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Budget deficits and money creation: Exploring their relation before Bretton Woods

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ABSTRACT

The sovereign debt crisis in the Eurozone has rekindled the use of the North–South (core-periphery) terminology to refer to the heterogeneity of countries belonging to the Economic and Monetary Union (EMU). In the gold standard literature, this geographical partition had already been employed to oppose the fiscal profligacy and subsequent problems of convertibility of southern countries against the fiscal probity and long convertibility records of their northern counterparts. We provide statistical evidence that the group of countries that, with available data for 1870–1938, exhibited convertibility problems during the classical gold standard, for this reason called the pre-WWI "sometimes-floaters", shared a pattern of fiscal dominance. This finding for the sometimes-floaters (southern European and South American countries plus Japan) differs from the non-fiscal dominance pattern that we obtain for the pre-WWI "never-floaters" (northern Europe and North America countries) when the Great War and its aftermath years are omitted. We also show that the presence of fiscal dominance was partly due to the lower levels of tax efficiency and political stability in the South.

1. Introduction

The last decade has seen an explosion of research that has reflected on the 2008 financial crisis. One strand of the literature has built chronologies of crises going back for up to two centuries to identify their triggering factors (Reinhart and Rogoff, 2009; Calomiris, 2010a; Jordá et al., 2011; Bordo and Meissner, 2015) and establish formal connections between financial and real cycles (Schularick and Taylor, 2012; Reinhart and Reinhart, 2015; Jordá et al., 2017). A related line of research has traced back changes in the regulatory framework and analyzed how these changes modified the risk-taking propensity of the banking system (Calomiris, 2010b; Mitchener and Richardson, 2013; Calomiris et al., 2016) and the connection between banking and the debt crises (Reinhart and Rogoff, 2011; Schularick, 2012; Mitchener, 2014; Bordo and Meissner, 2016). Furthermore, the sovereign debt crisis in the Economic and Monetary Union (EMU) reignited the discussion on the sustainability of a single currency without a single fiscal policy, prompting comparisons with the functioning of the gold standard a century ago (Eichengreen and Temin, 2010; Bordo and James, 2013).

The gold standard and the EMU involved the acceptance of a monetary objective, convertibility into specie during the standard and price stability within the Eurozone. In both cases, the long-run accomplishment of the monetary objective required budgetary discipline and, although there is a general consensus (the Greek case apart) that markets overreacted to fiscal positions when pricing the southern EMU sovereign bonds (Marzinotto et al., 2011; De Grauwe and Ji, 2013), the recent crisis has resuscitated the North–South partition that was so prevalent in the gold standard literature.

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There is a wide narrative reporting the failure of countries like Greece, Italy, Portugal and Spain to conduct fiscal policies compatible with lasting gold convertibility during the classical (1870–1913) and the exchange (1925–31) gold standards. Economic historians have long referred to southern Europe and South America as areas where the monetary financing of deficits drove prices to diverge from international (gold) prices, provoking balance of payments problems, gold depletion, and, eventually, the suspension of convertibility (Eichengreen, 1992; Bordo and Rockoff, 1996; Eichengreen and Flandreau, 1996; Martín-Aceña et al., 2000). The core (France, Germany, the UK and the USA) and other countries (in Scandinavia, Western Europe and new Anglo-Saxon settlements) have been presented, in contrast, as good practitioners of financial orthodoxy and, consequently, with long records of convertibility. This idea that systematic differences in the North–South fiscal and monetary performances might have determined a different record of gold adherence is at the heart of Bordo and Schwartz's (1996) survey on the operation of specie standards, where the higher demand-shock estimates corresponding to the southern European and South American countries are taken as indicative of their greater use of discretionary (fiscal and monetary) policies.

This article goes a step further and tests whether, underlying this North–South partition, there was a pattern of fiscal dominance in the South opposed to an absence of pattern in the North. We work with the broadest panel for which data are available during 1870–1938 and, for the first time in the gold standard literature, examine the relationship between deficits and money creation considering groups of countries with different convertibility performances on the basis of a unified statistical treatment. Prior research covering the classical and the exchange gold standards has provided evidence of fiscal dominance –that is, evidence that deficits drove money creation (seigniorage), at the country level. Fratianni and Spinelli (2001) and Sabaté et al. (2006, 2015) found supportive evidence for Italy during 1865–1998 and Spain during 1875–1998, respectively. Gadea et al. (2012) showed the same for Argentina during 1875–1990 and Morys (2017) illustrated how deficits drove money issue in Greece during 1861–1939 as well as in Bulgaria and Romania when omitting years characterized by foreign financial supervision or gold convertibility.

We test the hypothesis of fiscal dominance for two sub-samples, grouping countries according to their convertibility performance. The first group consists of ten countries that experienced inconvertibility episodes before the outbreak of World War I (WWI), whose exchange rates were, therefore, not always fixed and that we call the pre-WWI "sometimes-floaters", and the second group consists of seven countries that did not register inconvertibility episodes, hereafter, the pre-WWI "never-floaters". When we consider the entire sample period, 1870–1938, results from our cointegration analysis show a significant positive relationship between deficits and monetary base growth (our proxy for seigniorage) for both groups, although this relationship is stronger for the pre-WWI sometimes-floaters. More importantly, if we run the same analysis omitting the years 1914–24 (those of WWI and its aftermath), the significance of the association remains for the group of pre-WWI sometimes-floaters, but fades for the never-floaters. This means that, once the monetary impact of wartime deficits was absorbed, the group of pre-WWI never-floaters returned to financial probity and that this probity even survived their widespread abandonment of gold following the suspension of the pound's convertibility in 1931. Thus, this paper contributes to the gold standard literature by providing empirical evidence that underlying the differences in convertibility success, weaker for the pre-WWI sometimes-floaters and stronger for the pre-WWI never-floaters, were the presence and lack, respectively, of a fiscal dominance pattern.

Also, our finding of a pattern of fiscal dominance for the sometimes-floaters contributes to the public finance literature. The celebrated formulation of the fiscal dominance hypothesis by Sargent and Wallace (1981) soon suffered from an absence of supporting empirical evidence. A number of works following the seminal paper of King and Plosser (1985), mostly focused on OECD countries during the second half of the twentieth century, failed to support the existence of a statistically significant positive relationship between deficits and money growth and/or inflation rates. Strong empirical evidence for the second half of the twentieth century had to wait until the panel analyses in Catão and Terrones (2005), by distinguishing between short- and long-run effects of deficits on inflation and covering developed but also developing countries, found a significant association for the group of high-inflation (normally, developing) countries. The significant relationship between deficits and money creation that we find for the group of pre-WWI sometimes-floaters, which consists of countries with recurrent difficulties in keeping domestic prices linked to international (gold) prices, adds historical evidence of fiscal dominance to that provided by these authors for the post-Bretton Woods era.

Why did fiscal dominance take place in some countries during the nineteenth century? As mentioned in Catão and Terrones (2005), a less efficient tax system, lower creditworthiness, and higher political instability may explain a stronger proclivity to monetize deficits. Aisen and Veiga (2008) provide evidence that all these factors increased a country's reliance on seigniorage during the second half of the twentieth century. To our knowledge, no previous study has studied the effect of these factors on seigniorage before Bretton Woods. When the gold standard was operational, Bordo and Schwartz (1996) posited greater supply (terms of trade) shocks, and lower levels of development and political stability as the factors behind the greater use of discretional (fiscal and monetary) policy in southern Europe and South America. Further measures of fiscal health, development, and civil unrest have proved to be significant determinants of country-risk premia during 1880–1913 (Ferguson and Schularick, 2006) and negative shocks to a country's main-export price have been found significant in explaining the higher currency-risk premia registered by peripheral countries, even when formally on gold, within the period 1870–1913 (Mitchener and Weidenmier, 2015, Mitchener and Pina, 2016).

We build on this existing literature by testing how these factors influenced a country's ability to avoid seigniorage. We provide direct evidence that lower levels of development (and supposedly less efficient tax systems), poorer creditworthiness, and higher political instability expanded seigniorage during 1870–1938. We thus suggest that when pre-WWI sometimes-floaters resorted more heavily to seigniorage, it was partly because they averaged lower levels of economic development and a higher degree of political instability. Whenever southern European countries felt compelled to run profligate fiscal policies inconsistent with keeping their prices in line with the international (gold) prices, they would break free from their "golden fetters" (Eichengreen, 1992) and abandon convertibility. In this sense, history provides an interesting contrast for the (so far) contemporary willingness of countries like Greece, Italy, Portugal and Spain to wear what, in the form of fiscal austerity and internal deflation, have become tight (euro) "paper fetters" (Eichengreen and Temin, 2010).

2. The hypothesis of fiscal dominance

To capture the long-run effect of fiscal policy on money creation, following Sargent and Wallace (1981) and King and Plosser (1985), we start from the single-period budget constraint, for period t:

$$D_t - D_{t-1} = NFS + R_{t-1} D_{t-1} - T_t - F_t \tag{1}$$

where D_t is the stock of public debt in year t; NFS_t denotes non-financial (public) spending; R is the nominal interest rate; T_t stands for taxes; and F_t is our term for the funds transferred by the central bank to the Treasury in year t, that is, seigniorage.

For the purpose of considering the different modalities of transferring funds to the Treasury before World War II (WWII), which included the concession of interest-free loans and the purchase of public bonds by the central bank, a new framework is developed. We therefore modify Eq. (1) by splitting the total stock of public debt (D_t) into the debt actually held by the public (D_t^p) and the debt placed on the central bank's balance sheet (D_t^{cb}). The resulting equation is:

$$\left(D_t^p + D_t^{cb}\right) - \left(D_{t-1}^p + D_{r-1}^{cb}\right) = NFS_t + R_{t-1}\left(D_{t-1}^p + D_{t-1}^{cb}\right) - T_t - \left(L_t + R_{t-1} D_{t-1}^{cb}\right) \tag{2}$$

where L_t denotes the interest-free loans that the government obtains from the central bank and $R_{t-1} D_{t-1}$ stands for the remission of interest that accrues to the central bank for its holding of public debt. We can re-arrange Eq. (2) to obtain:

$$D_t^p = NFS_t + \left(1 + R_{t-1}\right) D_{t-1}^p - T_t - \left(Lt + D_t^{cb} - D_{t-1}^{cb}\right) \tag{3}$$

Defining the real rate of interest (r_t) as $1 + r_t = (1 + R_t)P_{t-1}/P_t$ and the real rate of economic growth (η_t) as $\eta_t = (y_t/y_{t-1}) - 1$ yields:

$$d_t^p = nfs + \frac{\left(1 + r_{t-1}\right)}{\left(1 + \eta_t\right)} d_{t-1}^p - \tau_t - \left(l_t + \Delta d_t^{cb}\right) \tag{4}$$

Here, lowercase letters are used for variables that have been divided by nominal gross domestic product (GDP)—that is, by the product of real GDP (y_t) and the price level (P_t). If we now solve forward, impose the transversality condition on debt, assume certainty, and discard defaults, then the intertemporal budget constraint can be written as:

$$d = \sum_{j=1}^{\infty} \gamma_{tj} nfs_{t+j} - \sum_{j=1}^{\infty} \gamma_{tj} \tau_{t+j} - \sum_{j=1}^{\infty} \gamma_{tj} \left(l_{t+j} + \Delta d_{t+j}^{cb}\right) \tag{5}$$

γ_{tj} being the discount factor, $\gamma_{tj} = \{\prod_{k=1}^{j} (1 + \eta_{t+k})\} / \{\prod_{k=1}^{j} (1 + r_{t+k-1})\}$. Finally, we can re-arrange Eq. (5) so that it reads:

$$\sum_{j=1}^{\infty} \gamma_{tj} \left(l_t + \Delta d_{t+j}^{cb}\right) = \sum_{j=1}^{\infty} \gamma_{tj} (nfs_{t+j} - \tau_{t+j}) - d_t^p. \tag{6}$$

According to this expression, if fiscal authorities control the paths of taxation, public spending and debt, then remain two factors only under the control of monetary authorities to achieve a predetermined present value of monetary revenue (seigniorage), namely, the timing of loans to the government and the timing of public debt purchases.

