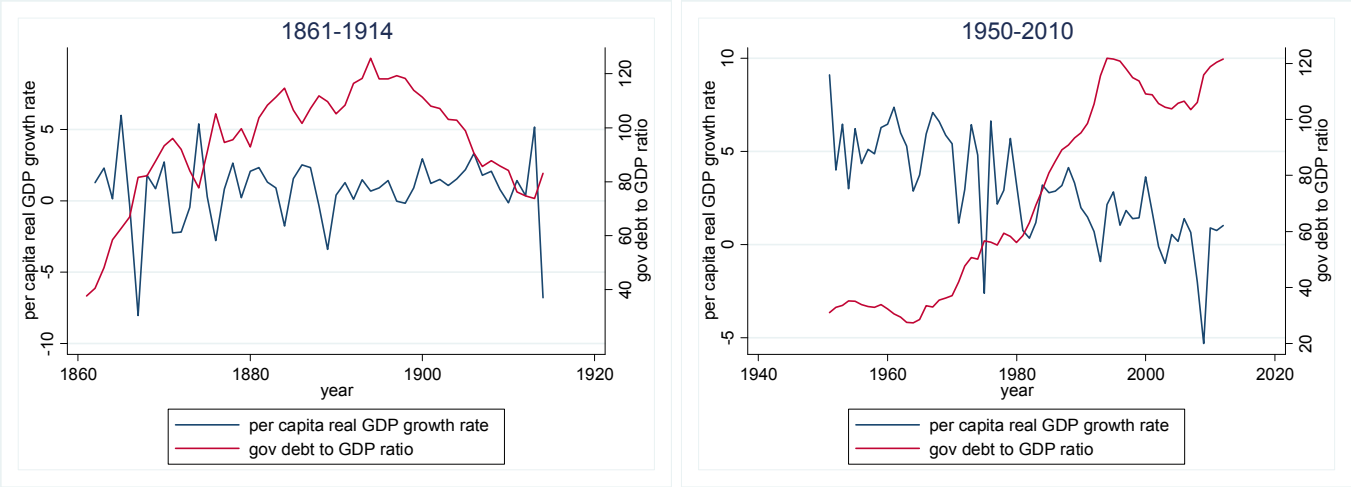


Fig. 4 - Debt and Growth in Italy: Selected Episodes

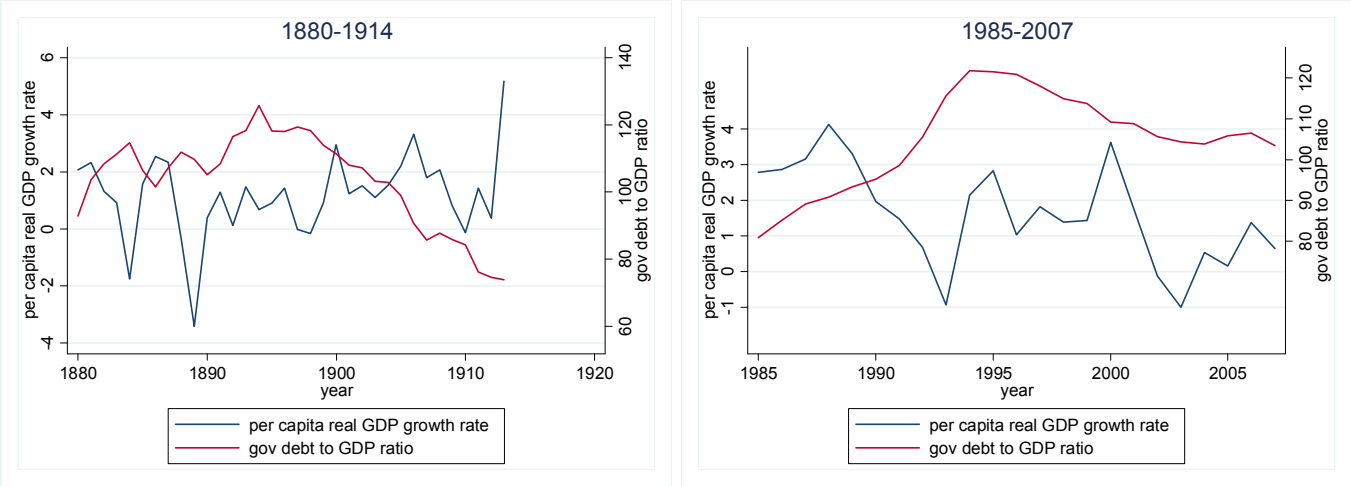
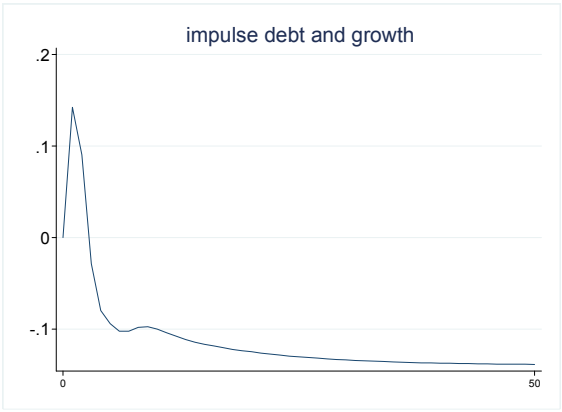
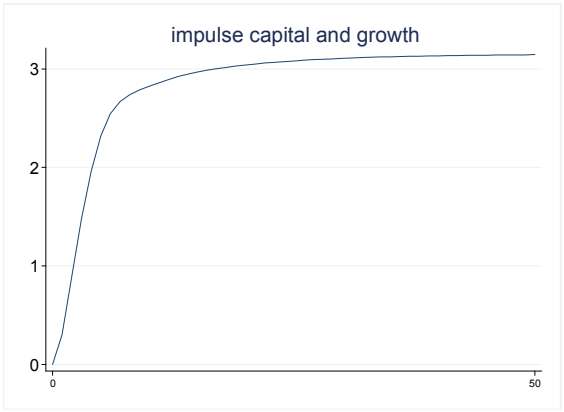


Fig. 5- Impulse-response charts from VECM of $\ln y_t$, $\ln d_t$ and $\ln k_t$

a)



b)



c)

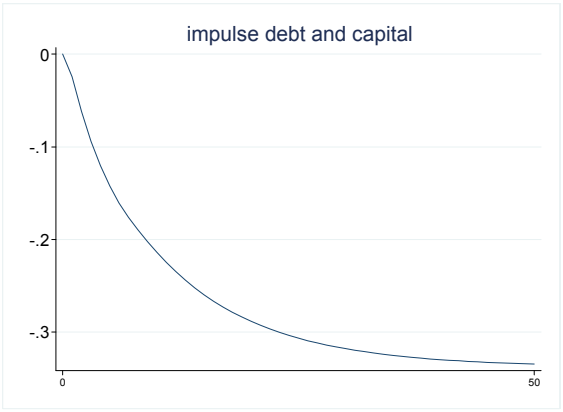


Fig. 6 – Changes in the budget balance and its main components: 1894-1913 vs. 1994-2007 *(% of GDP)*

