Fiscal Policy under Constraints: Fiscal Capacity and the (In-)Stability of Government Financing during the Great Depression

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Abstract

The Great Depression, and the interwar period more generally, were characterized by macroeconomic mismanagement. Fiscal policy, in particular, was essentially not used to fight the slump. Despite this, I find that a higher degree of fiscal capacity helped countries reduce the cyclical volatility of their governments' financing and, thus, to run stabilizing – or, at least, less destabilizing – fiscal policies. This smoothing effect worked principally by facilitating countries' access to borrowing. Thus, interwar governments were constrained in their policy choices by past investments in their fiscal systems, and not just Gold Standard membership and ideology, as commonly held in the literature.

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Max Weber Fellow, 2017-2018

1 Introduction

Fiscal policy in the interwar period was a complicated affair. Middleton (2013) highlights this with reference to the United Kingdom by drawing attention to the "[...] complex of enormous pressures for expenditure growth, a budget now significantly enlarged from pre-war and highly cyclically sensitive, and all of this within the context of considerable macroeconomic instability and the pressures for the Keynesian solution which, importantly, predate the 1929 downturn". Other countries faced even more formidable challenges, due to significantly greater economic instability combined with younger, less centralized and less fiscally endowed states. In fact, both public revenues and expenditures were extremely volatile in many countries in the interwar period, and this contributed to overall uncertainty in the economic and political spheres. This paper engages with the following questions: 1) How did fiscal capacity affect the volatility of tax revenues and government financing in the interwar period? 2) Through which channels did this effect occur? I tackle these questions using newly collected data for a large panel of countries (23 to 29, depending on the specification).

I carry out the empirical analysis in two steps. First, I show that the fiscal capacity of countries – measured by overall tax revenue and income tax revenue as shares of GDP – played a major role in reducing the cyclical volatility of government financing. Second, I focus on the role of fiscal capacity in guaranteeing countries an easier access to borrowing. Specifically, I show that high capacity countries had higher initial debt stocks, were able to borrow more compared to low capacity countries in the interwar years, and also had lower sovereign bond yield spreads, which allowed them to borrow more cheaply. By focusing on the composition rather than just the magnitude of tax revenues, I provide evidence that these effects were due to fiscal capacity signaling higher institutional quality, rather than simply a higher present value of future tax receipts.

(a) Fiscal Capacity=Tax/GDP   **(b)** Fiscal Capacity=IncomeTax/GDP
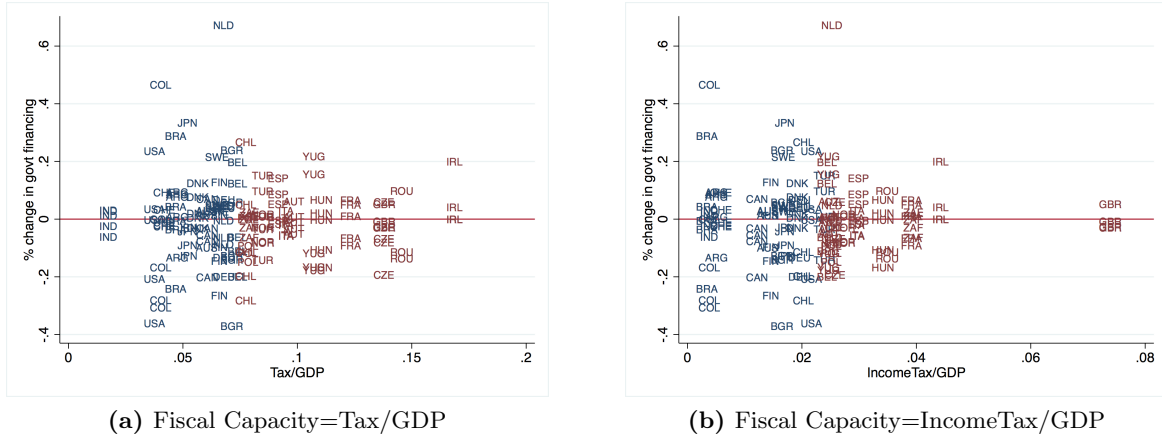
Figure 1: Government financing and fiscal capacity, 1929-33

Percentage changes in government financing are annual. Countries classified as low (blue) and high (red) capacity based on whether they are below or above the median of the respective fiscal capacity indicator. Source: Statistisches Reichsamt for the revenue data and Klasing and Milionis (2014) for the nominal GDP data.

The main finding of this paper – that is, the link between fiscal capacity and the ability to smooth government financing – is summarized in Figure 1. This illustrates annual percentage changes in government financing for the Great Depression years (1929-33) given a country's degree of fiscal capacity, measured using taxes as a share of GDP (panel a) and income taxes as a share of GDP (panel b). Countries are classified as low (in blue) and high (in red) capacity based on whether they are below or above the median of the respective fiscal capacity indicator. It is immediately evident that the dispersion of government financing is much larger for low compared to high capacity countries. In fact the standard deviation for the former is 58 to 34% (depending on which indicator is used) higher than thar of the latter. The analysis below will demonstrate that this insight is robust to the inclusion of a wide array of controls, non-linear specifications and an instrumental variable strategy to account for potential bias and measurement error.[1]

I deal with the potential endogeneity of fiscal institutions and the confounding effects of temporary changes in tax policy with two strategies. The first is holding the structure of fiscal systems stable by using 1914-1926 average fiscal indicators to study changes in government revenues between 1927 and 1938. The second is an instrumental variable approach. I employ two instruments for fiscal capacity: 1) the incidence of major external conflicts between 1816 and 1913, as reconstructed by Dincecco and Prado (2012); 2) the long term incidence of natural disasters, which I calculate based on data from the EM-DAT dataset of the Centre for the Epidemiology of Disasters (CRED, 2017). The choice of these variables has historical, theoretical and empirical foundations that are discussed in detail below. In short: external conflicts facilitate the extension of the state's franchise because they lead to an increase in the demand for a public good – national defense – which needs to be financed through taxation. Indeed, the historical record shows that warfare encouraged reforms, which had far reaching consequences for the fiscal development of countries. Natural disasters, instead, are a counter-force to the concentration of fiscal resources in national governments. This is because of their predominantly small scale, which spurs the creation of targeted local, rather than central, institutions and revenue streams to deal with their consequences.

This paper speaks to four main strands of literature. First, it addresses the economic history literature on policy reactions to the Great Depression. Amongst many others, Temin (1989) and Eichengreen (1992) have pointed out that these were either misguided – in core countries – or extremely limited – in the periphery. Eichengreen maintained that this was due to the constraints imposed by the dysfunctional interwar Gold Standard, in conjunction with weak international cooperation and an inadequate conceptual framework based on balancing the budget. Temin similarly claimed that the Gold Standard was the key mechanism for the diffusion and severity of the slump. I argue that the pre-existing structure of fiscal systems also severely constrained the policy responses of countries that saw their tax revenues collapse

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[1]For example, if countries with more volatile revenues decided to invest more in fiscal capacity to mitigate this, the effect of the latter would be underestimated in the regressions. Rodrik (1998) discusses the issue of the co-determinateness of volatility and government size in the context of estimating the effect of openness on government size, but it could similarly apply in this context. Conversely, if revenue volatility made investments in fiscal capacity more difficult, the impact of fiscal capacity would be overestimated.

and financial markets dry up. Moreover, I find that these constraints were more binding for countries which had left the Gold Standard, making the decision of shedding the golden fetters potentially endogenous to fiscal capacity. Thus, the Gold Standard straitjacket invoked by the literature interacted with additional and more-deeply rooted constraints.

Second, this paper contributes to the literature on the cyclicality of fiscal policy and the literature on the determinants and impact of macroeconomic volatility. It is now a well-established stylized fact that, in the post-World War II era, industrialized economies have consistently run countercyclical or acyclical fiscal policies, while developing countries have followed procyclical ones, which have presumably contributed to their macroeconomic volatility.[2] A further stylized fact for the post-WWII era is that countries with larger governments tend to have less volatile economies. This has been attributed to the combination of automatic stabilizers and composition effects (Galí, 1994; Fatás and Mihov, 2001; Andrés, Doménech, and Fatás, 2008). The argument for the latter is that the public sector is more stable than the private sector, therefore countries with larger public sectors will be less volatile overall.

I add an historical dimension to this literature by showing that both government revenue and expenditure were more volatile than GDP on average in the Great Depression years. Thus, the historical record, as well as the experience of developing countries today (Mendoza and Oviedo, 2006), demonstrates that a lower volatility in the public sector compared to the private sector should not be taken for granted. The paper's findings also support the notion that institutionally-determined credit constraints in countries with weak and small governments can play an important role in fiscal policy pro-cyclicality and volatility. Consequently, the ability of stronger governments to run more counter-cyclical and less volatile fiscal policies might help explain the negative correlation between government size and macroeconomic volatility.

Third, my findings shed further light on the far-reaching impact of fiscal institutions on economic outcomes. The literature linking fiscal capacity to long-term economic development both theoretically and empirically is now an established and burgeoning field (See Section 2). However, despite evidence that fiscal development is an important determinant of the ability to borrow (North and Weingast, 1989; Bordo and White, 1991; Dincecco, 2009; O'Brien, 2011), there are no empirical studies linking fiscal capacity directly to cyclical economic outcomes and fiscal policies. This paper helps fill this gap.