As argued by King and Plosser (1985), the theoretical nexus is between deficits (contemporary and previous) and the present discounted value of revenue from seigniorage. In other words, fiscal dominance requires the existence of a dynamic relationship from deficits (first term on the right-hand side of Eq. (6)) to the money created as a counterpart to loans to the government and placement of public debt in the central bank (left-hand side of Eq. (6)). The stock of these loans and public debt constitutes, *stricto sensu*, the Treasury component of the monetary base. Thus, ideally, we should test for a relation between deficits and increases in that Treasury component.[1] Yet, incompleteness in our data forces us instead to examine the relation between deficits and increases in the whole monetary base, of which foreign reserves are also a component.[2]

The availability of figures for public budget, monetary base and nominal GDP for the 1870–1938 allows us to work with a panel of seventeen countries that we split into two groups. As we have said, there is a group of ten countries which experienced fiscal problems and inconvertibility episodes before the outbreak of WWI, which we name pre-WWI sometimes-floaters. These countries are Argentina,

[1] Some countries, such as Italy (Cotula and Spaventa 1993) and Spain (Sabaté et al. 2006) used a procedure known as indirect debt monetization to place public bonds in the central bank. This procedure consisted of selling bonds to private buyers (in essence, private banks) with the added feature that the bonds could be automatically pledged at the central bank at a lower interest rate than the yield on bonds received by the subscribers, which rendered this procedure a privileged financing channel for the Treasury. In this scenario, the link to examine would ideally be that between deficits, on the one hand, and, on the other hand, increases in the Treasury component *plus* increases in the private component (for the pledging of public debt by private banks) of the monetary base.

[2] We are aware that using the whole monetary base raises the problem that shocks to its foreign component due, for example, to new gold discoveries, could blur the relation between deficits and money creation. If one assumes that a gold shock increases both demand and public revenues, then an increase in the monetary base would be paired with a fiscal improvement whereas, in a monetary-financing-of-deficit scenario, the relation between budget balance and money variations is expected to be negative. We thank an anonymous referee for this observation.

Table 1
Descriptive statistics: Yearly means (%) and standard deviations of variations in the monetary base (*dmb*) and budget balance (*b*), both divided by GDP.

	1870–1938		1870–1913		1914–38		1870–1938[a]	
	dmb [1]	*b* [2]	*dmb* [3]	*b* [4]	*dmb* [5]	*b* [6]	*dmb* [7]	*b* [8]
Whole sample								
Mean	0.830	–2.010	0.560	–1.570	1.280	–2.950	0.490	–1.510
Standard deviation	0.030	0.044	0.044	0.060	0.044	0.060	0.017	0.030
Pre-WWI sometimes-floaters								
Mean	1.150	–2.290	0.780	–2.130	1.790	–2.830	0.660	–1.870
Standard deviation	0.036	0.049	0.049	0.060	0.050	0.061	0.020	0.037
Pre-WWI never-floaters								
Mean	0.360	–1.610	0.240	–0.760	0.560	–3.110	0.250	–1.000
Standard deviation	0.011	0.039	0.017	0.061	0.017	0.062	0.008	0.019

Notes: The whole sample includes Argentina, Bulgaria, Brazil, Canada, Chile, Finland, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Romania, Spain, Sweden, the United Kingdom, and the United States. The pre-WWI sometimes-floaters subsample consists of ten countries that either suspended or held no gold convertibility during 1880–1913: Argentina, Bulgaria, Brazil, Chile, Greece, Italy, Japan, Portugal, Romania, and Spain. The pre-WWI never-floaters subsample consists of seven countries that maintained uninterrupted convertibility during 1880–1913: Canada, Finland, the Netherlands, Norway, Sweden, the United Kingdom, and the United States. The sources for values of *dmb* and *b* are given in Appendix 3.
[a] Columns [7] and [8] exclude the years 1914–24.

Bulgaria, Brazil, Chile, Greece, Italy, Japan, Portugal, Romania and Spain. The group of pre-WWI never-floaters is made up of seven countries that show unbreakable convertibility during the heyday of the classical gold standard (1880–1913). These countries are Canada, Finland, the Netherlands, Norway, Sweden, the UK and the USA.[3] Regretfully, two core countries, France and Germany, had to be excluded from the analysis. For France, there is no available series of monetary base and, for Germany, data on this series are not available for years after 1924 and there are no available data on nominal GDP from 1914 to 1924.

Table 1 presents descriptive statistics for the public budget balance (*b*) and variations in the monetary base (*dmb*), both over nominal GDP, for different country samples and periods. Some stylized facts can be drawn. To start with, it is clear that the group of pre-WWI sometimes-floaters averaged greater monetary base growth irrespective of the period considered. They also experienced greater deficits, on average, except during the years 1914–38, which are clearly dominated by WWI and its aftermath. Finally, both the average deficits and average increases in the monetary base of the periods 1870–1913 and 1870–1938 are remarkably similar, provided the war-related years (1914–24) are omitted. We will refer to these stylized facts when, in Sections 3 and 4, econometric estimates call for historical interpretation.

3. Empirical evidence

To estimate the dynamic essence of the monetary financing of deficits, we apply panel co-integration to the series of public budget balance (*b*) and the series of variations in the monetary base (*dmb*). Formally, we estimate the following equation:

$$dmb_{it} = \mu_i + \sum_{j=1}^{p} \beta_{1i,j} dmb_{i,t-j} + \sum_{k=0}^{p} \beta_{2i,j} b_{i,t-k} + \xi_{it} \tag{7}$$

where μ_i represents fixed effects for country *i; dmb_{it}* denotes monetary base variation and b_{it} budget balance for country *i* at time *t*. Monetary base variation and budget balance enter the equation with lags of order *p* and *q*, respectively.

Eq. (7) can be recast as a linear combination of variables grouped into levels and first differences:

$$\Delta dmb_{it} = \mu_i + \alpha\left[dmb_{i,t-1} - \chi_i b_{it}\right] + \sum_{j=1}^{q-1} \beta^*_{2i,k} \Delta b_{i,t-k} + \xi_{it} \tag{8}$$

and

$$\beta^*_{1i,j} = -\sum_{m-j+1}^{p} \beta_{1i,m}; \beta^*_{2i,k} = -\sum_{m=k+1}^{q} \beta_{2i,m};\ \chi_i = -\alpha_i^{-1} \sum_{k=0}^{q} \beta_{2i,k};\ \text{and } \alpha_i = -\left(1 - \sum_{j-1}^{p} \beta_{1i,j}\right).$$

The χ_i coefficient defines the long-run relation between budget balance and monetary base variations, and the α_i coefficient defines the speed of adjustment to equilibrium.

We start by analyzing the dynamics for the whole seventeen-country sample during 1870–1938 and find that the significance of the lagged dependent variable (*dmb*) confirms the posited dynamic nature of Eq. (7). We adopt the restriction $p < 2$ because additional

[3] Appendix 1 details the chronology of data availability across these countries. Our sources are given in Appendix 3.

Table 2
Dynamic heterogeneous panel estimation of variations in the monetary base (*dmb*) on the budget balance (*b*).

	1870–1938		1870–1938			
	All countries		Pre-WWI sometimes-floaters		Pre-WWI never-floaters	
	MG [1]	PMG [2]	MG [3]	PMG [4]	MG [5]	PMG [6]
Long-run elasticity (χ_i)	–0.051	–0.023***	–0.171**	–0.136***	0.122	–0.017*
	(0.487)	(0.008)	(0.047)	(0.000)	(0.223)	(0.085)
EC coefficient (α_i)	–0.683***	–0.621***	–0.756***	–0.678***	–0.577***	–0.574***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hausman statistic	0.13		0.17		1.92	
	[0.721]		[0.679]		[0.165]	
Likelihood ratio index	0.21		0.91		0.17	
Observations	1052		606		446	

Notes: The dependent variable is *dmb*, or variation in the monetary base divided by nominal GDP. Estimations are based on Eq. (8).
p-values are in parenthesis; *significant at the 10% level; **at the 5%; ***at the 1%.
Reported values are the mean group (MG) and pooled mean group (PMG) estimators of Pesaran, Shin, and Smith (1999). Both the lagged dependent variable and the public budget balance are lagged by one period. The Hausman statistic tests the null hypothesis that the difference between MG and PMG is not systematic.

lags are not significant; also, we impose $q \neq 0$ to avoid endogeneity and $q < 2$ to maximize the number of observations. We use both the mean group (MG) estimator and the pooled mean group (PMG) estimator for dynamic heterogeneous panels (Pesaran et al., 1999). The former is a consistent estimator derived as the mean of individual long-run effects. In contrast, the PMG estimator assumes a common long-run effect—that is, it assumes that the sample's long-run coefficients are homogeneous—and is efficient under the null hypothesis that there is no systematic difference between the MG and PMG estimators. When the Hausman test cannot reject that null hypothesis, the PMG estimator is preferred because it is both consistent and efficient.

The results from estimating (8) for the whole sample during 1870–1938 are reported in columns [1] and [2] of Table 2. The long-run coefficient, χ_i, is significant only when the PMG estimator is used and the two error-correction coefficients, α_i, are each significant and indicate that the half-life reaction of money creation to deficits is less than two years.[4] The Hausman test has a *p*-value exceeding 0.05 and so fails to reject the null that the MG and PMG estimators are not different, hence we prefer the efficient PMG estimator. As already mentioned, the PMG estimate of –0.02 is significant, so there is evidence, although weak, of a positive (negative) relation between deficits (budget balances) and increases in the monetary base before WWII. A 1% increase in the deficit, that is, a 1% decrease in *b*, the variable budget balance over nominal GDP, leads to an average increase in *dmb,* the monetary base over nominal GDP, of only 0.02 percentage points during 1870–1938.

Yet, even though the Hausman test selects the PMG estimator for our seventeen-country sample, this acceptance does not preclude the possibility of some heterogeneity and, consequently, of achieving additional efficiency gains by dividing it into more homogenous subsamples. We explore this possibility by splitting the sample into a group of pre-WWI sometimes-floaters and a group of pre-WWI never-floaters. Columns [3]–[6] of Table 2 give the results from estimating Eq. (8) for these two groups. The PMG estimator is the preferred option for both groups of countries, and once again we find a significant long-run positive (negative) relation between deficits (budget balances) and *dmb*. But now the relation is stronger (the coefficient is –0.14 rather than –0.02) and also more significant for the pre-WWI sometimes-floaters. For this group, moreover, the model fit is far better (likelihood ratio index = 0.91) than for the pre-WWI never-floaters (likelihood ratio index = 0.17).

These different strengths in the relation between deficits and money creation found for the two groups offer historical support to the idea that evidence of deficit monetization is highly sensitive to the sample selection, as shown by both Fischer et al. (2002) and Catão and Terrones (2005) for the second half of the twentieth century. Fischer et al. (2002), working with a sample of 94 countries in 1960–95, showed how, when allowing a different coefficient for high- and low-inflation countries, the coefficient value that related deficits and money growth rose sharply for the high-inflation countries, for which a significant positive relation between deficits and inflation was also found. This evidence was reinforced by Catão and Terrones (2005) who used dynamic panel data techniques to study a sample of 107 countries in 1960–2001 and found higher significant positive estimates for the relationship between fiscal deficits and inflation when the low-inflation economies were excluded from the panel. According to these authors, data samples with a disproportionate presence of low-inflation/developed countries had long been biasing the evidence towards the rejection of the fiscal dominance hypothesis.[5] The stronger relationship between deficits and money creation that we find for the group of pre-WWI

[4] More precisely, 1.81 and 1.45 years for the MG and PMG estimations, respectively.
[5] This sampling bias received further support in the analysis that Lin and Chu (2013) applied to a sample of 91 countries in 1960–2006, where the effect of deficits on prices gained strength in middle and high quantiles of inflation.