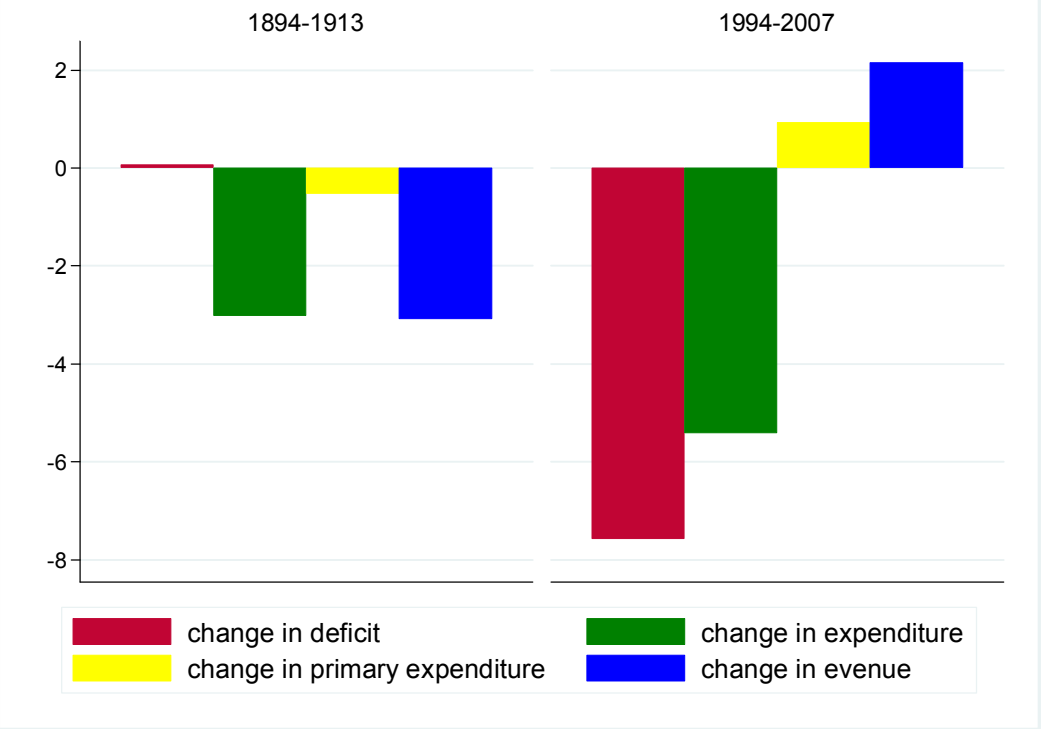


Fig. 7 – State Expenditure and Revenue 1862-1913 *(% of GDP)*

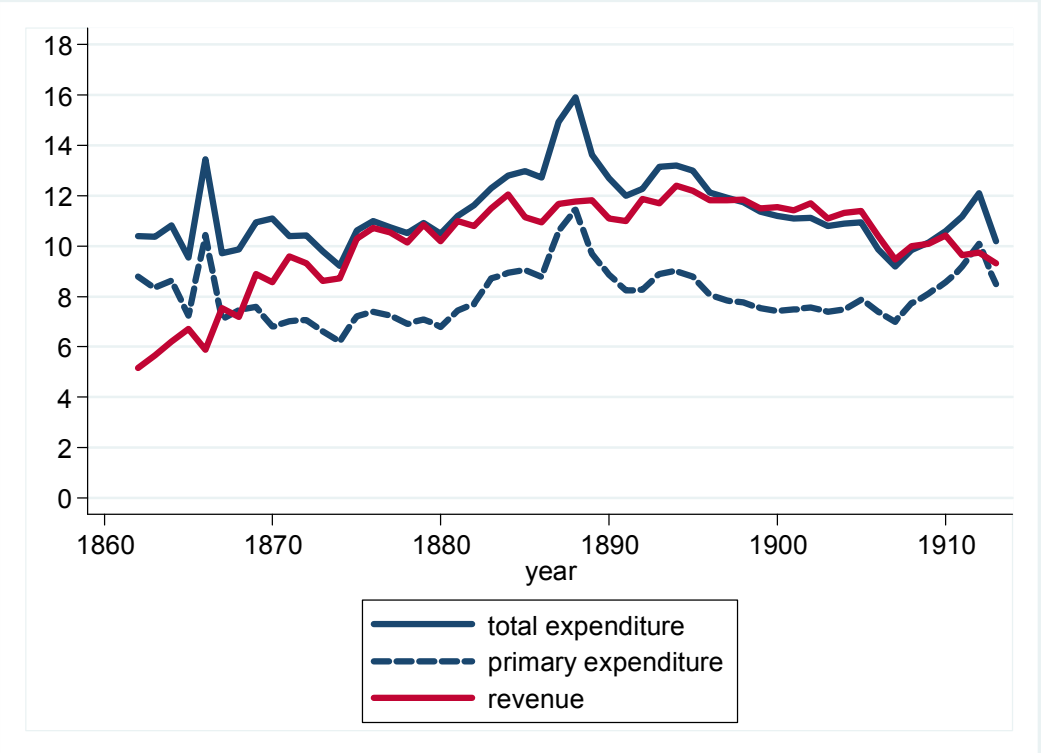


Fig. 8 – State Deficit and Change in Government Debt 1862-1913
(% of GDP)