The final contribution of the paper is to provide new data on the fiscal history of the interwar period. The extreme economic downturn and widespread collapse in public revenues caused by the Great Depression forced a broad spectrum of countries – which started from extremely low taxation levels by today's standards – to reconsider their taxing strategies. For some nations, the early 1930s represent the beginning of far-reaching changes in taxation and in the role of governments in the economy. In the United States, for example, the expansion of income taxation and of Federal spending programs in the 1930s ushered in a new era (Wallis, 2000; Fishback and Wallis, 2013). This is also true at the sub-national level: Gillitzer (2017)

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[2]See Gavin and Perotti (1997), Kaminsky, Reinhart, and Vegh (2004), Talvi and Vegh (2005), Mendoza and Oviedo (2006), Ilzetzki and Vegh (2008), Frankel, Vegh, and Vuletin (2013) and Vegh and Vuletin (2015), amongst others.

shows that US states that were hit more severely than average by the Depression were more likely to introduce new taxes compared to states hit by smaller slumps. Argentina provides another illustration. The country introduced its very first income tax in 1932 as response to the Depression (Alhadeff, 1985). More generally, the share of countries adopting withholding doubled during the interwar years, opening the way for modern tax systems (Besley and Persson, 2014).

The newly-assembled data confirms the existence the rapid increase in fiscal capacity in Europe and North America in the aftermath of the Depression. WWII and the consolidation of welfare states in the War's aftermath certainly contributed to the patterns of taxation we see today, but divergent paths between Western economies and the rest of the world were already visible in this earlier period.[3].

The rest of the paper is structured as follows. I discuss the concept and relevance of fiscal capacity in Section 2. In Section 3, I discuss how revenue volatility can affect policy and the action of states more generally. In Section 4. Section 5 illustrates the econometric strategy to investigate the link between fiscal capacity and government financing smoothing. Section 6 discusses the quantitative importance of the results, while Section 7 explores the borrowing channel through which fiscal capacity affected government financing. Section 8 concludes.

2 Fiscal capacity: definition, measurement and impact

2.1 What is fiscal capacity and why does it matter?

Historians, sociologists and other social scientists have long recognized that the development of means to raise taxes deserves serious study. Although Joseph Schumpter argued along these lines already in 1918 in the wake of the tumultuous changes brought about by World War I (Schumpeter, 1918), only a relatively recent literature in modern Economics has started tackling fundamental questions, such as where states' ability to raise revenues comes from and what impact it has on the economy, beyond the distortionary effects of taxes commonly discussed. Tim Besley and Torsten Persson, two pioneers of this literature, argue that it has been recognized that "[...] the power to tax is about much more than raising tax revenues – it is at the core of state development" (Besley and Persson (2014), page 100). However, despite a growing recognition of the role of fiscal institutions in shaping economic performance, most macroeconomic models still assume that governments always have the ability to raise the desired or needed tax revenues and are, in general, *effective.* This was clearly not the case historically, but neither is it today in many developing countries.

The concept of fiscal capacity – coined by Charles Tilly (Tilly, 1975, 1990) – is usually understood to represent the level of development of a country's fiscal system. Often, it is also considered as a more general indicator of state capacity and, in particular, of the ability of a government to implement complex policies (Rogers and Weller, 2013). This is because fiscal

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[3]The data includes some information on local governments, however, further work is necessary to increase the coverage on local governments in the interwar period – as in many other historical contexts – in order to fully grasp changes in taxation patterns (Hoffman, 2015; Dincecco, 2015)

capacity furnishes the necessary resources for the provision of public goods and the creation and maintenance of a qualified and efficient bureaucracy able to monitor the economy and society. From a theoretical perspective, Besley and Persson (2010) have shown that investments in legal and fiscal capacity are often complements. This leads to strong links between the ability to raise taxes and to provide market-supporting institutions. The complementarity between fiscal capacity, state development and institutional quality means that rich countries are also high tax countries, with good enforcement of contracts and property rights. Dincecco and Prado (2012) and Dincecco and Katz (2016) offer convincing empirical evidence of the positive effect of fiscal capacity on long-term economic performance at country level, whereas Dittmar and Meisenzahl (2016) offer evidence of this effect at city-level for pre-modern Germany.[4]

A high fiscal capacity, particularly when accompanied by effective restraints on the executive, is also indicative of an at least partly successful and functional bargain between the state and the economic elites. This is particularly important in the historical context because of the quasi-voluntary nature of taxation which still prevailed in some countries – for example Switzerland (Farquet, 2012) – in the interwar period. Apart from facilitating the taxing of a non-negligible share of resources, elite cooperation can also promote the implementation and success of policies.

The measurement of fiscal capacity is directly connected to these considerations. The share of taxes in GDP, the share of income (direct) taxes in GDP and the share of income (direct) taxes in total tax revenues are all widely used indicators of fiscal capacity. In my research, I also rely on these. The key insight is that the amount and types of resources the state is able to tax are both important elements of fiscal capacity. They exemplify the two aspects of institutional quality outlined above: 1) the amount of resources available to support the state's infrastructure, 2) the level of cooperation of the elites. Income (direct) taxes are a particularly good indicator of both. This is because they rely on a broad tax base, they are some of the most demanding taxes to collect in terms of monitoring and fiscal infrastructure, and they require some consensus between the state and the more or less broad elites for effective collection. At the other end of the spectrum are trade taxes. These are considered easy to collect, the tax base – goods entering and/or leaving the country – is easy to monitor, and the political bargain with the elites more straightforward. Indeed, Sokoloff and Zolt (2007), amongst others, note that richer countries have tax systems that are more progressive and rely on personal and corporate income taxes and broad-based property taxes, whereas poorer ones rely mainly on taxes on consumption, excise taxes and custom duties.

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[4]Even in the absence of large scale public goods provision, state capacity can foster growth and market integration by protecting from external predation, removing institutional barriers to trade, limiting the ability of local elites to extract rents, and offering widely applicable rule of law and regulations. A more effective bureaucracy might also be better able to resist the vested interests and rent seeking of the elites, and to raise taxes in a less distortionary way. For comprehensive illustrations of the relationship between state/fiscal capacity and development see also Epstein (2000); Acemoglu (2005); Hoffman (2015); Bardhan (2016) and Johnson and Koyama (2017).

2.2 Limits to the development of fiscal capacity

Difficulties in creating centralized revenue raising institutions are severe and have undermined the process of state formation for long stretches of human history. The first *modern* fiscal states appeared in Europe only in the last 200 to 300 or so years. Moreover, centralized taxation represents a necessary, but insufficient, condition for the creation of effective states. Parliamentary supremacy – i.e. an effective control of the executive – is generally considered to be a necessary complementary feature to fiscal centralization. This became widespread only in the 19th century in Europe (Dincecco, 2015).

A consensus in the literature is that reforms of fiscal constitutions are often the result of extreme circumstances (O'Brien, 2011). Wars and conflicts, such as the French Revolution, the English Civil War and the two World Wars, are examples of the type of events that can have a major impact on the role of governments in the economy and on the way taxes are raised. Tilly (1975) famously argued that "War made the state and the state made war".

Major macroeconomic events can also lead to fiscal reforms by, for example, increasing the demand for the provision of public goods, such as unemployment insurance. The Great Depression in the United States is an example of this at both the federal and state level (Wallis and Weingast, 2005; Gillitzer, 2017). In general, any exogenous increase in the demand for public goods can have both static and dynamic effects on the accumulation of fiscal and other state capacities. However, differing degrees of political resistance to increases in taxation will eventually determine how much the state is able to actually expand its franchise (O'Brien, 2011; Hoffman, 2015).

The underpinnings of the bargain between the economic elites, the broader public and the state regarding taxation are very probably contingent on time and place. Resistance to taxation can emerge, for instance, from a desire not to cede resources to an unaccountable and unrestrained sovereign. When a sovereign cannot credibly commit to refrain from confiscation, as is often in the case in absolutist regimes, a low fiscal capacity scenario might be the only viable equilibrium, as shown by Ma and Rubin (2017) for Qing China.

Both political scientists and economists have also argued that resistance to taxation can have its roots in the unwillingness to share resources with categories of people perceived as different. These differences can be due, for example, to ethnic, regional, or religious identities (Alesina, Baqir, and Easterly, 1999; Alesina and La Ferrara, 2005; Lieberman, 2003; Chaudhary and Rubin, 2016; Desmet, Gomes, and Ortuño-Ortín, 2016). However, fiscal reforms need not be connected to interclass, interethnic and inter-religious distributional issues or even to the financing of the welfare state. Mares and Queralt (2016), for example, argue that the introduction of the income tax in Britain was tied to the redistribution of the tax burden within the economic elite, from the traditional land-owning class to the recently emerged industrialists.

Even when starting conditions and shocks provide favorable conditions for big changes in fiscal systems, these cannot happen overnight due to the learning process and the investments in fiscal and human capital necessary for levying new taxes (Sylla and Wallis, 1998; Hansen, 2001; Sokoloff and Zolt, 2007). Thus, countries with inefficiently weak states unable to raise

sufficient revenues and to provide growth and welfare enhancing public goods have existed for most of history and continue to exist today in many parts of the world. This is the central message of much of the literature on this topic, which, in one form of the other, maintains that history matters in the creation and persistence of fiscal institutions.[5]

2.3 Fiscal capacity, borrowing and macroeconomic policy

The underdevelopment of fiscal capacity does not only limit countries' long term growth potential, but also their space for maneuver when dealing with cyclical fluctuations in economic activity and shocks more generally. As Besley and Persson (2010) point out, fiscal capacity is not fully utilized at all times, but past investments make it possible to raise revenue when this is necessary.[6] A key tool to deal with adverse shocks is borrowing, which has historically been intimately tied to fiscal development. Economic historians have long linked Britain's exceptional ability to borrow to its early development as an advanced fiscal state, for example (North and Weingast, 1989; Bordo and White, 1991; O'Brien, 2011).[7] In a comparative setting, Dincecco (2009) shows that European countries with centralized and/or limited regimes – the two preconditions for effective, high capacity states – enjoyed cheaper access to credit in the period 1750-1913.