Table 3
Dynamic heterogeneous panel estimation of variations in the monetary base (*dmb*) on the budget balance (*b*). Different periods.

	1870–1913				1870–38[a]			
	pre-WWI sometimes-floaters		pre-WWI never-floaters		pre-WWI sometimes-floaters		pre-WWI never-floaters	
	MG [1]	PMG [2]	MG [3]	PMG [4]	MG [5]	PMG [6]	MG [7]	PMG [8]
Long-run elasticity (χ_i)	–0.049	–0.055**	0.042	0.066	–0.140*	–0.087***	–0.030	–0.041
	(0.583)	(0.024)	(0.540)	(0.163)	(0.059)	(0.000)	(0.631)	(0.236)
EC coefficient (α_i)	–0.860***	–0.776***	–0.866***	–0.839***	–0.915***	–0.826***	–0.851***	–0.788***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hausman statistic	0.00		0.19		0.51		0.04	
	[0.949]		[0.659]		[0.475]		[0.848]	
Likelihood ratio index	0.24		0.13		0.91		0.17	
Observations	368		280		503		369	

Notes: See Notes to Table 2.
[a] Columns [5]–[8] exclude the years 1914–24.

sometimes-floaters, which consists of countries with recurrent difficulties in keeping domestic prices linked to international (gold) prices, is in tune with their results.

The importance of sampling emerges even more clearly if the hypothesis of fiscal dominance is studied through different subperiods. Columns [1]–[4] of Table 3 present the results from re-estimating Eq. (8) separately for the groups of pre-WWI sometimes-floaters and never-floaters during 1870–1913. We find no significant dynamic relation between deficits and *dmb* for the never-floaters, which contrasts with the significant positive relation found for the sometimes-floaters.

According to the widely accepted historical narrative, deficit monetization hampered the entry into and/or the permanence of the currencies of our sometimes-floaters in the classical gold standard. In these countries, the Treasury's financing needs led to money creation, price divergence and, eventually, to sacrificing the commitment to a fixed exchange rate that gold convertibility entailed.[6] For example, budgetary problems are alleged to have caused the Italian convertibility suspensions of 1870–72 and the mid-1880s (Fratianni and Spinelli, 1997). It has also been argued that such problems, *inter alia*, account for Spain's suspension of gold convertibility in 1883 (Sabaté et al., 2006) and for the exit of Portugal from the gold standard in 1891 (Reis, 2000). Laxity in tax collection and increased public spending have been posited to explain the Greek suspension in 1877 (Lazaretou, 2005) as well as Bulgaria's suspension of convertibility during 1897–1901 (Avramov, 2006; Dimitrova, 2010). In Argentina, the financing of deficits strained macroeconomic stability and led to the gold convertibility suspensions of 1876 and 1885 (Della Paolera and Taylor, 2001). The growth of public spending in Brazil jeopardized that country's plan to stabilize exchange rates in 1894 (Fritsch, 1988) while, in Chile, poor control of fiscal note issuance and the resulting monetary expansion are said to have prevented the declaration of convertibility during 1876–86 (Llona, 2000).

So, the significant positive (negative) effect of deficits (budget balances) on *dmb* that the more robust PMG estimator assigns to our pre-WWI sometimes-floaters, as reported in columns [1] and [2] of Table 3, supports the narrative's assertion that these countries relied on deficit monetization. It is true that the intensity of the link is weak, but, leaving aside the fact that we are estimating the relation between deficits and increases in the monetary base (rather than the relation between deficits and increases in the Treasury component of the monetary base), the narrative itself offers a rationale for the low long-run coefficient of –0.06. We refer to the attempts of some pre-WWI sometimes-floaters to counteract budget imbalances and thereby prevent their currencies from diverging substantially from gold parity. Thus, as emphasized by Bordo and Rockoff (1996), Italy, as well as Portugal and Spain, tried to keep deficits and money creation under control so that their respective currencies would continue to float near their gold parities before 1914. These efforts may explain their historically stable exchange rates even when officially outside the gold standard. The Spanish peseta never formally belonged to that standard, and the Italian lira was officially on gold only from 1883 to 1894. However, the perception of their exchange rate regimes changes substantially if we code the currencies not by a *de jure* criterion based on officially declared exchange rates but instead, as in Shambaugh (2004), by a *de facto* criterion reflecting the countries' actual behavior. This author proposes dividing exchange rates into pegged and non-pegged regimes depending on volatility. More specifically, a year is classified as pegged only if the difference between the maximum and minimum month-end values lies within a ±2% band.

Fig. 1 reveals that, although the Spanish peseta was not a *de jure* gold currency during 1870–1913, it maintained its exchange rate against the pound within a ±2% band for two thirds of this period; the same can be said of the pegged behavior of the Italian lira.

[6] By fixing the price of currencies in terms of gold (mint price), at which bank notes were freely convertible, adherence to convertibility, in a framework of free international gold flows, resulted in a system of fixed exchange rates. The price of bills of exchange for currencies belonging to the standard was constrained within the tight band that the gold points defined on the metallic (ratio of mint prices) parity. Whenever price divergence led to a worsening of the balance of payments of a country and the subsequent exchange rate depreciation of its currency surpassed the gold point, which represented the costs of placing gold into a foreign country, arbitrage would become profitable. The purchase of bills of exchange in that country would stop and, instead, its domestic notes would be converted at the mint price into gold. This gold would then be transported to a foreign country. In this way, be it to make a profit (gold-point arbitrage) or to transfer funds more cheaply to a foreign country (gold-effected transfer), gold outflows prevented convertible currencies from depreciation. See Officer (1996).

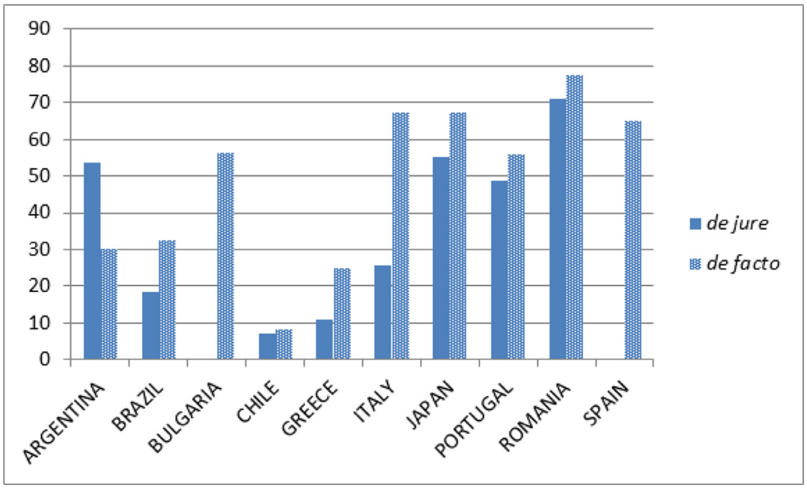

Fig. 1. Percentage of years with pegged exchange rates.
Notes: The chronology of the de jure gold standard is from Bordo and Schwartz (1996)—except for Bulgaria and Romania, whose chronologies are from Dimitrova and Ivanov (2014) and Stoenescu et al. (2014), respectively. Monthly exchange rates against the British pound, which we use to categorize currencies into "pegs" and "non-pegs" (per the criterion proposed by Shambaugh, 2004), are from Global Financial Data—except for the Bulgarian lev, the Greek drachma, and the Romanian leu, whose exchange rates are from South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World WarII.

The correspondence between the *de jure* and *de facto* pegged years was even stronger for the Portuguese escudo, which maintained convertibility until 1891 and strong correspondence is also observed in the case of the Japanese yen that, included in our panel from 1885 on, formally joined the standard in 1897. Finally, the Bulgarian lev and, to an even greater extent, the Romanian leu both exhibited a long record of *de facto* stability (data for these currencies are available from 1890 and 1882, respectively).[7]

Even for countries like Greece, Argentina, Brazil, and Chile, all with a much poorer record of exchange rate stability, there were well-documented attempts to control fiscal and monetary variables. With the aim of rekindling foreign capital inflows, Argentina implemented contractionary fiscal policies before restoring convertibility in 1883 and 1899 (Della Paolera and Taylor, 2001). Chile undertook an ambitious process of redeeming fiscal notes in 1893, a prelude to the restoration of convertibility in 1895 (Llona, 2000). To satisfy the requirements for a foreign loan, Brazil shifted to a restrictive fiscal policy in 1898 (Fritsch, 1988); in the same year, Greece initiated a stabilization program that likewise aimed to restore the gold standard and, thus, the country's creditworthiness (Lazaretou, 2003, 2014). All these aspirations to a gold-based regime also served, albeit loosely, to constrain deficit monetization in these countries (Bordo and Kydland, 1996) and contribute to explaining the weak relation between deficits and *dmb* for the sometimes-floaters during 1870–1913.[8]

It is noteworthy that this positive effect of deficits on *dmb* continues to be significant for our group of sometimes-floaters during 1870–1938 when the years of WWI and its aftermath are omitted. As shown in columns [5] and [6] of Table 3, if we disregard the period 1914–24, whose end was marked by the symbolic return of the pound to convertibility, the coefficient −0.09 derived using the more robust PMG estimator maintains its significance for the pre-WWI sometimes-floaters.[9] This evidence of fiscal dominance

[7] We thank an anonymous referee for the observation that some central banks in the group of sometimes-floaters, even if their respective countries claimed officially to be on gold, nonetheless resisted converting notes into metal. In our sample, this observation applies to Italy (Tattara 2000) and to Bulgaria and Romania (Morys 2013). For these countries, then, our count of the de jure years of pegged exchange rates is biased upward.

[8] A related issue is the credibility that capital markets assigned to the fixing of exchange rates that followed the efforts of fiscal probity in these countries. Mitchener and Weidenmier (2015) estimated the currency risk premium (the compensation investors required for the possibility of devaluation) as the difference between the borrowing country's open-market interest rate and the UK trade bill rate. With very few exceptions in their twenty-one-country sample, these authors found that sizable differentials persisted for as many as five years after a country's formal adherence to gold. This currency risk premium ranged from an average of around 150 basis points (bps) for Italy to 750 bps for Chile. Between these extremes, the premium averaged more than 200 bps for Greece and Romania, about 380 bps for Bulgaria, and more than 400 bps for Argentina and Japan. Despite controlling for country-specific factors, these authors found no significant evidence that this adherence reduced the currency risk premium for the subsample of emerging-market countries. These results are in line with the mixed evidence found by Ferguson and Schularick (2006) about how gold adherence affects the country risk premium. These authors measured this premium as the difference between a country's gold or sterling bond yield and the UK Consol yield, and they established that the combination of membership in the British Empire and keeping the debt/revenues ratio under control had a more robust and significant effect on spreads than belonging to the gold standard *per se*. Alquist and Chabot (2011) also found no evidence of bonds issued by off-gold countries earning higher returns than bonds issued by on-gold countries once exposure to common risk factors was taken into account.

[9] The 1925 return of the UK to the gold standard led us to take that year as the start of a new phase of financial stability. In selecting 1925 as a watershed, we follow related econometric analyses (see Obstfeld and Taylor, 2003, Mitchener and Wandschneider, 2015). By 1925, most of the

supports the historical narrative in its record of the problems these countries faced following the contractionary effects of the 1929 crisis on their economies, as we describe below.