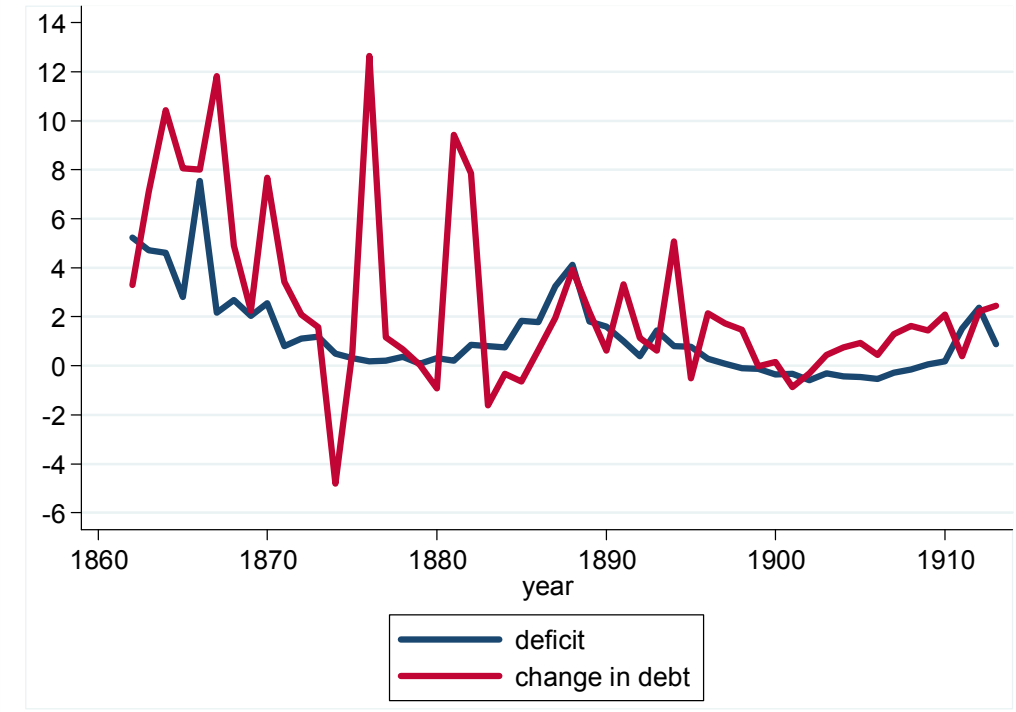
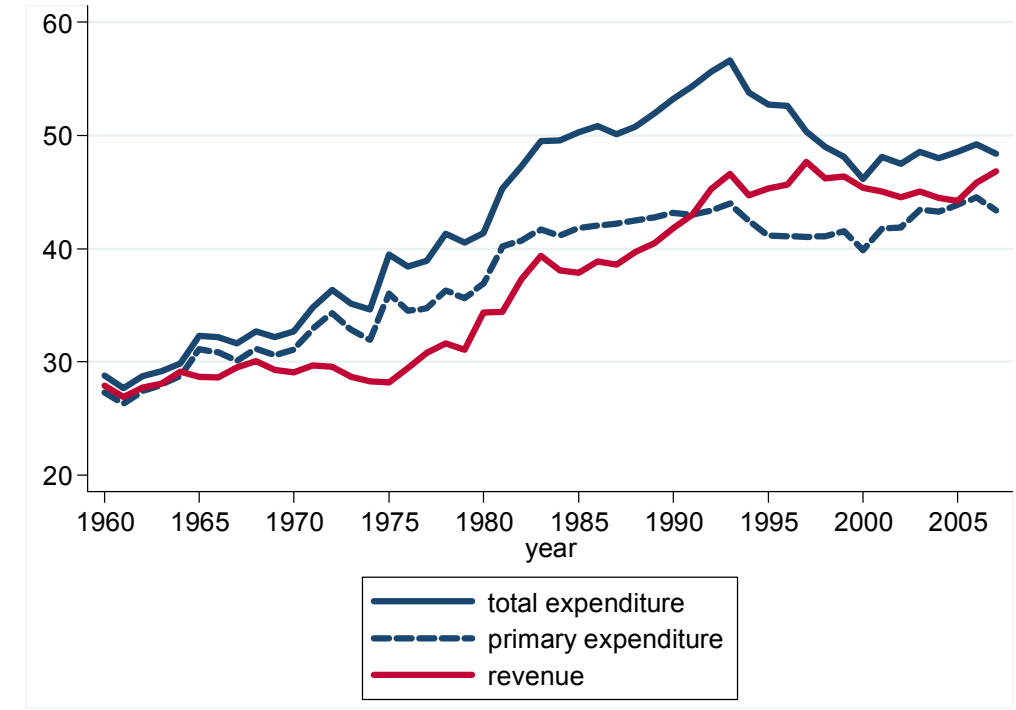