Limits to the ability to borrow are still a key factor in fiscal policy today. Gavin and Perotti (1997) argue that borrowing constraints have been important determinants of pro-cyclical fiscal policy in Latin America. Mendoza and Oviedo (2006) suggest that the more severe financial frictions faced by developing countries in borrowing markets, combined with greater tax revenue volatility, can explain the procyclicality of their fiscal policies and their lower debt-to-GDP ratios

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[5]See, amongst many others, Acemoglu (2005); Acemoglu, Ticchi, and Vidigni (2011); Besley and Persson (2009); Besley, Ilzetzki, and Persson (2013); Besley and Persson (2014); Dincecco and Prado (2012); Dincecco (2015); Dincecco and Katz (2016); Hoffman (2015) and Johnson and Koyama (2017).

[6]An example of this is provided by Sylla and Wallis (1998) who highlight the role of pre-existing state-level revenue structures in the debt crisis of the 1840s in the US. The authors argue that some states faced insurmountable obstacles to raising additional taxes, leading to a wave of defaults following the 1839 recession. According to the authors, newly established frontier states had narrower tax bases than older ones, and relied on property taxes which were too politically costly to expand rapidly in order to continue servicing the debts. Another is provided by O'Brien (2011) who highlights that Britain historically faced less constraints to the expansion of its fiscal base than its main rival powers France, Spain, Austria, Denmark, Russia and the Ottoman Empire. This means that it was able to weather fiscal and financial crises with more ease and with more rapid recoveries.

[7]More precisely, North and Weingast (1989) argued that the shift of power from the king to parliament after the Glorious Revolution of 1688 opened the way for more extensive taxation by transferring control of the fiscal resources to broad elites. This, in turn, increased Britain's credibility, allowing it to borrow extensively and relatively cheaply on financial markets. Some authors stress the importance of earlier periods in British constitutional and fiscal history, particularly the Commonwealth and Civil War (O'Brien, 2011), but the main message is unchanged. Bordo and White (1991) further argued that the superior strength and credibility of its fiscal system allowed the United Kingdom to borrow and inflate its economy more extensively than France during the Napoleonic Wars, while O'Brien and Palma (2016) make a similar argument on the monetary side, highlighting the importance of the Bank of England's previous commitment to an orthodox monetary policy. Stasavage (2016) paints a less optimistic picture of these developments. The author argues that institutional reforms rest on two different narratives that are often conflated. On one side are executive constraints, shared governance and transparency, which are generally perceived as good. On the other side are restrictions on the influence of tax payers and the devolvement of decision power to creditors, which are redistributive in nature and not necessarily welfare enhancing. The author argues that British and European history support the latter narrative more consistently.

compared to industrial countries.[8] Theoretical models have also formalized the idea that the efficiency of tax systems endogenously affects creditworthiness and, thus, the ability to borrow (Aizenman, Gavin, and Hausmann, 2000; Arellano and Bai, 2016; Bi, Shen, and Yang, 2016).[9] With many countries still having to "graduate" from fiscal policy procyclicality (Frankel, Vegh, and Vuletin, 2013), understanding the origin of the constraints that keep countries locked in this inefficient policy space is an extremely relevant issue.

3   The impact of revenue volatility

Figure 2 illustrates annual percentage changes in central government tax revenues, financing and expenditure for the countries in my sample. These are Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, the Netherlands, New Zealand, Norway, Peru, Poland, Romania, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States of America, Uruguay and Yugoslavia with various degrees of temporal coverage between 1927 and 1938. Some of these countries are later left out of the analysis due to lack of data on co-variates.[10]

While the definition of tax revenues and public expenditure are straightforward, the composition of government financing, which is my main variable of interest in the analysis, deserves a brief explanation. This variable is made up of tax revenues, non-tax revenues and long-term borrowing (over 1 year maturity). Interestingly, it represents perhaps the most widely reported fiscal aggregate by statistical offices in the interwar period, when it was classified as simply government revenue. In essence, it is a measure of the planned and budgeted part of government expenditure, which made up the vast majority (96%) of public budgets. Although short-term borrowing was used to make up for budget short-falls, the financing variable, and long-term borrowing in particular, are the portions of public intakes that are most closely related to fiscal capacity and institutional quality more generally. They are thus the focus of my analysis.

The dispersion of the variables is very large and can only be partially attributed to changes in economic activity. In fact, as mentioned above, both revenue and expenditure were more volatile than GDP in this period. The analysis below shows that tax revenues moved very closely with economic activity. Government financing, instead, was less responsive to changes in output thanks to the contribution of non-tax revenues. This smoothing effect is analyzed in detail below.

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[8]See Ilzetzki (2011) for an alternative, political economy-based, explanation for fiscal policy procyclicality. This is grounded in disagreements amongst successive governments regarding the distribution of public spending.

[9]Esslinger and Müller (2015) show that the relationship between capacity and borrowing can also go the other way. Through a political economy model that endogenizes choices regarding investment in fiscal capacity, while explicitly allowing for public debt and the possibility of default, the authors show that borrowing can facilitate investment in fiscal capacity, but only if income fluctuations are not too large.

[10]I have also collected data on India and Indonesia, but these countries are excluded from the analysis because they were not independent sovereign states at the time.
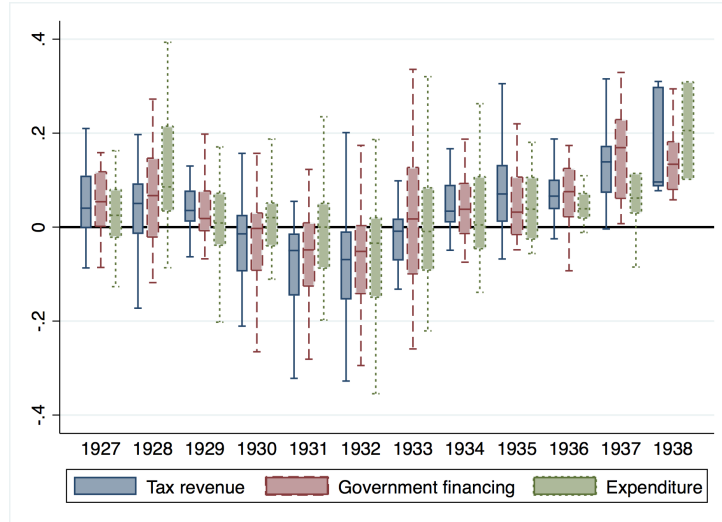
Figure 2: Annual percentage changes in fiscal aggregates, 1927-38

All variables are in nominal terms. The box-plot illustrates the median, interquartile range and adjacent values of the variables. Government financing is composite, which includes tax revenues, revenues from publicly owned enterprises and capital, other unclassified revenues and long term (over 1 year maturity) borrowing. This was a widely reported fiscal aggregate in the interwar period, which essentially represented the budgeted part of government expenditure and made up around 96% of total fiscal resources. Source: author's calculation see Appendix B for details.

3.1 Fiscal policy: the interwar experience

Given this backdrop of instability, how was fiscal policy conducted in the interwar period? Fiscal deficits, when at all present, tended to be very small, especially in comparison to the loss of GDP (Figure 3, see also Almunia, Bénétrix, Eichengreen, O'Rourke, and Rua (2010)). For example, in the US the deficit was less than 6% of GDP in 1933. By comparison, in 2009 it was 10%. At the same time, the cumulative contraction of real GDP per capita between 2007 and 2009 was less than one sixth of the Great Depression one, around 5% compared to 31%. Additionally, deficits in early 1930s US were mostly due to the lack of a political consensus on policies to balance the budget, rather than a form of proto-Keynesianism (De Long, 1998), and were in any case compensated by surpluses at the state level (Fishback, 2013). Even in Germany, a country that is conventionally seen as having embraced Keynesianism (nearly) ante-litteram, the recovery of the 1930s was not driven by fiscal policy (Ritschl, 2002a); a similar story applies to Sweden (Schön, 2007).[11]

The extremely limited use of fiscal (and monetary) policy has led scholars to argue that governments' responses to the Great Depression were gravely inadequate and potentially aggravated the slump. Eichengreen (1992) highlighted the lack of international cooperation – fueled by mutual suspicion – and the dominant conceptual framework – underpinned by the balanced budget ideology – as two key determinants of the weak policy responses to the Depression. Indeed, even for those potentially well disposed towards Keynesianism, the dogma of the balanced budget was hard to displace. The smoothing of the business cycle through fiscal and monetary