At first, highly-indebted countries like Argentina, Brazil, Bulgaria and Greece responded by cutting public debt and raising taxes (Eichengreen, 1992). However, the failure of these attempts to counteract the fiscal effect of the crisis is widely reported to explain the countries' subsequent resorting to money creation to finance their deficits. In Japan, deficits caused by increased military spending and growth stimulus policies rendered public debt unsustainable as early as 1932 (Shizume, 2011). Deficit financing in Spain was channeled through the pledging of public bonds and the Treasury's rising overdraft accounts at the Bank of Spain (Sabaté et al., 2015). The Argentine Currency Board was also pressured by increasing deficits and, in 1932, began to issue money backed by government bonds. This re-discounting policy continued after the creation of the Central Bank of Argentina in 1935, which marked the Currency Board's demise (Díaz Alejandro, 1983; Della Paolera and Taylor, 1999, 2001).[10] Increased public spending financed by money creation occurred also in Brazil and Chile (Díaz Alejandro, 1983). The Great Depression changed the relation between Bank National of Romania and the country's Treasury, as the former lost autonomy in favor of the latter to issue notes to finance deficits (Blejan et al., 2010). A similar change took place in Bulgaria, whose central bank, in 1928, began using money creation to finance deficits in lieu of paying off the government debt in the Bulgarian National Bank (Dimitrova, 2010). Finally, it is well documented how fiscal imbalances put pressure on money in Italy from 1929 to 1933, which, in 1935, led to the suspension of gold reserve requirements to enable the monetization of deficits (Fratianni and Spinelly, 1997).

The finding of a significant relation between deficits and money creation during 1870–1938, even when omitting the WWI-related years, supports the narrative in that our pre-WWI sometimes-floaters rekindled their resort to seigniorage after 1929. The inability of these countries to control deficit monetization paralleled their poor record of exchange rate stability. Most of them had adopted convertibility by the second half of the 1920s, the latest being Portugal in 1931. Yet it was not long before convertibility suspensions started. Latin American countries were early abandoners (Argentina in 1929, Brazil in 1930), as were Japan and Portugal (both in 1931). Chile and Greece each left gold in 1932, although capital controls had already been adopted in both countries by 1931. Romania suspended convertibility in 1935 and Italy in 1936, countries that had implemented capital controls in 1932 and 1934. Spain remained outside the standard for the entire interwar period, while Bulgaria introduced capital controls in 1931 and a system of multiple exchange rates in 1933.[11] As a result, the percentage of years in which the currencies in our sample were pegged according to the Shambaugh (2004) criterion and not subject to capital controls declined substantially when compared with that of the classical gold standard. During 1919–38, the pre-WWI sometimes-floaters pegged years averaged less than 25% of the period. The corresponding percentage during 1870–1913 had been nearly 50%.[12]

Fiscal dominance and convertibility problems went hand in hand for the pre-WWI sometimes-floaters during 1870–1938. For the never-floaters, columns [7] and [8] of Table 3 show the absence of a significant positive relationship between deficits and money creation when the years 1914–24 are omitted. Thus, we view WWI as a financial shock that, once processed, no longer prevented these countries from exercising fiscal probity. In other words, we interpret the persistent lack of fiscal dominance when the period 1925–38 is added to 1870–1913, as proof that policymakers in these countries continued with their "gold-standard mentality" (Eichengreen and Temin, 2000), even after the suspension of convertibility in the early 1930s. All the pre-WWI never-floaters were back on gold in the mid-1920s and convertibility problems could be dealt with until when, following the 1929 Wall Street crash, fixed exchange rates began to transfer the US deflation to the rest of the world. The combination of declining prices and downward nominal wage rigidity (due to labor markets becoming more structured) was widely discussed as a determinant of declining profits, investment and employment (Eichengreen, 1992) and, although the countries in our sample were initially reluctant to sacrifice convertibility, most had renounced gold by 1932.[13]

The UK left the gold standard in 1931, an exit that was immediately followed by more than twenty countries. Among those followers were Finland, Norway, and Sweden, the first two leaving gold because of their tight trade links with the UK and Sweden forced by a depletion of reserves. Canada had already left in 1929, imposing an embargo on gold exports, and the United States declared inconvertibility in 1933. Suspending its adherence in 1936, the Netherlands became the last of these countries to abandon gold.[14] Yet in contrast to what is reported about the pre-WWI sometimes-floaters, the literature insists that abandonment of convertibility by the never-floaters did not involve renouncing fiscal and monetary discipline. The British reluctance to depart from financial probity is well documented, its "cheap money" strategy not beginning until the second quarter of 1932 (Eichengreen, 1992; Crafts 2013). A similar hesitation was present in the Scandinavian political arena during 1931–32 (Straumann 2009; Straumann and Woitek 2009). In Canada, more than two years elapsed before its 1929 suspension of gold shipments was followed by a looser monetary policy

pre-WWI never-floaters in our sample (the Netherlands, Sweden, the UK and the USA) were on gold. Canada and Finland returned in 1926, as did Norway in 1928.

[10] Gadea et al. (2012) used a recursive estimation to show that the relation between deficits and money creation strengthened in Argentina during the 1930s. Sabaté et al. (2015) applied that estimation procedure to illustrate the same effect for Spain after WWI.

[11] The chronology of convertibility resumptions and suspensions is based on Eichengreen (1992). For the introduction of capital controls, see Dimitrova and Ivanov (2014) and Mitchener and Wandschneider (2015).

[12] The sources of monthly exchange rates are the same as in the notes to Fig. 1. However, here we take the US dollar as the anchor currency for the period 1919–1938.

[13] In theory, deflation could have been avoided by coordinating national policies, in an expansionary sense, because such a coordination would have allowed fixed exchange rates to continue. Yet several countries (most notably, France and Germany) had a vivid memory of post-war hyperinflation, and their resistance resulted in the eventual failure of UK attempts to move in that direction. This juncture is well described by Eichengreen (1992).

[14] See Eichengreen (1992) and Mitchener and Wandschneider (2015).

(Shearer and Clark 1984; Bordo and Redish 1986). In the USA, a great resistance to discounting public debt as a counterpart to money creation was shown by the Federal Reserve and some Treasury officials in 1933–34 (Meltzer, 2003).

A particular aversion to fiscal departures from orthodoxy was evident among the pre-WWI never-floaters. In the UK, attempts at fiscal tightening continued until 1933–34 (Crafts, 2013). Although the Scandinavian countries resorted to public spending in their efforts to stimulate job creation, this was actually a "conservative" policy (Straumann, 2009). As late as 1932, the Canadian government boasted of implementing a sound fiscal policy (Bordo and Redish, 1990). Fears of unbalanced budgets and their potential effect on money creation were frequently expressed in discussions leading up to the passing, in 1935, of the US Banking Act (Meltzer, 2003). By increasing spending and reducing revenues the crisis spread deficits widely. At first, however, efforts were made to curb the resulting fiscal imbalances and these imbalances were covered mainly by issuing debt.[15] This account is supported empirically by the lack of evidence for fiscal dominance among our group of pre-WWI never-floaters during 1870–1938, when the war-related years are removed.

4. Seigniorage proclivities

So far, we have shown how the relation between budget balance (b) and monetary variation (dmb) was strong for the group of pre-WWI sometimes-floaters during 1870–1938, but was statistically non-significant for the never-floaters when WWI and its aftermath are disregarded. As shown in Section 2, the former group averaged higher levels of seigniorage (greater increases in the monetary base) during 1870–1938 and, in this section, we explore the roles that some economic and political factors might have played in raising their resort to seigniorage.

A useful starting point for this exploration is the optimal taxation theory. According to this theory, governments that want to finance a given level of public spending will choose the combination of revenue sources (taxes and money creation, or seigniorage) that equalizes the marginal deadweight losses from each source (Phelps, 1973). Moreover, if those losses increase with revenue, then the optimization requires revenues from taxes and seigniorage to be smoothed over time (Barro, 1979). In other words, the revenues from taxes and seigniorage must be set to finance permanent government spending while transitory spending is financed by debt issuance (Mankiw, 1987). One therefore expects that, as a country's development achieves significant efficiency gains in the collection of taxes, there will be a weaker resort to seigniorage to finance its level of permanent spending. The optimal taxation theory also implies that, *ceteris paribus*, higher levels of permanent spending lead to more seigniorage.

However, transitory deviations from long-run spending might not be financed through debt. One strand of the literature, starting with Click (1998), relaxes the optimal taxation assumption of no bounds on public indebtedness to consider the following situation. Once the amount of outstanding debt reaches a threshold, a constraint on further indebtment, given the stickiness of taxes, forces seigniorage to take on the full financing of transitory spending. If this were the case, the greater the transitory deviations from a country's long-run spending and the lower its creditworthiness, the greater the incentive to engage in money creation.

For the moment, we have assumed that the main priority of governments is social optimization. Nonetheless, this assumption was relaxed by Cukierman et al. (1992), who developed a model in which an inefficient tax system that is biased toward seigniorage is preferred by the incumbent government as a constraint on the behavior of future governments with whose spending goals it disagrees. This preference for seigniorage is more likely to exist in countries with a more unstable political system because instability increases the probability of losing power in the short run to a party that is antagonistic to the incumbent's spending goals.

To statistically explore the relationship between the optimal taxation and political instability variables and money creation, we apply a dynamic panel model to the following equation:

$$dmb_{it} = \mu_i + \alpha dmb_{i,t-1} + \sum_{v=1}^{q} \beta_{i,v} Y_{i,t} + \xi_{it} \tag{9}$$

where μ_i represents fixed effects; dmb_{it} denotes the monetary base variation (seigniorage) in sample i at time t; Y is a vector that includes the q proxies for variables related to optimal taxation and political instability; and β is the coefficient of that vector. As before, we must bear in mind the problems that can arise when monetary base variations (dmb) are used to proxy seigniorage. That said, this shortcoming allows us to take any significant relationship we find as the lowest bound for the effect of the variables in vector Y on dmb.

As a proxy for the efficiency of the tax system we use real GDP per capita (in 1990 Geary–Khamis dollars) (*Real GDPpc*). This approach implicitly assumes that a higher value of GDP per capita indicates a higher level of development, so we expect there to be a negative relation between *Real GDPpc* and *dmb*. Following Click (1998), our proxy for the level of permanent government spending (*Public Spending* $_{avg}$) is the average of actual spending levels during 1870–1913 and 1919–38. We expect this variable to exhibit a positive association with *dmb*. Transitory spending is proxied by its standard deviation (*Public Spending* $_{SD}$) from the 1870–1913 and 1919–38 spending averages and we expect it also to have a positive relationship with *dmb*. To proxy a country's creditworthiness, we use the ratio of debt to nominal GDP (*Outstanding Debt*). On the one hand, a high debt level may reflect the

[15] These countries maintained their balanced-budget aspirations for some time after suspending convertibility. Furthermore, research that has reassessed the direct impact of fiscal *stimuli*, when they were finally adopted, agrees on their low significance. Grytten (2008) underlined the difficulty of tracing countercyclical fiscal policies during the 1930s in Norway and Sweden, since both countries compensated for most of their increased public spending by raising taxes. Fishback (2010) explained, in the same terms, the fairly moderate impact of increased USA public spending until 1937. Crafts and Mills (2013) found that the UK re-armament program, which began in 1935, fostered recovery, although it did so more through the private sector's reaction to news of future government spending increases than through any direct effect on aggregate demand.

Table 4
Dynamic panel estimates of variations in the monetary base (*dmb*) on several variables, 1870–1938 (excluding 1914–24).