Fig. 9 – General Government Expenditure and Revenue 1960-2009
(% of GDP)



Tab. 1 - Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
1861-2007					
log real per capita GDP - ln y_t	147	-6.471	0.818	-7.364	-5.009
real per capita GDP growth rate	146	1.931	5.101	-19.539	33.871
log - real per capita capital - ln k_t	147	-5.014	0.769	-5.808	-3.534
government debt to trend GDP ratio - d_t	147	85.490	33.321	24.760	175.234
1861-2007 excl. years from IWW to 1949					
log real per capita GDP - ln y_t	111	-6.334	0.898	-7.364	-5.009
real per capita GDP growth rate	110	2.217	2.667	-8.045	9.116
log - real per capita capital - ln k_t	111	-4.884	0.840	-5.808	-3.534
government debt to trend GDP ratio - d_t	111	80.236	31.114	27.200	125.346
1861-1913					
log real per capita GDP - ln y_t	53	-7.188	0.148	-7.364	-6.894
real per capita GDP growth rate	52	0.932	2.201	-8.045	5.998
log - real per capita capital - ln k_t	53	-5.654	0.096	-5.808	-5.495
government debt to trend GDP ratio - d_t	53	94.609	20.498	38.258	125.346
1950-2007					
log real per capita GDP - ln y_t	58	-5.553	0.486	-6.569	-5.009
real per capita GDP growth rate	58	3.370	2.531	-2.611	9.116
log - real per capita capital - ln k_t	58	-4.180	0.546	-5.190	-3.534
government debt to trend GDP ratio - d_t	58	67.102	33.426	27.200	123.409

Tab. 2 – Dickey-Fuller test for unit root

Variable	Test statistic	McKinnon approximate p-value	Variable	Test statistic	McKinnon approximate p-value
$\ln y_t$	1,050	0,995	$\Delta \ln y_t$	-7,665	0,000
$\ln k_t$	4,289	1,000	$\Delta \ln k_t$	-3,916	0,002
$\ln d_t$	-1,984	0,294	$\Delta \ln d_t$	-9,263	0,000
Number of obs: 146			Number of obs: 145		
Critical values: -3.495 (1%); -2.887(5%); -2.577(10%)).					

Tab. 3 – Johansen tests for cointegration

Trend: constant		Number of obs= 145	
Sample: 1863-2007		Lags=2	
maximum r	trace statistics		5% critical value
0	45,003		29,68
1	12,160	*	15,41
2	0,009		3,76