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[11]As cited by Almunia, Bénétrix, Eichengreen, O'Rourke, and Rua (2010)).
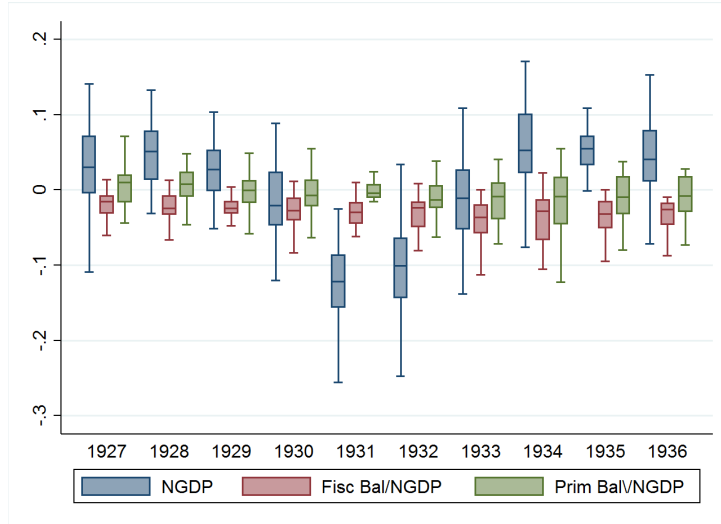
Figure 3: Fiscal and primary balances as a share of GDP, 1927-36

Source: Statistisches Reichsamt for the fiscal data and Klasing and Milionis (2014) for the nominal GDP data. See Appendix B for details. $FiscalBalance = Expenditure - TaxRevenue$; $PrimaryBalance = FiscalBalance + DebtService$.

policy was a radical notion even among economists in the Labour camp in the UK – see for example (Dalton, 1934) – or the Communists in France (Eichengreen, 1992). Eichengreen furthermore identified the dysfunctional interwar Gold Standard as the institutional straitjacket that limited countries' maneuvering space on both the monetary and fiscal fronts. According to the author, the unwillingness to let go of the gold anchor, seen by many as the last connection to the successful pre-WWI monetary order, constrained expansionary policies and piled further deflationary pressures and austerity on ailing countries. Temin (1989) similarly argued that the Gold Standard-imposed limitations to maneuvering space were the fundamental channel for the spread of the Depression.

But how much room for maneuver would countries have possessed had they been free from the *golden fetters*? What constraints, apart from Gold Standard membership, did they face? On the fiscal side, many countries probably had limited possibilities to act for a number of reasons.

First, governments in the interwar period were small. Leaving aside all other issues, the simple fact that states were modestly-sized relative to the economy made large scale fiscal stimuli practically impossible to implement. Second, sources of finance for governments shrunk very quickly during the Depression. After 1929, international financial markets, which had been bolstered by an outburst of US foreign lending after WWI, essentially dried up. Many countries that had experienced substantial capital inflows during the second half of the 1920s experienced dramatic reversals and capital flight. On top of this, domestic financial markets were underdeveloped in many countries and the legacy of the 1920s hyperinflations and the post-'29 collapse in asset prices greatly reduced the wealth governments could tap for domestic borrowing. Borrowing from central banks was certainly an option for countries not on gold. However, it is difficult to imagine that the loans some countries would have needed to counterbalance the

large funding shortfall would not have had major economic consequences in terms of of further capital flight in the absence of stringent capital controls, had they been financed by money printing alone. Supported by my empirical findings, I argue that, in addition to these factors, a low level of development of the fiscal system was a major constraint on countries' ability to smooth government financing, or – at a minimum – limit its collapse through borrowing.

3.2 Beyond fiscal policy: revenue volatility and the action of states

Apart from contributing to procyclical fiscal policies, public revenue volatility can have further negative repercussions through four main channels. First, the tax-smoothing literature pioneered by Barro (1979) and Lucas and Stokey (1983) shows that deviations from the optimal path of keeping tax rates (the share of income paid into taxes) stable over the business cycle will lead to additional distortions and welfare losses for any given level of government spending.[12] Thus, even dismissing a Keynesian approach, optimal fiscal policy requires the ability to borrow during slumps to allow taxes to fall in line with output while keeping public expenditures stable.

Second, as shown empirically by Fatás and Mihov (2013), countries with more volatile fiscal policies have substantially lower long-term growth. Robinson, Torvik, and Verdier (2017) propose a political economy mechanism through which high public revenues volatility can reduce the efficiency of public policy and, as a consequence, directly lower economic growth.[13]

Third, to the extent that revenue volatility contributes to macroeconomic volatility, it can also indirectly negatively affect economic growth (Loyaza, Ranciére, Servén, and Ventura, 2007).[14] Empirical evidence for the post-WWII period indicates that countries and regions with larger governments consistently display a lower volatility of output (Galí, 1994; Fatás and Mihov, 2001; Andrés, Doménech, and Fatás, 2008).[15] However, the channels through which larger governments stabilize the economy are not clear. Researchers have argued that automatic stabilizers and simple composition effects might both contribute to the smoothing of output.[16] Automatic stabilizers were extremely limited in geographical diffusion and scope in

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[12]This result is based on this assumption that expenditure is exogenously determined. Ferriére and Karantounias (Forthcoming) show that, when government expenditure is endogenized, the optimal fiscal policy response can resemble austerity under certain conditions.

[13]The mechanism is the following: volatility in public income lowers re-election probability by reducing the benefit of staying in power; this, in turn, reduces the (political) cost of inefficient policies, such as patronage and clientelism, thus negatively affecting economic growth.

[14]Bleaney, Gemmell, and Greenway (1995) and Ebeke and Ehrhart (2011) offer interesting insights by focusing on sub-Saharan Africa. Both studies find adverse effects of revenue instability on the volatility of government investment and expenditure, and on the level of public investment.

[15]Some studies take this as a starting point to argue that countries facing more external shocks due to their openness will choose to have a larger government sector as a form of self-insurance (Rodrik, 1998; Epifani and Gancia, 2009).

[16]The mechanism through which government size reduces macroeconomic volatility proposed in the recent literature (Andrés, Doménech, and Fatás, 2008) is quite different in spirit to how the smoothing effect of automatic stabilizers in the traditional Keynesian framework. The latter posits that taxes react more than proportionally to income shocks so that disposable income, and therefore consumption of credit-constrained consumers, is smoother than income (De Long and Summers, 1986). This basic mechanism can be extended to government transfers and general government spending. In Andrés et al, however, the requirements of Real Business Cycle (RBC) general equilibrium modeling mean that governments smooth consumptions because higher taxes lead

the interwar period, however, and their role in dampening business cycle fluctuations is unclear even in modern economies (McKay and Reis, 2016). Composition effects depend on the public sector being less volatile than the private sector and, thus, a stabilizing force in the economy. This assumption, however, is based on the limited experience of developed countries in the recent past. In the interwar period, governments were certainly not a stabilizing force on average, given that both their revenues and expenditures were more volatile than GDP. The ability to smooth government financing, which I find to be related to the fiscal capacity and thus the size of governments, can help to explain under what conditions governments reduce or increase macroeconomic volatility.

Finally, in countries which raise small amounts of revenue compared to the size of the economy, sudden falls in government financing can disrupt the very functioning of states. During the early 1930s, many countries around the world experienced dramatic regime changes. The case of Germany with the rise to power of the NSDAP in 1933 is notorious, but many countries in Eastern and Central Europe, in Latin America and beyond experienced sharp autocratic turns. de Bromhead, Eichengreen, and O'Rourke (2013) analyze the link between economic hard times and right-wing extremisms during the interwar period and find that, where depressed economic conditions were allowed to persist due to inadequate policy responses, the rise of extremism was more likely. The inability to prevent a collapse in government financing may have played an important role in this mechanism, which deserves an exploration in future research.[17]

4   New data and some descriptive statistics

Existing datasets on fiscal variables in the interwar period are incomplete. The most comprehensive sources collecting international data are Mitchell's International Historical Statistics volumes (Mitchell, 2007) and Flora et al's data handbook on Western Europe (Flora, Kraus, and Pfenning, 1987). However, these do not provide detailed information on tax structures and are almost exclusively focused on central governments.

I have transcribed data on the size and composition of countries' central government tax revenues – as well as some more limited information on local governments – from various publications of the German Imperial Statistical Office (*Statistiches Reichsamt*). In the interwar period, the Office aggregated large amounts of international data from national statistical yearbooks, greatly simplifying the task of collecting these data.[18] The local level data remains incomplete and the econometric analysis below focuses on central governments. Nonetheless, some interesting stylized facts, which improve our understanding of taxation in the interwar era, can be drawn from both central and local data. Directly below, I discuss my two fiscal capacity indicators: tax revenues as a share of GDP and income tax revenues as a share of

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[17]Other past regime changes have also been linked to fiscal factors, for example the French Revolution (Tilly, 1975; Sargent and Velde, 1995).

[18]See Papadia (2017) for more information on the features and reliability fo this source.

to consumers having less disposable income to begin with, so that, when a productivity shock hits, the fall in disposable income is smaller in relative terms.

GDP. In Appendix B, I discuss the other data and the sources in detail.