	Difference-GMM				
	[1]	[2]	[3]	[4]	[5]
Real GDP per capita	−0.0238***	−0.0180***	−0.0285***	−0.0313***	−0.0111***
	(0.003)	(0.000)	(0.000)	(0.000)	(0.003)
Public spending (average)	0.0149				
	(0.263)				
Public spending (SD)	−0.0127				
	(0.107)				
Outstanding debt	−0.0023**	−0.0020***	−0.0004		−0.0082***
	(0.032)	(0.006)	(0.556)		(0.000)
Outstanding debt (L1)				0.0069***	
				(0.006)	
Cabinet changes		0.0005*			0.0013***
		(0.074)			(0.000)
Cabinet changes (L1)			0.0005***	0.0067***	
			(0.000)	(0.001)	
dmb (L1)	0.0516***	0.0005	0.0331*	0.0231	0.1556***
	(0.008)	(0.981)	(0.067)	(0.118)	(0.000)
Observations	912	895	894	895	895
Wald test	34.15***	62.77***	42.37***	45.86***	375.40***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(1)	−2.19**	−2.14**	−2.11**	−2.13**	−2.04**
	(0.028)	(0.033)	(0.034)	(0.033)	(0.041)
AR(2)	−0.01	−0.78	−0.95	−1.36	0.62
	(0.991)	(0.435)	(0.343)	(0.175)	(0.533)
Groups	16	16	16	16	16
Instruments	66	64	64	64	17
Hansen's over-identification test	11.17	13.23	13.88	13.92	13.57
	(1.000)	(1.000)	(1.000)	(1.000)	(0.405)
Adjusted R^2	0.20	0.27	0.27	0.27	0.15
Akaike IC	−8.27	−8.35	−8.35	−8.35	−8.20
Bayesian IC	−8.25	−8.33	−8.33	−8.33	−8.18

Notes: The dependent variable is *dmb*, or variations in the monetary base divided by nominal GDP. Estimations are based on Eq. (9). All explanatory variables are given in logarithms—except for *CabinetChanges*, which is expressed as the number of changes per year. Reported values are the two-step difference GMM estimates.
p-values are in parenthesis; *significant at the 10% level; **at the 5%; ***at the 1%.
The Wald test values confirm the joint significance of the explanatory variables; hence they adequately explain the dependent variable. The Arellano and Bond (1991) second-order autoregressive, or AR(2), test values show no second-order serial correlation of the errors; hence the null hypothesis is not rejected, which allows us to infer that the models deal correctly with endogeneity. To guarantee the validity of instruments, Roodman (2006) recommends a Hansen test *p*-value in the interval [0.05, 0.8]. In columns [2]–[5], *dmb* is lagged one period (L1) and with the minimum number of instruments.

government's exploitation of its creditworthiness, in which case the expected association with *dmb* is a negative one. On the other hand, it is also possible that a government, once the level of its outstanding debt reaches some threshold, loses creditworthiness and, hence, must rely more on money creation. In this event, we should expect a positive link between *Outstanding Debt* and *dmb*. Finally, following Cukierman et al. (1992) and Aisen and Veiga (2008), we proxy political instability –that is, the incumbent cabinet's expected frequency of change–, through the actual number of cabinet changes per year (*Cabinet Changes*).[16]

The results of estimating Eq. (9) for the 1870–1938 period (excluding WWI) are presented in Table 4. [17] We find that the lagged value of monetary base variation (*dmb*) is significant, which confirms the dynamics posited by our model. We accordingly apply the Arellano and Bond (1991) difference Generalized Method of Moments (GMM) to obtain consistent estimates. Column [1] reports the results when only the variables related to optimal taxation are considered. Both *Real GDPpc* and *Outstanding Debt* have a significant contractionary effect on *dmb*. We interpret the negative coefficient of *Outstanding Debt* as indicating that this variable reflects the margin of creditworthiness of a country to avoid using seigniorage to finance its public spending. In sum, the higher a country's level of development (our proxy for its efficiency at collecting taxes) and the greater its reliance on indebtedness (our proxy for the

[16] Appendix 2 details the chronology of data availability across countries. For our *Cabinet Changes* variable, data are from the Cross-National Time-Series Data Archive (https://www.cntsdata.com/), which provides information on the number of times in a year that a new prime minister is named or half of the cabinet is replaced. For the rest of our data sources, see Appendix 3.

[17] Owing to the lack of data for *Outstanding Debt*, we exclude Romania from this estimation.

country's creditworthiness), the lower its resort to seigniorage. At the same time, our measures of permanent and transitory public spending play no evident role in explaining seigniorage. That these two factors have no significant effect could be due to the minimal variability of both the averages and standard deviations of public spending, which, when we estimate via differences, are reduced to a single observation in 1919.

We therefore exclude both *Public Spending* $_{avg}$ and *Public Spending* $_{SD}$ in all subsequent estimations. Column [2] of Table 4 also reveals that the sign and the significance of both *Real GDPpc* and *Outstanding Debt* remain unchanged when the regression adds *Cabinet Changes*. This variable has a significant effect and, as expected, increases *dmb*.[18]

Our econometric analysis so far has accorded explanatory power to *Real GDPpc, Outstanding Debt* and *Cabinet Changes*. Fig. 2 displays, for the period 1870–1938, the annual country averages of these three variables as well as the yearly average of monetary base variations and help us to understand our estimation results.[19] It illustrates the different monetary base behavior exhibited by our two groups of countries. For the pre-WWI sometimes-floaters, which encountered convertibility problems in the classical gold standard's heyday, there is, as described in Section 2, more monetary expansion. Also, levels of real GDP per capita are generally lower, while the number of cabinet changes per year is greater. Within this group, however, Argentina had a higher real GDP per capita and fewer cabinet changes than Spain and, despite this, the former registered more monetary expansion. This seeming anomaly highlights the potentially counteracting effect of indebtment, which was higher in Spain, on seigniorage. In other words, these descriptive statistics fit well with the estimates obtained when considering contemporaneous values of our proxies for optimal taxation and political instability.[20]

As shown in column [3] of Table 4, the results change slightly when we follow Aisen and Veiga (2008) in lagging the *Cabinet Changes* variable by one period to prevent endogeneity. As these authors explain, if high seigniorage causes high inflation and if high inflation, in turn, causes political instability, then using the contemporaneous value of the *Cabinet Changes* variable (our proxy for political instability) could create endogeneity problems. When lagging *Cabinet Changes*, both this variable and *Real GDPpc* maintain their former sign and significance and *Outstanding Debt* remains negative but loses significance. But, endogeneity might also affect our *Outstanding Debt* variable.[21] If, to address this potential endogeneity, we lag this variable by one period, then, as shown in column [4] of Table 4, *Real GDPpc* and *Cabinet Changes* maintain their sign and significance, but the relationship between *Outstanding Debt* and *dmb* becomes positive. Because the results are evidently sensitive to lags, we address the endogeneity issue more systematically by applying the GMM in differences, assuming that our three significant variables are endogenous.[22] To prevent the Hansen test from being weakened by too many instruments, we restrict the number of lags used as instruments by collapsing them. We thereby obtain the consistent coefficients reported in column [5], which confirm the significant negative effect of both *Real GDPpc* and *Outstanding Debt* on *dmb* as well as the positive effect of *Cabinet Changes* on *dmb*.

These results should be viewed with some caution. The GMM procedure is designed for data panels with a large number of individuals, small time periods, and no cross-sectional heteroskedasticity. Yet we are examining a very small number of countries and the presence of heteroskedasticity is confirmed statistically.[23] Kiviet et al. (2017) have recently stressed the convenience of strengthening this method's accuracy, for models of the dynamic micro panel data type, by employing inference techniques that are more refined.[24] Importantly, these authors establish that the GMM works acceptably well when the inequalities $L << 10\,\mathrm{K}$ and $L << NT/20$ hold, even if $K < L < 2\,\mathrm{K}$ where, in these expressions, L denotes the number of instruments, K the number of regressors, N the number of groups (here, countries) and T the time dimension. Because our case satisfies these criteria, we accept the aforementioned results (in column [5]) even though working with a high number of instruments would tend to bias the standard errors downward. Given the extremely low values of these errors and our reduced number of instruments, we believe that there is enough margin to accept the significance, in explaining seigniorage, of our proxies for tax collection efficiency, creditworthiness and political instability.

These results are in line with those obtained by Aisen and Veiga (2008), who working with a 1960–99 sample of more than 100 countries, found a significant negative effect of real GDP per capita and creditworthiness (the latter proxied by the Euromoney rating) on seigniorage. As regards our model's goodness of fit, the adjusted pseudo-R^2 of 0.15 for column [5] of Table 4 is greater than the value of 0.07 obtained by Aisen and Vega (2008) when they do not incorporate fixed effects. So, despite our much narrower geographical coverage and data availability, the fact that we also find a significant positive relationship between the number of

[18] The model does not include year dummies because they are not jointly significant when the WWI years are omitted.

[19] The averages are calculated for the periods detailed for each country in Appendix 2. We exclude, as elsewhere, the WWI years.

[20] Appendix 4 presents averages and standard deviations on a per-country basis.

[21] There might be a negative relation from *Outstanding Debt* (the wider the creditworthiness margin) to seigniorage (the less the need of seigniorage) or, conversely, from seigniorage (the stronger the reliance on seigniorage) to *Outstanding Debt* (the less the need to finance deficits through public debt).

[22] According to the Durbin–Wu–Hausman test, the variables *Real GDPpc, Outstanding Debt* and *Cabinet Changes* are all endogenous. We performed this test on the original model in levels and in first differences.

[23] The null hypothesis of homoskedasticity is rejected for our model both in levels and in first differences. For the model in levels: the Lagrange multiplier (LM) statistic = 2.74×10^4; the likelihood ratio (LR) statistic = -772.8117; and the Wald test = 4.45×10^5. For the model in differences: the LM statistic = 2.69×10^4; the LR statistic = -943.8420; and the Wald test = 1.49×10^6. For all these statistics, *p-value* = 0.000.

[24] The Windmeijer correction for small samples is not effective here. Standard errors are biased by heteroskedasticity, which makes coefficient biases even more serious.

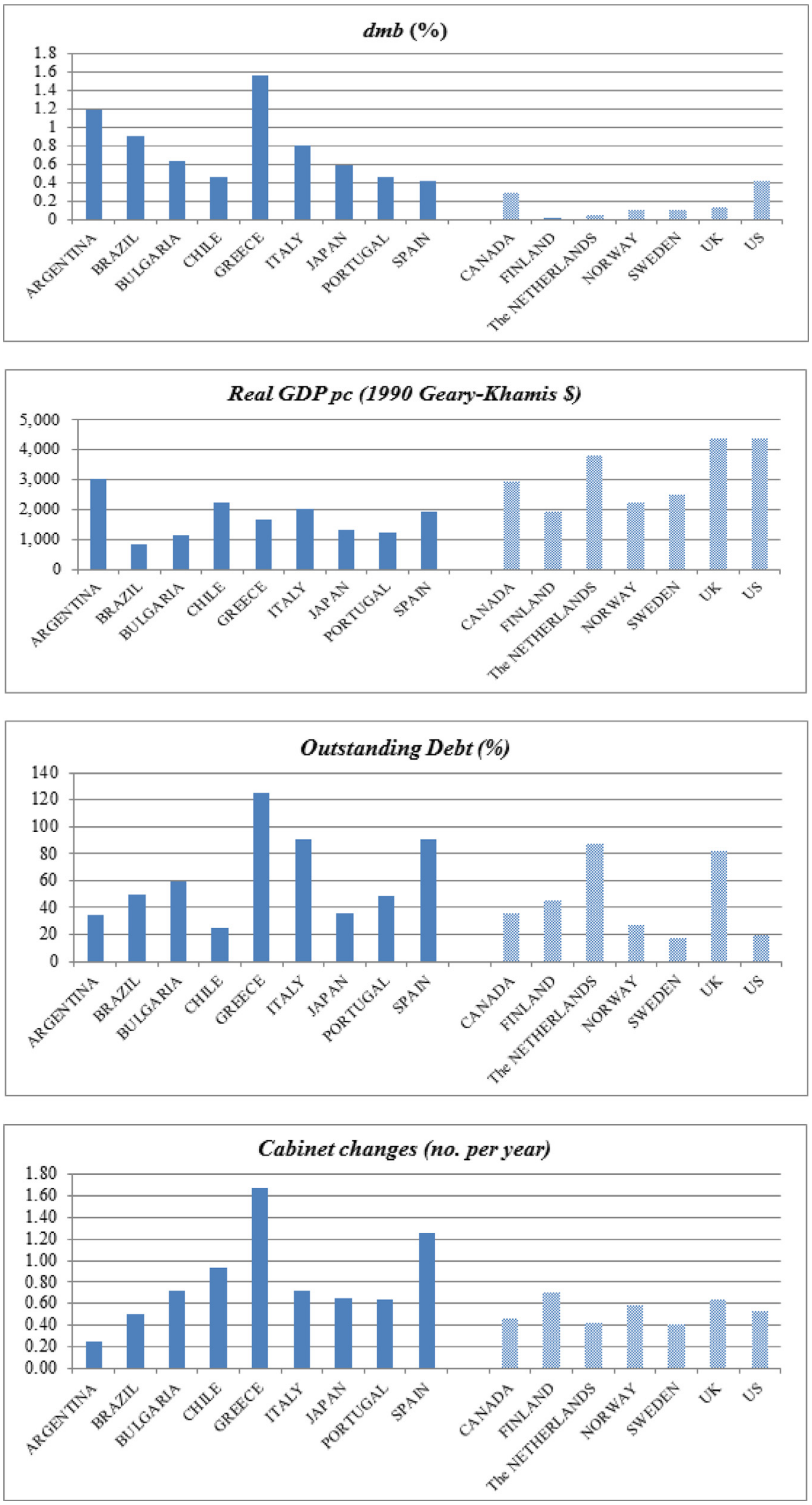

Fig. 2. Yearly average variations for selected variables (excluding WWI-related years).