Tab. 4 – Estimation results

Variables		basic specification (no ARDL terms) (1)		ARDL(4) (2)		selected specification (3)		nl (with non linear constraints on parameters) (4)		2SLS (5)		selected specification 1861-1913 (6)		selected specification 1950-2007 (7)	
		coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
constant	β_0	-2.242 ***	0.000	-2.136 ***	0.002	-2.356 ***	0.000	-1.763 ***	0.001	-1.514	0.119	-10.536 ***	0.001	0.583	0.598
year	β_1	0.001 ***	0.000	0.001 ***	0.002	0.001 ***	0.000	0.001 ***	0.000	0.001	0.121	0.004 ***	0.000	-0.001	0.335
ln y_{t-1}	β_2	-0.216 ***	0.000	-0.153 ***	0.001	-0.208 ***	0.000	-0.156 ***	0.000	-0.185 ***	0.000	-0.602 ***	0.000	-0.270 ***	0.001
ln d_{t-1}	β_3	-0.027 ***	0.000	-0.015 **	0.035	-0.023 ***	0.001	-0.025 ***	0.000	-0.028 ***	0.001	-0.109 ***	0.000	0.004	0.726
ln k_{t-1}	β_4	0.174 ***	0.000	0.111 ***	0.004	0.164 ***	0.000	0.122 ***	0.000	0.159 ***	0.000	0.296 ***	0.000	0.246 ***	0.001
Δln d_t	β_5	-0.143 ***	0.000	-0.164 ***	0.000	-0.176 ***	0.000	-0.161 §		-0.274 ***	0.010	-0.205 ***	0.000	-0.161 ***	0.000
Δln k_t	β_6	0.676 ***	0.000	0.735 ***	0.000	0.800 ***	0.000	0.782 §		0.848 ***	0.000	0.691 ***	0.000	0.972 ***	0.000
No. Obs.		110		106		107		107		107		49		58	
R-squared		0.628		0.728		0.696		0.685		0.647		0.711		0.818	
Tests															
parameters restrictions															
1) $-(\beta_4/\beta_2)=\beta_6$		-1.370 (0.174)		0.080 (0.937)		0.100 (0.924)		constrained coeffs.		-0.100 (0.922)		1.480 (0.148)		0.360 (0.723)	
2) $'-(\beta_3/\beta_2)=\beta_5$		-0.460 (0.646)		-1.250 (0.216)		-1.400 (0.164)		constrained coeffs.		-1.620 (0.106)		-0.510 (0.615)		-3.030 (0.004)	
normality of rediduals															
Skewness/Kurtosis tests						2.440 (0.295)						0.120 (0.942)		5.150 (0.076)	
Shapiro-Wilk W test						-0.111 (0.544)						-1.768 (0.961)		0.727 (0.234)	
Shapiro-Francia W' test						0.572 (0.284)						-1.468 (0.929)		1.250 (0.106)	
Portmanteau for whitenoise						49.405 (0.146)						19.698 (0.602)		30.179 (0.306)	
autocorrelation of residuals															
a) Breusch-Godfrey LM test for autocorrelation															
lags 1						1.388 (0.239)						0.505 (0.477)		2.292 (0.130)	
lags 2						1.400 (0.497)						0.735 (0.693)		3.032 (0.220)	
b) Durbin's alternative test for autocorrelation															
lags 1						1.249 (0.264)						0.386 (0.535)		1.893 (0.169)	
lags 2						1.246 (0.536)						0.548 (0.760)		2.482 (0.289)	
c) LM test for autoregressive conditional heteroskedasticity (ARCH															
lags 1						0.090 (0.764)						0.542 (0.462)		0.354 (0.552)	
lags 2						0.805 (0.669)						0.450 (0.798)		7.615 (0.022)	

*, ** and *** significance at 10, 5 and 1 per cent respectively

§ computed given parameters restrictions

Tab. 5 – Development of selected variables over debt accumulation/reduction episodes

	1880-1913		1985-2007	
	debt accummulation	debt reduction	debt accummulation	debt reduction
	1880-1894	1895-1913	1985-1994	1995-2007
average per capita GDP growth (%)	0.77	1.49	2.16	1.19
per capita capital growth	decreasing	increasing	decreasing	decreasing
average yearly variation	-0.07	0.10	-0.04	-0.07
average debt ratio	109.44	98.84	97.61	110.52
change in the debt ratio	32.91	-51.88	40.94	-18.37
of which: foreign debt	4.8	-22.9	3.4	0.7

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