Table 1: Tax revenues as a percentage of GDP

	Central tax revenue/GDP				Central & Local tax revenue/GDP			
	Pre-GD	1929-33	Post-GD	Average	Pre-GD	1929-33	Post-GD	Average
Austria	8	10	15	10		15	21	16
Belgium	5	7	10	7	5	8	11	8
Bulgaria	7	6	8	7			8	8
Czechoslovakia	10		17	14				
Denmark	7	5	6	6	12	9	10	10
Finland	7	6	7	7				
France	9	13	16	12		15	22	17
Germany	3	7	12	7	12	15	22	17
United Kingdom	14	14	16	14		17	19	18
Greece		8	5	7				
Hungary	10	9	15	11		12	20	15
Ireland		14	20	17				
Italy	7	9	14	10	10	14		12
Netherlands	6	6	9	7	8	10	16	10
Norway	10	8	8	8	20	14	14	16
Poland	5	7	10	8		13	13	13
Romania	14	15	15	15				
Spain	9	8		9				
Sweden	6	6	7	6	10	10		10
Switzerland	3	4	6	4	7	10		9
Yugoslavia		11		11				
Canada	6	6	7	6				
USA	3	3	5	4	8	12	12	10
Argentina	5	4	6	5				
Brazil		4	5	4				
Chile	8	8	7	8				
Colombia	5	5	3	4				
Australia	6	7	6	6				
Japan	6	5	4	5				
Turkey		6	13	8				
Egypt	10	10	14	11				
South Africa	7	7	10	8				
Average	7	8	10	8	10	12	13	12
Western Europe average	7	7	10	8	9	11	15	11
European core average	7	9	13	9	9	13	18	14
Eastern Europe average	9	9	13	11		11	17	12
Latin America average	6	5	5	5				

Source: author's estimates, see Appendix B for detail on the sources. The post-Depression figure for the United States is from the Historical Statistics of the United States, millennial edition (Wallis, 2006). Pre-GD=1918-28. Post-GD= 1934-38. Western Europe: Austria, Belgium, Denmark, Finland, France, Germany, UK, Italy, Netherlands, Norway, Spain, Sweden, Switzerland. European core: Belgium, France, Germany, UK, Italy, Netherlands. Eastern Europe: Bulgaria, Czechslovakia, Hungary, Poland, Romania. Latin America: Argentina, Brazil, Chie, Colombia.

Table 1 offers a comparative picture of tax revenues as a share of GDP. Direct comparisons across countries are imperfect due to different accounting standards, but are nonetheless useful. The very low incidence of taxation by the standard of today's developed countries is immediately evident. Rich countries today tax around 40% of GDP on average (Besley and Persson, 2014), while the average incidence of central government taxation between 1918 and 1928 was around 7% and had increased to 10% by 1934-1938. These levels are similar to those of low-tax developing countries today. The inclusion of local level taxation for countries with available data only increase the fiscal capacity indicator to 15% and 12% in post-Depression Western Europe and US respectively.

However, a clearly divergent trend emerges when Europe and the United States are compared to the rest of the world. In Western Europe, the incidence of taxation at the central level increased on average from 7% before the Great Depression to 10% after, and from 10% to 13% when local governments are included. The incidence of taxes rose in almost all the Western European countries considered in the sample, the exceptions being Denmark, Finland, Norway, and Greece. The relatively high and increasing taxation levels of Eastern Europe are also noteworthy. Taxes as a share of GDP were slightly higher than in Western Europe as a whole, but lower than the European core constituted of Belgium, France, Germany, Italy, Netherlands and the United Kingdom. In the US, the increase in tax levels was from 3 to 5% for the federal and 8 to 12% for the general government respectively. By considering government financing data, which is more complete than the tax data at the local level,[19] Canada can also clearly be assimilated to the European and US experience of relatively high and increasing revenues levels. No similar general upward trend is visible in the rest of the world, with the exception of Egypt and South Africa.

The two African countries in the sample, in fact, also stand out for their relatively high taxation levels. This could be at least partially explained by the fact that they were a British protectorate and a recently independent British ex-colony respectively. In Asia, Japan's taxation levels are below average. Unfortunately, the coverage of Asia and Africa is limited to these three countries and to the central government level because of data availability. This rules the assessment of broader developments in the two continents.

The most striking aspect of the table, however, is Latin America's overall very low and stagnant taxation levels, which have persisted, in relative terms, until today (Sokoloff and Zolt, 2007). The only partial exception is Argentina, a country which introduced substantial reforms – for example by implementing its first income tax – as a result of the Depression.

Table 2 offers an even clearer picture different taxation patterns by presenting information on income (direct) taxes. Europe, and the European core in particular, stand out for their high level of direct taxation both as a share of GDP and as a share of overall tax revenue. As expected, the United Kingdom emerges as the country with the most developed system of income taxation. Latin America, instead, is confirmed to be lagging behind severely in the development of its tax system, with the partial exception of Argentina.

The dynamics of direct taxes offer an interesting picture as well. In most European countries

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[19]When the tax and financing data overlap, they offer a very similar picture.

Table 2: Income (direct) taxes as a percentage of GDP and total tax revenues

	Income Tax Revenue/GDP				Income Tax Revenue/Total Tax Revenue			
Country	Pre-GD	1929-33	Post-GD	Average	Pre-GD	1929-33	Post-GD	Average
Austria	2.5	2.4	2.9	2.5	30.4	24	19.2	26.1
Belgium	1.9	2.4	3	2.3	37.9	33.3	30.3	33.3
Bulgaria	1.4	1.6	1.8	1.7	21.5	26.3	20.5	23
Czechoslovakia	2.1		3.1	2.6	20.4		17.7	19.1
Denmark	2.6	1.7	1.8	1.9	38.4	34.1	30.2	33.8
Finland	1.6	1.4	1.4	1.5	22.1	23.8	20.5	22.1
France	3.3	4	4.7	3.9	35.6	32.2	29.1	32.6
Germany	1.1	1.5	6	2	19.1	22	50	24.8
United Kingdom	7.9	7.6	7.8	7.7	57.3	56.3	49.6	53.5
Greece		1.6	1.2	1.4		19.7	22.8	21
Hungary	2.4	3	4.8	3.4	23.9	33.2	31.7	30.6
Ireland		3.9	4.9	4.4		27.9	25.1	26.5
Italy	2.8	2.8	3.5	3.3	39.4	32	25.4	32.8
Netherlands	2.5	2.5	2.6	2.5	45.3	40.5	27.5	38.4
Norway	4	2.4	2.6	2.7	38.4	31.7	30.3	31.7
Poland	1.7	2.3	3.4	2.5	31.6	30.8	34.4	32.2
Romania	3.8	4.2	3.1	3.5	26.9	29.2	20.9	24.1
Spain	2.9	2.8		2.8	32.4	33.2		32.8
Sweden	1.8	1.5	1.8	1.7	28.3	26	23.9	25.5
Switzerland	0.5	0.5	0.7	0.7	17.2	13.1	12.6	13.6
Yugoslavia		2.5		2.5		22.9		22.9
Canada	1	1.3	1.6	1.2	17.4	20.9	22.9	19.9
United States of America	2.2	2	2.4	2.2	66.1	60.9	47.9	58.7
Argentina	0.2	0.4	1	0.5	4.3	8.8	17.1	10
Brazil		0.2	0.4	0.3		6.8	9.1	8
Chile	1.8	2.4	1.8	2	21.5	30.2	24.4	26.1
Colombia	0.2	0.4	0.5	0.4	4.8	9.8	16	10.3
Australia	1.6	2	1	1.4	26.3	28.8	17.8	22.5
Japan	2.1	1.7	1.3	1.7	32.9	30	39.1	32.6
Turkey		1	4.5	2.4		17.1	35.8	23.3
Egypt	2.8	2.8	3.9	3.2	29.3	27.8	27.3	28.1
South Africa	3	3.9	5.9	4	42.8	43.1	56.1	47.9
Average	2.3	2.3	2.8	2.3	30.1	28.3	27.8	27.7
Western Europe average	2.5	2.4	3	2.5	31.6	28.7	26.8	28.7
European core average	3.3	3.5	4.6	3.6	39.1	36.1	35.3	35.9
Eastern Europe average	2.3	2.8	3.2	2.7	24.9	29.9	25	25.8
Latin America average	0.7	0.9	0.9	0.8	10.2	13.9	16.6	13.6

Source: author's estimates, see Appendix B for detail on the sources. The post-Depression figure for the United States is from the Historical Statistics of the United States, millennial edition (Wallis, 2006). Pre-GD=1918-28. Post-GD= 1934-38. Western Europe: Austria, Belgium, Denmark, Finland, France, Germany, UK, Italy, Netherlands, Norway, Spain, Sweden, Switzerland. European core: Belgium, France, Germany, UK, Italy, Netherlands. Eastern Europe: Bulgaria, Czechslovakia, Hungary, Poland, Romania. Latin America: Argentina, Brazil, Chie, Colombia.

– the exceptions are Germany, Greece, Hungary and Poland – and in some non-European countries – the US and Australia – the share of income taxes in overall tax revenues decreased

significantly over the course of the interwar period, while their share in GDP tended to increase. This partly reflects a return to a lower relative reliance on income taxes after the strain of WWI. The expansion of indirect taxes – such as taxes on sales, consumption, capital transactions and transportation – also played a substantial role in the decrease of the relative importance of income taxes in this period. These factors, however, do not change the fact that income taxes continued to increase compared to the size of the economy in these countries. The picture for custom duties, instead, is less clear cut. In general, they lost some relevance in this period, but the pattern is different in every country.

The increase in fiscal capacity in Europe and North America documented in the tables suggests that the staggering increase in the incidence of taxation, which took place over the course of the 20th century, was already well under way in the interwar era. Research on the US has identified the Great Depression as a crucial episode in triggering an increase in the role of government in the economy (Wallis, 2000; Gillitzer, 2017), and it would appear that a similar pattern can also be identified for Europe. Naturally, rearmament during the second half of the 1930s, and not just the Great Depression, played a role in these patterns, but crucially, these were not reversed after the war, indicating that deep structural changes were underway.