Notes: Darker bars correspond to the subsample of countries defined in the text as pre-WWI sometimes-floaters; lighter bars correspond to the subsample of pre-WWI never-floaters. Data sources are given in Appendix 3.

cabinet changes and seigniorage offers historical support to their idea that reducing political instability can mitigate the resort to seigniorage.[25]

5. Conclusion

The optimal (if any) fiscal design for the EMU (Bénassy-Quéré et al., 2018; De Grauwe and Ji, 2018) and the idea that one-size-does-not-fit-all in Europe has received renewed attention since the global financial crisis (Demertzis et al., 2018). Over twenty years ago, the desirability of creating a European monetary union had already been disputed on the same basis, namely that, given the heterogeneity of the countries due to adopt the single currency, a one-size-fits-all monetary policy committed with price stability might hamper its operation (De Grauwe and Vanharverbeke, 1991; Bayoumi and Eichengreen, 1993). To avoid the group of potential members with longer records of fiscal profligacy ending up pressuring for a looser monetary control, entry into the EMU was conditioned on the accomplishment of some public budget and debt rules (set out in the Maastricht Treaty (1992) and reinforced in the Stability and Growth Pact (1997)), which were thought to be sufficient to ensure the implementation of sovereign fiscal policies consistent with long-run price stability and, consequently, with fixed exchange rates.

Parallels between the EMU and the gold standard have been broadly based on the fact that both systems constituted an “extreme form of fixed exchange rates” (Eichengreen and Temin, 2010). We provide the first statistical evidence that one shared trait of the group of pre-WWI sometimes-floaters (which includes the countries at the center of the euro-crisis) was, in fact, fiscal dominance. Conversely, we do not find such a pattern for the pre-WWI never-floaters if the exceptional years of the Great War and its aftermath are excluded. Further, we illustrate that less efficient tax systems (inferred from lower levels of development) along with higher political instability led the pre-WWI sometimes-floaters to run fiscal policies biased towards seigniorage and, therefore, inconsistent with long-lasting convertibility. However, whenever this inconsistency led Greece, Italy, Portugal or Spain to feel menaced with gold depletion and internal deflation, they would suspend convertibility-cum-fixed-exchange-rates. One century later, maintaining euro membership has meant that these same countries must follow fiscal austerity and internal deflation to fit the re-designed EMU one-size macro-policies.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.eeh.2018.12.002.

Appendix 1. Data availability across countries to test Eq. (8)

	Period	Source of constraint
Argentina	1870–1938	
Brazil	1870–1938	
Bulgaria	1886–1938	Monetary base (1881), nominal GDP (1886)
Canada	1871–1929	Monetary base
Chile	1870–1938	
Finland	1882–1938	Budget balance
Greece	1870–1938	
Italy	1870–1938	
Japan	1885–1938	Nominal GDP
Netherlands	1870–1938	
Norway	1870–1938	
Portugal	1870–1938	
Romania	1881–1914	Nominal GDP
	1920–38	
Spain	1874–1935	Monetary base
Sweden	1871–1938	Monetary base
UK	1870–1938	
USA	1870–1938	

[25] The R^2 statistic is valid only for ordinary least-squares estimates, which minimize the residual sum of squares. It follows that obtaining a goodness-of-fit measure (a pseudo-R^2) for our model requires using the value of the estimated variance. We use this estimated variance also to compute the measures of the Akaike and Bayesian information criteria, which coincide with the pseudo-R^2 measure in selecting columns [2]–[4] as the specifications that yield a better fit.

Appendix 2. Data availability across countries to test Eq. (9)

	Period	Source of constraint
Argentina[a]	1870–1938	
Brazil	1870–1938	
Bulgaria[b]	1888–1938	Outstanding Debt
Canada	1871–1929	For coherence with Eq. (8)
Chile	1870–1938	
Finland	1882–1938	For coherence with Eq. (8)
Greece		
	1870–1913	Outstanding Debt
	1919–38	
Italy	1870–1938	
Japan	1885–1938	For coherence with Eq. (8)
Netherlands	1870–1938	
Norway	1880–1938	Outstanding Debt
Portugal	1870–1938	
Spain	1874–1935	For coherence with Eq. (8)
Sweden	1871–1938	For coherence with Eq. (8)
UK	1870–1938	
USA	1870–1938	

[a]Data on real GDP per capital are the result of interpolation between 1870 and 1875.
[b]Annual data on real GDP per capita start in 1924. The series from 1888 to 1923 is the result of interpolating data for 1870, 1892, 1899, 1905, 1911 and 1921.

Appendix 3. Data sources

Monthly exchange rate series come from **Global Financial Data - Exchange Rate database** (www.globalfinancialdata.com/Databases/ExchangeRateDatabase.html).

For Bulgaria, Greece and Romania, data are in the ***South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War*** Romania and Oesterreichische Nationalbank, 2014. Athens, Sofia, Bucharest, Vienna.

Real GDP per capita (in 1990 in Geary-Khamis US $) come from Maddison, A., Bolt, J. and Van Zanden, J. L. (2013). ***The First Update of the Maddison Project; Re-Estimating Growth Before 1820***. Maddison Project Working Paper 4 (www.ggdc.net/maddison/Historical_Statistics/horizontal-file_02-2010.xls).

Argentina

Monetary base, Fiscal series (public revenue and spending), Trade series and *Nominal GDP* come from FERRERES, O.J. (director), ***Dos siglos de economía argentina – Historia argentina en cifras 1810–2010***. Fundación Norte y Sur, 2010.

Brazil

Monetary base comes from “Moeda e Sistema Bancário”, Tablea 10.1 “Composição da moeda manual 1810–1945” pp.527–532, column 1 “Papel-moeda emitido”.

Fiscal series come from “Finanças Públicas”, Table 12.1 “Receita e despesa da Uniao”, p.616, column “superavit ou deficit”.

Trade series come from “Setor Externo”, Tables 11.1 and 11.2 “Valores em moeda nacional e em libras das exportações e importações, saldo comercial e taxa de câmbio implícita 1821–1987*”*, pp.568–570.

The three chapters are in ***Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988***. Volumen 3 de *Séries estatísticas retrospectivas*. Bow Historical Books, 1990.

Nominal GDP comes from Mitchell, B.R. (2003), ***International Historical Statistics: The Americas, 1750–2000***. Basingstoke: Macmillan.

Bulgaria

Monetary base, Fiscal series (public revenue and spending), Trade series and *Nominal GDP* come from ***South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War II***. Published by the Bank of Greece, Bulgarian National Bank, National Bank of Romania, Oesterreichische Nationalbank, 2014, Athens, Sofia, Bucharest, Vienna.

To estimate the *ordinary public revenues* we have discounted the revenues from debt issuing from the ***Statistical Yearbooks of the Kingdom of Bulgaria***, various issues, Sofia.

Canada

Monetary base comes from Urquhart, M.C. and Buckley, K.A.H. (1965). The Historical Statistics of Canada. Ottawa: Statistics Canada [Section H: Banking and Finance (beginning in page 222)]. The series has been reconstructed with instructions from Rousseau and Wachtel (1998) "Financial intermediation and economic performance: Historical evidence from five industrialized countries", Journal of Money, Credit and Banking 30 (4), 657–678.

Fiscal series come from Statistics Canada – Government of Canada (www.statcan.gc.ca/start-debut-eng.html).

Trade series come from Historical Canadian Macroeconomic Dataset 1871–1994. Compiled by Prof. R. Marvin McInnis, Department of Economics, Queen's University, Kingston, Ontario, Canada, 2001.

Nominal GNP comes from Urquhart, M.C. and Buckley, K.A.H. (1965). ***The Historical Statistics of Canada***. Ottawa: Statistics Canada.

Chile

Monetary base, Fiscal series (public revenue and spending), Trade series and *Nominal GDP* come from Díaz, J. Lüders, R. and Wagner, G., La República en Cifras, 2010. EH Clio Lab-Iniciativa Científica Milenio. URL: http://www.economia.puc.cl/cliolab.

Finland

Monetary base comes from Autio, J. (1996) "Rahan tarjonta Suomessa 1868–1980, Suomen Pankin keskustelualoitteita" 31/96.

Fiscal Series (public revenue and spending) and *Trade series* come from Mitchell, B.R. (2003), International Historical Statistics: Europe 1750–2000. London: Macmillan.

Nominal GDP comes from Smits, J.P., Woltjer, P.J. and Ma, D. (2009), A Dataset on Comparative Historical National Accounts, ca. 1870–1950: A Time-Series Perspective, Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. [Groningen Growth and Development Centre, Historical National Accounts Database, January 2009, http://www.ggdc.net/].

Greece

Monetary base, Fiscal series (public revenue and spending), Trade series and *Nominal GDP* come from ***South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War II***. Published by the Bank of Greece, Bulgarian National Bank, National Bank of Romania and Oesterreichische Nationalbank, 2014. Athens, Sofia, Bucharest, Vienna.

To estimate the *ordinary public revenues* we have discounted the revenues from debt issuing available Prontzas, Kimourzis and Melos (2012): ***Sources of the economic history of modern Greece. Quantitative data and statistical series: public revenues, 1830–1939***. Centre for Planning and Economic Research and the National Bank of Greece.

Italy

Monetary base comes from Fratianni, M. and Spinelli, F. (1997), ***A Monetary History of Italy***, Cambridge University Press, 49–52.

Fiscal Series come from ***Il bilancio dello Stato Italiano dal 1862 al 1967***, Volume II, Table 5, 140–170, "Operazioni Finali" (Ministero del Tesoro 1967 – Ragioneria Generale dello Stato).

Trade series and *Nominal GDP* come from ***Italian National Accounts, 1861–2011*** by BAFFIGI, A. (2011). A project of Banca d'Italia, Istat, University of Rome "Tor Vergata". Economic History Working Papers (Quaderni di Storia Economica), number 18 – October.

Japan

Monetary base comes from Weber, W. E. (2000). ***International Data. 1810–1995***. Research Department, Federal Reserve Bank of Minneapolis. (http://cdm16030.contentdm.oclc.org/cdm/singleitem/collection/p16030coll4/id/8/rec/5) from 1885 to 1900.

Fiscal series. Following Shizume (2011), we have proxied budget balance for any one year by substracting the previous year's long-run debt from that year's. Data is available at ***Historical Statistics of Japan***, Statistics Bureau (www.stat.go.jp/english/data/chouki/05.htm).