5   Empirical strategy

This section outlines the empirical strategy of the principal analysis of this paper. Its objective is detecting and quantifying the effect of pre-existing tax structures, in conjunction with changes in economic activity, on changes in fiscal aggregates.

More precisely, I study the impact of fiscal capacity on tax revenues and on the composite introduced above: government financing. This is made up of tax revenues, non-tax government income – i.e. the profits of publicly owned corporations and public monopolies and other unclassified revenues including the sales of some commodities abroad – and long-term – over 1 year maturity – borrowing. As mentioned above, this variable represented the planned part of governments' budgets and the bulk of resources at their disposal – 96% on average between 1927 and 1938 – while tax revenues represented on average 73%. Governments also relied on short-term borrowing from various sources – including central banks – to ramp-up spending within short time horizons.

The results indicate a major role for fiscal capacity in reducing the instability government financing, while the results for just tax revenues indicate no effect. This suggests that high capacity countries were able to smooth their public revenues though non-tax revenues, as would be desirable from an optimal fiscal policy perspective. I hypothesize that these findings are due the impact of fiscal capacity on countries' ability to borrow and explore this channel in detail in Section 7. I conclude that fiscal capacity, by signaling higher institutional quality, allowed countries to borrow more extensively and more cheaply.

The rest of this section is structured as follows. I firstly discuss the model used in the estimations (Section 5.1). I then discuss two important issues: the interpretation of the fiscal capacity coefficients (Section 5.2), and the possibility of reverse causality between my outcome

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variables and output (Section 5.3). Finally, I outline my instrumental variable (IV) strategy (Section 5.4). of

5.1 Model

The basic empirical approach consists in relating annual changes in public revenues to annual changes in economic activity measured by GDP. This approach is common in the empirical literature studying the elasticity of revenues to changes in output.[20]

I introduce several innovations compared to previous studies. First, I investigate the impact of fiscal capacity on government revenues volatility. Second, I control for the composition of tax revenues, the degree of fiscal capacity and the other control variables by keeping them constant at their average values before the estimation period. I adopt this strategy to reduce the risk of reverse causality – countries might choose a particular tax system because of changes in their revenues – and to deal with confounding effects due to idiosyncratic changes in the regressors unrelated to true changes in fiscal institutions. This is important because my objective is establishing how the persistence of fiscal systems locks-in countries leading to differences in the response of revenues to economic shocks. Third, I deal with potential endogeneity by instrumenting fiscal capacity with the time countries spent fighting major external conflicts, in line with the literature studying the impact of fiscal capacity on long-term development (Dincecco and Prado, 2012), and by introducing a novel instrument: the incidence of natural disasters.

I begin the analysis by simply estimating the elasticity of tax revenues and government financing to economic activity. Economic activity is measured by the nominal, non-PPP-adjusted GDP provided by Klasing and Milionis (2014) (NGDP). This is a useful indicator given that changes in revenues are driven by both changes in real economic activity and prices. The alternative would be to use changes in real GDP and convert the revenues into constant prices, but the choice of deflator is problematic and particularly challenging in the strong deflationary context of the the Great Depression. Even with an adequate deflator, the PPP adjustment would have to be accounted for. Using Klasing and Milionis' data represents the most straightforward solution. The differences models is outlined in equation 1 where c_i are country fixed effects, l_t are year fixed effects and $\epsilon_{i,t}$ are idiosyncratic disturbances.

$$\Delta Revenue_{i,t} = \beta_0 + \beta_1 \Delta NGDP_{i,t} + c_i + l_t + \epsilon_{i,t} \tag{1}$$

The inclusion of country fixed effects allows me to control for a vast array of time invariant or

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[20]For an early example see Vogel and Trost (1979)'s study of the elasticity of tax receipts to changes in income in US states between 1957 and 1975; Kodrzycki (2014) applies the methodology to contemporary US states revenues, Ilzetzki and Vegh (2008) use it in a cross-country setting and Brückner (2012) employs to focus on sub-Saharan African countries. In a different, but connected application, Vegh and Vuletin (2015) use it to study the cyclicality of tax rates, rather than revenues, across countries. While in the literature, this relationship is often estimated in levels as well, I retain the differences specification for the whole analysis in order to account for the probable persistence and non-stationarity of the data. Due to the large size of the swings in the dependent variables, I use percentage changes rather than log differences given that the latter represent precise approximations only for small percentage changes.

slow moving country characteristics – including geography, demography and economic structure – and to thus minimize the danger of omitting a variable correlated with the regressors and causal for the dependent variable. Time fixed effects allow me to account for common shocks. Panel estimation also minimizes issues of cross-country comparability of the data by exploiting the time series rather than cross-sectional variation of the variables.

After estimating simple elasticities, I expand the model include my fiscal capacity indicator. In addition, I control for the structure of tax revenues – since these are potentially correlated with both the outcome and the capacity indicator – and a series of other vaeriables included in vector $\mathbf{x}$. The structure of tax revenues is measured as a the share of trade taxes and the share of indirect taxes in total tax revenue. Income taxes are excluded to avoid collinearity, but the results are robust to their inclusion in place of either the trade or indirect taxes. The rest of the right hand variables are discussed throughout the analysis, and described in detail in Appendix B.

As mentioned above, I use two indicators of fiscal capacity – taxes as a share of GDP and income taxes as a share of GDP – while using the share of income taxes in total tax revenue as an (implicit) control. The objective of the paper is to estimate the effect of fiscal capacity separately from the effect of the composition of tax revenues. The two effects are different because the former regards the reaction of revenues to changes in a particular tax base (income, imports, sales, etc.) while the latter deals with the more general way in which the level of development of a tax system influences changes in revenues. The empirical analysis demonstrates that, indeed, the tax share indicators measure something different from the fiscal capacity indicators, at least in the interwar context. While I find no significant connection between the share of income taxes in tax revenue and government financing volatility, however measured my fiscal capacity indicators are significantly associated with revenue smoothing.

The model is not yet satisfactory for three reasons. First, it simply estimates whether, given a certain fiscal structure and a certain change in economic activity, changes in revenues are smaller or larger on average. This is not particularly informative given that changes in activity and revenues can be both positive and negative. The result of the estimation will be a simple average of the two. Second, there is no reason to believe that the response of revenues to changes in economic activity should be linear. One could expect large shocks to be different from small shocks. Third, the presence of time-invarying regressors makes the estimation problematic because, with standard panel data methods, their coefficients cannot be estimated. Failing to quantify these might lead to a partial picture of the marginal effect of fiscal systems on revenues. My solution to overcome all these issues is twofold. First, similarly to Brückner (2012), I interact the percentage change in economic activity (ΔNGDP) with all the other regressors. The result is that all the variables become time-varying and I can now identify non-linear relationships in the data. Second, I employ the the Hausman and Taylor (1981) (HT) approach alongside standard estimators. This allows me the obtain the coefficients of time-invarying regressors, while controlling for fixed-effects.

The model is now as follows:

$$\Delta Revenue_{i,t} = \beta_0 + \beta_1 \Delta NGDP_{i,t} + \phi_1 FiscalCapacity_{i,av} + \phi_2 TradeTaxShare_{i,av}$$

$$+\phi_3 IndirectTaxShare_{i,av} + \mathbf{x_{i,av}}\gamma + \Delta NGDP_{i,t} * \mathbf{z_{i,av}}\theta + c_i + l_t + \epsilon_{i,t} \quad (2)$$

where $\mathbf{z} = \{FiscalCapacity, TradeTaxShare, IndirectTaxShare, \mathbf{x}\}$.

The av subscripts on the regressors indicate that they are 1914-1926 averages, while the regressions are run from 1927 to 1938.[21] Due to the presence of interactions, the marginal effect of the variables changes with the value of the variable with which the interaction occurs. For example, the marginal effect of $\Delta NGDP$ is now $E(\Delta Revenue | \Delta NGDP + 1, \mathbf{z}) - (\Delta Revenue | \Delta NGDP, \mathbf{z}) = \beta_1 + \mathbf{z}\theta$, where the vector $\mathbf{z}$ is held constant. The marginal effect of the element j of $\mathbf{z}$ is $E(\Delta Revenue | z_j + 1, \Delta NGDP) - E(\Delta Revenue | z_j, \Delta NGDP) = \phi_j + \theta_j \Delta NGDP$, where this time $\Delta NGDP$ is held constant. I offer intuitive illustrations of the magnitude of the results in Section 6.6.

5.2 Interpreting the fiscal capacity coefficients

The main coefficients of interest in the analysis illustrate the reduced form relationship between fiscal capacity (interacted with changes in NGDP or not) and changes in tax revenues and government financing. The underlying hypothesis is that fiscal capacity will affect the extent to which revenues change following shocks to economic activity. In the interwar context, it is sensible to interpret annual changes in public revenues as a combination of three factors: 1) automatic reactions to changes in output (i.e. the elasticity), 2) changes in fiscal policy; 3) a general positive trend in public revenues (to the extent that this does not get filtered out by first differencing). The first two elements depend directly on changes in economic activity, so that:

$$\Delta Revenue = \Delta NGDP \times \{Elasticity + PolicyReaction\} + Trend$$

A distinction can be drawn between the two outcome variable of the analysis. In the case of tax revenues, for policy reactions to play an important role one would need to assume that fiscal policy in the interwar period responded in a systematic way and with no lag to economic conditions. Based on what we know, this is not realistic. Fiscal policy was essentially not employed as a tool if not in an extremely limited way and in a handful of countries. Delay in budgetary processes and parliamentary approval would have made it very difficult for governments to change tax policy to respond contemporaneously to changes in economic conditions. Moreover, although the monitoring of economic activity made significant progress in some countries in the interwar era, this was still a relatively new and limited phenomenon, making it difficult for governments to respond in real time. In particular, the concept of GDP did not exist and it is

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[21]For some countries, observations before 1926 are limited, so the averages at times refer to 1 to 3 observations only. For robustness, I also run the model for a longer sub-period, 1921-38, using alternatively full sample averages (1914-38) and 5-year moving averages as regressors. The results are very similar.

thus difficult to fathom the existence of fiscal policies designed to respond to yearly changes in this variable.