Trade series come from Mitchell, B.R. (2003), ***International Historical Statistics: Africa, Asia and Oceania 1750–2000***, Basingstoke: Macmillan.

Nominal GDP from 1885 to 1940 comes from Ohkawa, K., Takamatsu, N., and Yamamoto, Y. (1974): Vol. 1 *National Income.* In Ohkawa, K., Shinohara, M., and Umemura, M. (eds.), ***Estimates of Long-Term Economic Statistics of Japan Since 1868***. Tokyo: Tokyo Keizai Shinposha.

The Netherlands

Monetary base comes from Weber, W. E. (2000). ***International Data. 1810–1995***. Research Department, Federal Reserve Bank of Minneapolis. (http://cdm16030.contentdm.oclc.org/cdm/singleitem/collection/p16030coll4/id/8/rec/5).

Fiscal Series (public revenue and spending) and *Trade series* come from Mitchell, B.R. (2003), ***International Historical Statistics: Europe 1750–2000***. London: Macmillan.

Nominal GDP from 1870 to 1913 comes from Smits, J.P., Woltjer, P.J. and Ma, D. (2009), ***A Dataset on Comparative Historical National Accounts,* ca. *1870–1950: A Time-Series Perspective***, Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. [Groningen Growth and Development Centre, Historical National Accounts Database, January 2009, http://www.ggdc.net/]. From 1914 to 1940 comes from Weber, W. E. (2000). ***International Data. 1810–1995***. Research Department, Federal Reserve Bank of Minneapolis. (http://cdm16030.contentdm.oclc.org/cdm/singleitem/collection/p16030coll4/id/8/rec/5).

Norway

Monetary base comes from Eitrheim, Ø., Grytten O.H. and Klovland, J.T. (2007), "Historical Monetary Statistics for Norway – some cross checks of the new data", 385–434: Chapter 7 in Eitrheim, Ø., J.T. Klovland and J.F. Qvigstad (eds.), ***Historical Monetary Statistics for Norway*** – Part II, Norges Bank Occasional Papers No. 38, Oslo.

Fiscal Series (public revenue and spending) come from Mitchell, B.R. (2003), ***International Historical Statistics: Europe 1750–2000***. Ed. Palgrave Macmillan.

Trade series and *Nominal GDP* come from Grytten, O.H. (2004). "The gross domestic product for Norway 1830–2003" in Eitrheim, Ø., J.T. Klovland and J.F. Qvigstad (eds.), ***Historical Monetary Statistics for Norway 1819–2003***, Chapter 6, Norges Bank Occasional Papers no. 35. Oslo, 241–288.

Portugal

Monetary base comes from Reis, J. Chapter 7: Moeda e crédito – Quadro 7.4: Oferta monétaria, 1834–1993 (M0 de Mata, Valério, 1993).

Fiscal Series (public revenue and spending) come from Mata. E. Chapter 9: Finanças públicas e dívida pública – Quadro 9.3: Síntese das contas públicas, 1833–1998 (*saldo das contas públicas*).

Trade series come from Fontoura, M.P. and Valério, N. Chapter 10: Relações económicas externas – Quadro 10.1: Comércio externo e direitos de importação 1776–1997.

Nominal GDP comes from Valério, N. Chapter 6: Contas nacionais – Quadro 6.6 *Produto interno bruto e suas variações desde 1837*

All in: ***Estatísticas Históricas Portuguesas***, vol. I (**2001**), coord. Nuno Valério, Instituto Nacional de Estatística, Portugal.

Romania

Monetary base, Fiscal series (public revenue and spending), Trade series and *Nominal GDP* come from ***South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War II***. Published by the Bank of Greece, Bulgarian National Bank, National Bank of Romania and Oesterreichische Nationalbank, 2014. Athens, Sofia, Bucharest, Vienna.

Spain

Monetary base comes from Tortella, G. (1974): "Las magnitudes monetarias y sus determinantes". In Tortella, G. (dir.): ***La Banca española en la Restauración***, vol. I. Madrid: Servicio de Estudios del Banco de España, 457–521. Also from MARTÍN-ACEÑA, P. (1985): ***La cantidad de dinero en España***. Madrid: Banco de España.

Fiscal series come from Comín and Díaz (2005). Sector público y estado del bienestar. In Carreras, A. and Tafunell, X. (eds.): ***Estadísticas Históricas de España, siglos XIX-XX***. Madrid: Fundación BBVA, 873–974.

Nominal GDP comes from Prados, L. (2003). ***El progreso económico de España.*** Madrid: Fundación BBVA.

Sweden

Monetary base come from Edvinsson, R. (in collaboration with Hortlund, P. and Jonung, L.). **Money Supply 1888–2006.** Table 1: *Money supply and its components 1871–2006* (Annual). Swedish Riksbank - Sveriges Riksbank.

Fiscal series come from Fregert, K. and Gustafsson, R. (2008). **Fiscal Statistics for Sweden 1719–2003**, in *Research in Economic History* vol. 25 (editor Field, A.J., coeditors Clark, G. and Sundstrom, W.A.). Emerald Group Publishing Limited, 169–223.

Trade series come from Edvinsson, R. ***Historical national accounts for Sweden 1800–2000*** (Historiska nationalräkenskaper för Sverige 1800–2000). Version 1.0 Last updated: 05.04.04.

Nominal GDP comes from Krantz, O. and Schön, L. (2007). ***Swedish Historical National Accounts 1800–2000***, Lund Studies in Economic History 41.

UK

Monetary base, Fiscal series (public revenue and spending) and *Trade series* come from Mitchell, B.R. (2003), *International Historical Statistics: Europe 1750–2000*. London: Macmillan.

US

Monetary base come from Friedman, M. and Schwartz, A.J. (1963), ***A Monetary History of the United States, 1867–1960***, Princeton University Press.

Fiscal series (public revenue and spending), Trade series and *Nominal GDP* come from Mitchell, B.R. (2003), ***International Historical Statistics: the Americas, 1750–2000***. Basingstoke: Macmillan.

Appendix 4. Descriptive statistics. Yearly mean and standard deviations across countries

		dmb (%)	Real GDPpc (1990 Geary-Khamis $)	Outstanding Debt (%)	Cabinet changes (no. per year)
Argentina	Mean	1.20	3009	34.18	0.25
	Standard deviation	0.03	893	20.78	0.44
Brazil	Mean	0.91	846	50.03	0.50
	Standard deviation	0.03	168	19.28	0.50
Bulgaria	Mean	0.64	1132	59.65	0.72
	Standard deviation	0.01	124	58.35	0.81
Canada	Mean	0.29	2961	35.96	0.46
	Standard deviation	0.01	1030	28.57	0.57
Chile	Mean	0.46	2255	24.89	0.94
	Standard deviation	0.01	574	6.00	1.11
Finland	Mean	0.03	1954	45.23	0.71
	Standard deviation	0.00	624	35.07	0.70
Greece	Mean	1.56	1650	124.89	1.67
	Standard deviation	0.04	445	50.98	1.37
Italy	Mean	0.81	2013	90.23	0.72
	Standard deviation	0.01	409	24.72	0.60
Japan	Mean	0.60	1320	35.90	0.65
	Standard deviation	0.01	489	15.22	0.60
Netherlands	Mean	0.06	3812	87.72	0.42
	Standard deviation	0.01	909	14.05	0.50
Norway	Mean	0.11	2220	26.64	0.59
	Standard deviation	0.01	794	10.16	0.58
Portugal	Mean	0.46	1243	48.09	0.64
	Standard deviation	0.02	241	14.58	0.70
Spain	Mean	0.43	1946	90.73	1.25
	Standard deviation	0.02	353	33.35	1.23
Sweden	Mean	0.11	2494	17.01	0.41
	Standard deviation	0.00	1039	3.22	0.53
UK	Mean	0.14	4393	82.01	0.64
	Standard deviation	0.00	783	56.11	0.57
US	Mean	0.43	4379	19.37	0.53
	Standard deviation	0.01	1310	10.60	0.50

References

Aisen, A., Veiga, F.J., 2008. The political economy of seigniorage. J. Dev. Econ. 87, 29–50.

Alquist, R., Chabot, B., 2011. Did gold-standard adherence reduce sovereign capital costs? J. Monet. Econ. 58, 262–272.

Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Rev. Econ. Stud. 58, 277–297.

Avramov, R., 2006. The Bulgarian National Bank in a historical perspective: shaping an institution, searching for a monetary standard. In: Avramov, R., Pamuk, S. (Eds.), Monetary and Fiscal Policies in South-East Europe: Historical and Comparative Perspective. Bulgarian National Bank, pp. 93–108.

Barro, R., 1979. On the determination of the public debt. J. Polit. Econ. 87, 940–971.

Bayoumi, T., Eichengreen, B., 1993. Shocking aspects of European monetary unification. In: Torres, F., Giavazzi, F. (Eds.), Adjustment and Growth in the European Monetary Union. Cambridge University Press, Cambridge, pp. 193–229.

Bénassy-Quére, A., Brunnermeier, M., Enderlein, H., Farhi, E., Fratzscher, M., Fuest, C., Gourinchas, P.-O., Martin, P., Pisani-Ferry, J., Rey, H., Schnabel, I., Véron, N., Weder Di Mauro, B., Zettelmeyer, J., 2018. Reconciling Risk Sharing with Market discipline: A Constructive Approach to Euro Area Reform. CEPR Policy Insight, p. 91.

Blejan, E., Costache, B.G., Alaman, A., 2010. The National Bank of Romania during the Great Depression 1929-1933. National Bank of Romania.

Bordo, M.D., James, H., 2013. The European Crisis in the Context of the History of Previous Financial Crises. NBER Working Paper 19112.

Bordo, M.D., Kydland, F.E., 1996. The gold standard as a commitment mechanism. In: Bayoumi, T., Eichengreen, B., Taylor, M. (Eds.), Economic Perspectives on the Classical Gold Standard. Cambridge University Press, Cambridge, pp. 55–100.

Bordo, M.D., Meissner, C.M., 2015. Growing up to stability? Financial globalization, financial development and financial crises. In: Rousseau, P.L., Paul Wachtel, P. (Eds.), Financial Systems and Economic Growth: Credit Crises, and Regulation from the 19th Century to the Present. Cambridge University Press, New York, pp. 14–51.

Bordo, M.D., Meissner, C.M., 2016. Fiscal and financial crises. In: Taylor, J., Uhlig, H. (Eds.). In: North Holland Handbook of Macroeconomics, 2A. Elsevier (North Holland Publishing Company), Amsterdam, pp. 355–412.

Bordo, M.D., Redish, A., 1986. Why Did the Bank of Canada emerge in 1935?. NBER Working Paper 2079.
Bordo, M.D., Redish, A., 1990. Credible commitment and exchange rate stability: Canada's interwar experience. Can. J. Econ. 23, 357–380.
Bordo, M.D., Rockoff, H., 1996. The gold standard as a "good housekeeping seal of aprovement". J. Econ. Hist. 56, 389–428.
Bordo, M.D., Schwartz, A.J., 1996. The operation of the specie standard: evidence for core and peripheral countries, 1880-1990. In: Eichengreen, B., Braga de Macedo, J. (Eds.), Historical Perspectives on the Gold Standard: Portugal and the World. Routledge, London, pp. 11–83.
Calomiris, C.W., 2010a. Banking crises yesterday and today. Financ. Hist. Rev. 17, 3–12.
Calomiris, C.W., 2010b. The political lessons of depression-era banking reform. Oxford Rev. Econ. Policy 26, 540–560.
Calomiris, C.W., Flandreau, M., Laeven, L., 2016. Political foundations of the lender of last resort: a global historical narrative. J. Financ. Intermed. 28, 48–65.
Catão, L.A., Terrones, M.E., 2005. Fiscal deficits and inflation. J. Monet. Econ. 52, 529–554.
Click, R., 1998. Seigniorage in a cross-section of countries. J. Money Credit Bank. 30, 154–171.
Cotula, F., Spaventa, L., 1993. La Politica Monetaria Tra Le Due guerre: 1919–1935. La Politica Monetaria Tra Le Due guerre: 1919–1935. Editori Laterza, Rome-Bari.
Crafts, N., 2013. Returning to Growth: Lessons from the 1930s. CAGE, University of Warwick March.
Crafts, N., Mills, T., 2013. Rearmament to the Rescue? New Estimates of the Impact of 'Keynesian' Policies in1930s' Britain. EHES Working Papers in Economic History 31.
Cukierman, A., Edwards, S., Tabellini, G., 1992. Seigniorage and political instability. Am. Econ. Rev. 82, 537–555.
De Grauwe, P., Ji, Y., 2013. Self-fulfilling crises in the Eurozone: an empirical test. J. Int. Money Finance 34, 15–36.
De Grauwe, P., Ji, Y., 2018. How Safe is a Safe Asset?. CEPS Policy Insight 2018-08.
De Grauwe, P., Vanhaverbeke, W., 1991. Is Europe an Optimum Currency Area? Evidence from Regional Data. CEPR Discussion Papers 555.
Della Paolera, G., Taylor, A., 1999. Economic recovery from the argentine great depression: institutions, expectations, and the change of macroeconomic regime. J. Econ. Hist. 59, 567–599.
Della Paolera, G., Taylor, A., 2001. Straining at the Anchor. National Bureau of Economic Research.
Demertzis, M., Pisani-Ferry, J., Sapir, A., 2018. One Size does Not Fit All: European Integration by Differentiation Bruegel PolicyBriefs 3, September.
Díaz Alejandro, C.F., 1983. Stories of the 1930s for the 1980s. In: Aspe Armella, P., Dornbusch, R., Obstfeld, M. (Eds.), Financial Policies and the World Capital Market: The Problem of Latin American Countries. University of Chicago Press, Chicago, pp. 5–40.
Dimitrova, K., 2010. Monetary and Fiscal Policies in Bulgaria: Lessons from the Historical Record. International Center for Economic Research, Working Paper, p. 13.
Dimitrova, K., Ivanov, M., 2014. Bulgaria: from 1879 to 1947. South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War II, 2014. Bank of Greece, Bulgarian National Bank, National Bank of Romania, Oesterreichische Nationalbank, Athens, Sofia, Bucharest, Vienna.
Eichengreen, B., 1992. Golden fetters. The Gold Standard and the Great Depression 1919-1939. Oxford University Press, Oxford.
Eichengreen, B., Flandreau, M., 1996. The geography of the gold standard. In: Braga de Macedo, J., Eichengreen, B., Reis, J. (Eds.), Currency Convertibility. The Gold Standard and Beyond. Routledge, London, pp. 113–143.
Eichengreen, B., Temin, P., 2000. The gold standard and the great depression. Contemp. Eur. Hist. 9, 183–207.
Eichengreen, B., Temin, P., 2010. Fetters of gold and paper. Oxford Rev. Econ. Policy 26, 370–384.
Ferguson, N., Schularick, M., 2006. The empire effect: the determinants of country risk in the first age of globalization, 1880-1913. J. Econ. Hist. 66, 283–312.
Fischer, S., Sahay, R., Végh, C.A., 2002. Modern hyper- and high-inflations. J. Econ. Lit. XL, 837–880.
Fishback, P., 2010. US monetary and fiscal policy in the 1930s. Oxford Rev. Econ. Policy 26, 385–413.
Fratianni, M., Spinelli, F., 1997. A Monetary History of Italy. Cambridge University Press, Cambridge.
Fratianni, M., Spinelli, F., 2001. Fiscal dominance and money growth in Italy: the long record. Explor. Econ. Hist. 38, 252–272.
Fritsch, W., 1988. External Constraints On Economic Policy in Brazil, 1889-1930. Macmillan Press, London.
Gadea, M.D., Sabaté, M., Sanz-Villarroya, I., 2012. Long-run fiscal dominance in Argentina: 1875-1990. Financ. Hist. Rev. 19, 311–335.
Grytten, O.O., 2008. Why was the great depression not so great in the Nordic countries? Economic policy and unemployement. J. Eur. Econ. Hist. 37, 369–403.
Jordà, O., Schularick, M., Taylor, A.M., 2011. Financial crises, credit booms, and external imbalances. IMF Econ. Rev. 59, 340–378.
Jordà, O., Schularick, M., Taylor, A.M., 2017. Macrofinancial history and the new business cycle facts. In: Eichenbaum, M., Parker, J.A. (Eds.), NBER Book Series Macroeconomics Annual 31, 2016. University of Chicago Press, Chicago, pp. 213–263.
King, R., Plosser, C., 1985. Money, Deficit and Inflation 22, 147–196.
Kiviet, J.F., Pleus, M., Poldermans, R.W., 2017. Accuracy and efficiency of various GMM inference techniques in dynamic micro panel data models. Econometrics 5, 1–54.
Lazaretou, S., 2003. Greek Monetary Economics in Retrospect: The Adventures of the Drachma. Bank of Greece Working Paper 2.
Lazaretou, S., 2005. The drachma, foreign creditors, and the international monetary system: tales of a currency during the 19th and the early 20th centuries. Explor. Econ. History 42, 202–236.
Lazaretou, S., 2014. Greece: from 1833 to 1949. South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War II, 2014. Published by the Bank of Greece, Bulgarian National Bank, National Bank of Romania, Oesterreichische Nationalbank, Athens, Sofia, Bucharest, Vienna.
Lin, H.-Y., Chu, H.-P., 2013. Are fiscal deficits inflationary? J. Int. Money Finance 32, 214–233.
Llona, A., 2000. Chile during the gold standard: a succesful paper money. In: Martín-Aceña, P., Reis, J. (Eds.), Monetary Standards in the Periphery. Paper, Silver and Gold, 1854-1933. Macmillan press, London, pp. 174–206.
Mankiw, N.G., 1987. The Optimal Collection of Seigniorage: Theory and Evidence. NBER Working Paper 2270.
Martín Aceña, P., Reis, J., Llona, A., 2000. The gold standard in the periphery: an introduction. In: Martín-Aceña, P., Reis, J. (Eds.), Monetary Standards in the Periphery. Paper, Silver and Gold, 1854-1933. Macmillan press, London, pp. 1–17.
Marzinotto, B., Sapir, A., Wolff, G., 2011. What Kind of Fiscal Union? Bruegel PolicyBriefs 6.
Meltzer, A.H., 2003. In: A History of the Federal Reserve, 1. University of Chicago Press, Chicago, pp. 1913–1951. 2013.
Mitchener, K.J., 2014. The diabolic loop. precedents and legacies. In: Allen, F., Carletti, E., Gray, J. (Eds.), Bearing the Losses from Bank and Sovereign Debt Default in the Eurozone. Wharton Financial Institutions Center, Philadelphia, pp. 165–180.
Mitchener, K.J., Pina, G., 2016. Pegxit Pressure: Evidence from the Classical Gold Standard. NBER Working Paper 22844.
Mitchener, K.J., Richardson, G., 2013. Does "skin in the game" reduce risk taking? Leverage, liability and the long-run consequences of new deal banking reforms. Explor. Econ. Hist. 50, 508–525.
Mitchener, K.J., Wandschneider, K., 2015. Capital controls and recovery from the financial crisis of the 1930s. J. Int. Econ. 95, 188–201.
Mitchener, K.J., Weidenmier, M.D., 2015. Was the classical gold standard credible on the periphery? Evidence from currency risk. J. Econ. Hist. 75, 479–511.
Morys, M., 2013. Discount rate policy under the classical gold standard: core versus periphery (1870s–1914). Explor. Econ. Hist. 50, 205–226.
Morys, M., 2017. Greece in a Monetary Union: Lessons from 100 Years of Exchange-Rate Experience. Paper prepared for American Economic Association Annual Meeting, Chicago January.
Obstfeld, M., Taylor, A.M., 2003. Globalization and capital markets. In: Bordo, M.D., Taylor, A.M., Williamson, J. (Eds.), Globalization in Historical Perspective. Globalization and Capital Markets National Bureau of Economic Research, Chicago, pp. 121–183.
Officer, L.H., 1996. Between the Dollar-Sterling Gold Points. Exchange Rates, Parity, and Market Behavior. Cambridge University Press, Cambridge.
Pesaran, M.H., Shin, Y., Smith, R.P., 1999. Pooled mean group estimation of dynamic heterogeneous panels. J. Am. Statist. Assoc. 94, 621–634.
Phelps, E., 1973. Inflation in the theory of public finance. Swedish J. Econ. 75, 67–82.
Reinhart, C.M., Reinhart, V.R., 2015. Financial crises, development, and growth: a long-term perspective. World Bank Econ. Rev. 29 (Suppl), 53–76.
Reinhart, C.M., Rogoff, K., 2009. This Time is Different: Eight Centuries of Financial Folly. Princeton University Press, Princeton.
Reinhart, C.M., Rogoff, K., 2011. From financial crash to debt crisis. Am. Econ. Rev. 101, 1676–1706.
Reis, J., 2000. The gold standard in Portugal, 1854-91. In: Martín-Aceña, P., Reis, J. (Eds.), Monetary Standards in the Periphery. Paper, Silver and Gold, 1854-1933. Macmillan press, London, pp. 69–111.

Roodman, D., 2006. How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata. Center for Global Development Working Paper 103.
Sabaté, M., Escario, R., Gadea, M.D., 2015. Fighting fiscal dominance. The case of Spain, 1874-1998. Eur. Rev. Econ. Hist. 19, 23–43.
Sabaté, M., Gadea, M.D., Escario, R., 2006. Does fiscal policy influence monetary policy? The case of Spain 1874-1935. Explor. Econ. Hist. 43, 309–331.
Sargent, T.J., Wallace, N., 1981. Some unpleasant monetarist arithmetic. Federal Reserve Bank Minneapolis Q. Rev. 1–17.
Schularick, M., 2012. Public debt and financial crises in the twentieth Century. Eur. Rev. Hist. 19, 881–897.
Schularick, M., Taylor, A.M., 2012. Credit booms gone bust: monetary policy, leverage cycles, and financial crises, 1870-2008. Am. Econ. Rev. 102, 1029–1061.
Shambaugh, J.C., 2004. The effect of fixed exchange rates on monetary policy. Q. J. Econ. 119, 301–352.
Shearer, R.A., Clark, C., 1984. Canada and the interwar gold standard, 1920-35: monetary policy without a central bank. In: Bordo, M.D., Schwartz, A.J. (Eds.), A Retrospective on the Classical Gold Standard. University of Chicago Press, Chicago, pp. 277–302.
Shizume, M., 2011. Sustainability of public debt: evidence from Japan before the Second World War. Econ. Hist. Rev. 64, 1113–1143.
Stoenescu, G.V., Aloman, A., Blejan, E., Costache, B.G., 2014. Romania: from 1880 to 1947. In: South-Eastern European Monetary and Economic Statistics from the Nineteenth Century to World War II. Bank of Greece, Bulgarian National Bank, National Bank of Romania, Oesterreichische Nationalbank, Athens, Sofia, Bucharest, Vienna, p. 2014.
Straumann, T., 2009. Rule rather than exception: Brüning's fear of devaluation in comparative perspective. J. Contemp. Hist. 44, 603–617.
Straumann, T., Woitek, U., 2009. A pioneer of a new monetary policy? Sweden's price-level targeting of the 1930s revisited. Eur. Rev. Econ. Hist. 13, 251–282.
Tattara, G., 2000. Was Italy ever on gold? In: Martín-Aceña, P., Reis, J. (Eds.) Monetary Standards in the Periphery. Paper, Silver and Gold, 1854-1933. Macmillan Press, London, pp. 18–68.