In summary, it is implausible to assume systematic and contemporaneous policy reactions in terms of tax law changes to changes in economic activity in the interwar period. Therefore, the bulk of the variation in tax revenues should reflect the elasticity of tax revenues to changes in economic activity and the trend. In this scenario, fiscal capacity should affect tax revenues only to the extent that it captures the breadth of the tax base. Since I control for the structure of tax revenues, however, the expectation is that fiscal capacity should not affect the response of tax revenues to changes in output. This is indeed the case, as the results demonstrate.

When considering government financing, however, the role of policy reactions can no longer be ignored. This is because the amount a country borrows (a component of the financing variable) is a policy choice, which needs to be made however imperfect the information available to the policymaker might be. This choice can be further broken down into two components. One is the extent to which a country smoothes its revenues on average through borrowing in response to changes in economic activity, which depends on country specific factors, such as fiscal capacity. The other is discretionary changes in the preference for borrowing. The smoothing effect of fiscal capacity on government financing represents my quantity of interest, whereas the discretionary component, if unrelated to fiscal capacity or the other regressors, will simply end up in the error term without affecting the estimates. With the inclusion of an adequate set of controls, which account for countries' economic and political conditions, the model outlined above should be able to capture precisely the magnitude of interest. Indeed, the smoothing effect of fiscal capacity on financing emerges strongly and clearly throughout the whole analysis.

5.3 Reverse causality between changes in revenue and economic activity

Although estimating the relationship between changes in economic activity and revenue is the not the primary goal of this paper, it is nonetheless important to insure that reverse causality between economic activity and revenues does not mar the estimation. This is because the resulting bias might affect the other coefficients as well. Fortunately, there are substantial reasons to exclude dangers to inference.

First, for the reverse causality between economic activity and revenues to be a concern, one would have to assume that GDP in the interwar period responded in a systematic way and with no lag to changes in public revenues. Leaving aside the long-standing and so far inconclusive empirical and theoretical debates on the effects of fiscal policy on economic activity, there is no strong theoretical prior regarding the impact of an increase in revenue, narrowly or broadly defined, on GDP without regard to what is happening on the expenditure side. Changes in revenue alone tell us nothing about the stance of policy. The correlation between changes in my government financing variable and expenditure, albeit strong (0.624), is far below 1. As mentioned earlier, changes in expenditures were influenced by short term borrowing, which is excluded from my analysis. The correlation between changes in tax revenue and expenditure, instead, is low at 0.158.

Second, our knowledge of the Depression years indicates that changes in output were most likely little related to fiscal policy. As discussed above, in most cases fiscal policy was not used. In the few cases in which countries did run deficits, these were too small to be effective. (Almunia, Bénétrix, Eichengreen, O'Rourke, and Rua, 2010).

Third, while basic economic theory tells us that a higher tax burden will distort economic activity leading to lower output, the regression coefficients do not square with causality running from changes in revenue to changes in output in the interwar period. Whereas one would expect a negative correlation between changes in tax revenues and GDP, this is positive, and strongly so. Moreover, one would expect changes in government financing (which includes long term borrowing) to be more positively correlated with GDP than tax revenues, since more borrowing should lead to more public expenditure and higher output. However, I find the opposite: government financing is less strongly positively correlated with GDP than tax revenues. This indicates that causality ran from changes in economic activity to changes in tax revenues, which were then partially mitigated by non-tax revenues.

Despite this evidence, worries that changes in revenue could affect economic activity remain. As a final reassurance that my results are not affected by reverse causality, I run a robustness check in which I use a similar methodology to Ilzetzki and Vegh (2008): I instrument changes in output with average changes in the GDP of trading partners weighed by the pre-Depression share of exports going to that country. This exercise also serves to insure that potential non-linearities in the effect of changes in GDP in fiscal capacity do not affect the outcome variable directly, thus invalidating my IV strategy. By using this methodology, I can also employ expenditures directly as my outcome variable with fewer worries about reverse causality. I report the results of this exercise, which yields very similar results to the baseline analysis, in Appendix A.

5.4 IV strategy

The main empirical relationship of interest, that between changes in revenues and fiscal capacity, might also be affected by endogeneity. A plausible way in which this can operate is that countries with a higher revenue volatility might invest more in fiscal capacity in order to reduce it. In this case, the effect of fiscal capacity on changes in revenue would be biased towards zero.[22] Another potential source of endogeneity, of the opposite sign, is that a higher revenue volatility might make investments in fiscal capacity more difficult. Thus, the direction of potential bias is a priori unclear. In order to overcome this threat to causal inference, I employ an instrumental variable approach.

I use two variables to instrument fiscal capacity. The first is the number of years a country spent fighting major external conflicts between 1816 and 1913, as reconstructed by Dincecco and Prado (2012). The use of this variable follows a large literature linking armed conflicts, fiscal reforms and fiscal development. The second is a novel instrument which, I argue, captures a different mechanism of fiscal capacity formation. The variable is the number of natural disasters to hit a country between 1900 and 1990.

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[22]The issue of the potential co-determinateness of economic volatility and government size arises also in other contexts, as demonstrated by Rodrik (1998)'s study on the effect of openness on government size.

Figure 4 illustrates the unconditional correlation between the instruments and my two fiscal capacity indicators. This is positive for the conflict variable (panels 4a and 4b) even if the United Kingdom, an outlier with significant leverage, is excluded. The correlation is negative for the disasters variable (panels 4c and 4d) even if the two outliers (Japan and the USA) are excluded. The analysis shows that both variables represent relevant instruments for fiscal capacity from a statistical perspective when used alone and in conjunction. Directly below, I outline why the instruments are relevant and valid from an economic perspective, starting with the conflicts instrument and proceeding with the disasters one.

(a) Tax Revenues/NGDP

(b) Income Tax Revenues/NGDP

(c) Tax Revenues/NGDP

(d) Income Tax Revenues/NGDP
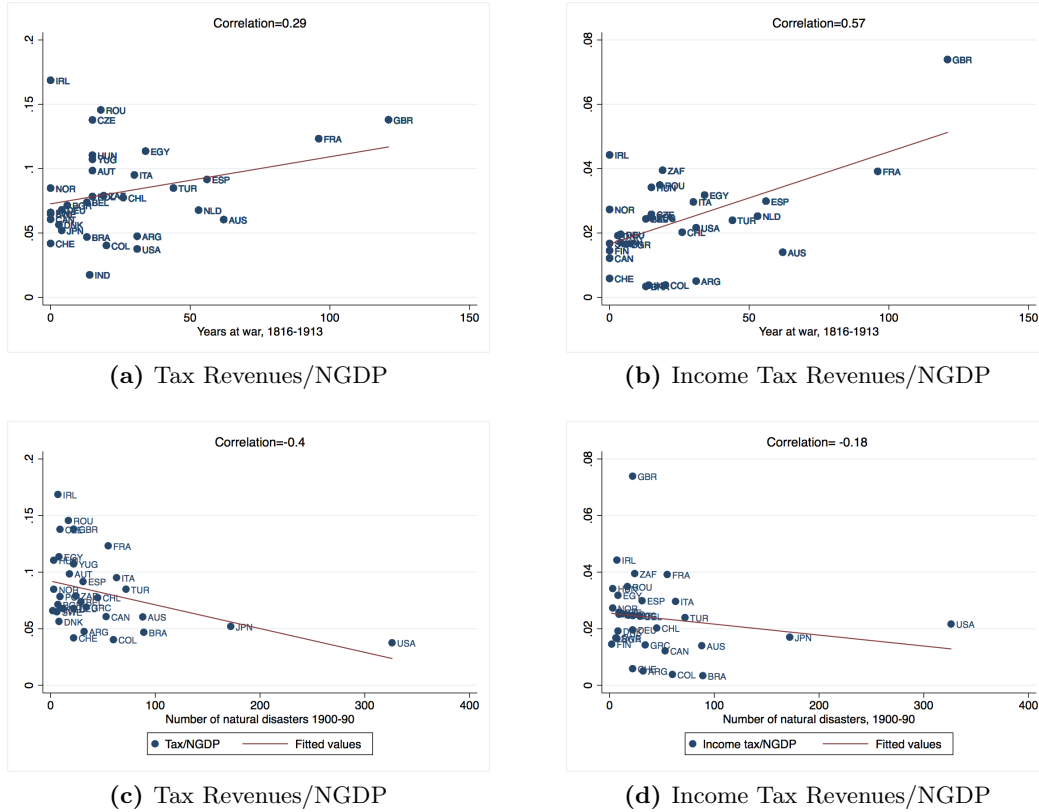
Figure 4: Fiscal capacity, the incidence of external conflict and natural disasters

Source: The years at war data is from Dincecco and Prado (2012), the natural disasters data is from the EM-DAT dataset of the Centre for the Epidemiology of Disasters (CRED, 2017), the GDP data is from Klasing and Milionis (2014), for the historical tax revenue data see the text and Appendix B for details.

5.4.1 The warfare instrument

In their work, Dincecco and Prado (2012) use the incidence of major past external conflicts – more likely to have led to substantial and lasting fiscal reforms compared to small conflicts – as an instrument for contemporary fiscal capacity in order to quantify its effect on long-term development. The authors construct their instruments from Clodfelter (2002)'s database of major external conflicts in Europe, Africa, the Middle East, Asia and Oceania between 1500 and 2000. Their preferred instrument is the number of casualties due to major external conflicts

between 1816 and 1913 normalized by country size, while their fiscal capacity indicator of choice is the share of direct taxes in total tax revenue. My instrument of choice, instead, is one they construct for robustness: the number of years a country spent at war between 1816 and 1913.[23] I choose this variable over the casualties indicator because of its stronger correlation with my fiscal capacity indicators. The casualties variables, instead, is very weakly related to these.

For the warfare instrument to be relevant, different degrees of engagement in external conflicts between 1816 and 1913 need to have led to the accumulation of different degrees of fiscal capacity, which then persisted at least until the interwar period. For the instrument to be valid three conditions need to be met, conditional on controls: 1) the incidence of conflicts between 1816 and 1913 had no effect on changes in government revenues between 1927 and 1938 except through its effect on interwar fiscal capacity; 2) changes in revenues in 1927-38 had no effect on the incidence of conflicts in 1816-1913; 3) there is no reverse causality between fiscal capacity and warfare. A violation of the first condition could occur if, for example, a higher incidence of external conflicts raised the probability of a country gaining (losing) access to a revenue source that was more (less) volatile than its existing tax base. This could be a territory, a port, or a tradable natural resource. The second condition could be violated if the volatility of revenues in 1927-38 was correlated through persistence to the volatility of revenues in 1816-1913 and this in turn influenced the probability of fighting wars in this period. Finally, and more worryingly, the exclusion restriction would be violated if fiscal capacity drove the decision to engage in conflicts rather than vice versa.

Based on a large body of research by historians, economic historians and other scholars, Dincecco and Prado argue that "war participation drove fiscal capacity improvements, but that capacity constraints themselves did not significantly influence whether rulers went to war." (page 175). Indeed the work of authors such as Brewer (1990), Tilly (1975, 1990), Hoffman and Rosenthal (1997), O'Brien (2011), Dincecco, Federico, and Vidigni (2011) and Hoffman (2015) indicates that in the early modern and modern period the incidence (and threat) of war stimulated fiscal reforms and other innovations to increase fiscal capacity, particularly in Europe.[24] From a theoretical perspective, Besley and Persson (2010) conceptualize the warfare-state formation nexus by arguing that war leads to an exogenous increase in the demand for a public good – defense – which needs to be financed through taxation. The increase in fiscal capacity due to war, is then maintained and amplified because of the dynamic interactions between fiscal capacity, legal capacity and development.[25]

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[23]This variable can exceed 97 if countries are involved in more than one conflict in a given year.

[24]Dincecco and Prado make an important distinction between external and internal conflicts. While the latter contribute to the strengthening of fiscal and state capacity, the former can severely damage it. See also Besley and Persson (2010) on this point.

[25]Dincecco and Prado illustrate two further channels through which increases in fiscal capacity might persist after the end of conflicts. First, after the creation of strong and centralized fiscal institutions due to wars "the new executives inherit strong fiscal institutions, they may wish to exploit them for their own purposes rather than cede authority back to traditional elites." Second, the changing nature of warfare in the 19th century may have led to the elites conceding an increase in the resources made available for taxation in a bargain with the rulers. Once these changes were implemented, the new taxes might have been redirected towards public services valued by the elites, rather than the taxation being rolled back to pre-war levels. Alesina, Reich, and Riboni (2017) offer a complementary perspective by arguing that warfare can shift public expenditure towards public

Recent empirical evidence supports the existence of a link between warfare and the development of fiscal capacity although this might not always persist (Sabaté, 2016), lead to development of general interest states (Dincecco, Fenske, and Onorato, 2016), or be as strong outside of European countries (see Centeno (1997, 2002); Gupta, Ma, and Roy (2016) and references in Dincecco (2015), page 909-11). Additionally, the ability to rely on borrowing to finance wars undermined the impact of warfare on fiscal capacity development, since countries could default on their debts after the end of conflicts instead of increasing tax revenues (Queralt, 2017). Furthermore, countries that faced less political resistance to increases in taxation would have been able to raise more tax revenues for any given incidence of external conflicts (O'Brien, 2011; Hoffman, 2015). These qualifications highlight the importance of the context in which conflicts took place, but they are not inconsistent with the causality running from conflict to capacity; they simply imply that the effects of warfare were not homogeneous across countries and time due to other factors also playing a role.

Gennaioli and Voth (2015), however, build a theoretical model that incorporates the idea that causality might also run from fiscal and state capacity to conflict. Their key insight is that the threat of war after the Military Revolution, which made monetary resources more important in conflicts, led to cohesive states investing in state building in order to fight wars, while divided ones dropped out of the competition. Thus, they argue, conflict might not necessarily lead to the accumulation of fiscal capacity. It is the underlying characteristics of countries that make these investments possible in the first place.

The panel framework of my analysis allows me to dispel many of these worries. By using fixed effects, I control for structural differences across countries and for pre-1927 historical events. Thus, the inclusion of fixed effects drastically reduces the possibility that the incidence of pre-1913 conflicts could influence the magnitude of revenue changes post-1926 through channels other than fiscal capacity. The only way in which the exclusion restriction might still be violated is that a transformation in the nature of pre-1927 circumstances took place in the 12 years between 1927 and 1938 (this circumstances would have to have been caused by pre-1913 conflicts); this would, in turn, need to have an effect on the volatility of post-1927 revenues. This instance cannot be ruled out, but appears very unlikely given the short time span considered. Also, I am not aware of any study which claims such an instance. Furthermore, the inclusion of fixed effects also guarantees that pre-1913 fiscal capacity and revenue volatility are all controlled for in the regressions, since these are time-invarying country characteristics from the vantage of point of the period studied in this paper. This accounts for the potential bias coming from correlations between past capacity, past revenue volatility, past conflicts and current changes in revenues.

The over-identifying tests conducted below, thanks to the combined use of historical conflicts and natural disasters, further help dispel worries that warfare might not be a valid instrument.

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goods during times of war in order to foster support in the population. More precisely, the authors argue that states will attempt to modify the degree of political resistance in the population by employing positive and/or negative nationalisms. The former is tied to creating a national identity and a common language through the provision of public goods. The latter consists of aggressive negative propaganda towards to opponent and is the go-to option when the capacity to provide mass public goods is absent.

These tests, however, are only valid conditional on the natural disasters variable being a relevant and valid instrument. I now turn to arguing that this is the case.

5.4.2 The disasters instrument

I argue that the incidence of natural disasters can negatively affect the creation of centralized revenue raising institutions. Moreover, I argue that this effect also applies to countries outside of Europe. Thus, apart from helping dispel worries of reverse causality between conflicts and fiscal capacity outlined above, introducing an additional instrument with a broader scope presents advantages also from this point of view.

Table 3 offers an overview of all disasters for my sample of countries and time period contained in the EM-DAT Database of the Centre for the Epidemiology of Disasters at the Université Catholique de Louvain (CRED, 2017). For an event to qualify as a disaster at least one of these conditions needs to be met: 1) ≥ 10 casualties, 2) ≥ 100 people affected, 3) declaration of a state of emergency, 4) call for international assistance. This broad definition means that the data includes natural disasters of very different magnitudes. This is reflected by the number of deaths due to the disasters, which varies between 0 and millions for a single incident.

The starting point of the data is 1900 because no information is available before this date. I pick 1990 as the endpoint of my data because in recent years there has been an increase in natural disasters potentially linked to global warming and exposure hazard due to population growth, and thus unrelated to the historical data generating process (Strömberg, 2007). However, results are robust to using a longer period (1900-2015) or ending the sample in 1926, one year before the starting point of my analysis, in order to avoid a direct relationship between disasters and yearly changes in revenue.[26]

Natural disasters can affect fiscal capacity in two ways. First, when resources have to be deployed towards disaster relief, all else equal, fewer resources can be dedicated to fiscal development. As Besley and Persson (2010) argue, countries need to invest in order to create and strengthen fiscal institutions, and large scale disasters can drain substantial resources, delaying or impeding these investments altogether. [27]

Two objections can be raised against this argument. The first is that war, much like disaster relief, drains resources away from public investments; however, the historiography and this paper argue that armed conflicts can lead to the accumulation of fiscal capacity. Why should the effect of natural disasters be the opposite? A rebuttal for the first objection is that the accumulation of fiscal capacity is a long-run phenomenon. In the short-run, conflicts, like disasters, might have led to investment diversion, but in the long term they led to fiscal capacity accumulation by

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[26]The reporting of historical disasters is clearly not as complete as that of more recent episodes. In particular, small-scale disasters in countries outside of Western Europe and North America are potentially under-reported in the dataset. This measurement error could bias my results indirectly through its effect on the strength of the instrument. Standard tests, however, suggest that the instrument is strong enough to limit this potential source of bias within reasonable bounds.

[27]The devastating flood which affected around 20% of China's provinces in 1823 offers an example of this: the Qing administration devoted around half of its small (relative to the size of the economy) annual budget to disaster relief and this severely slowed down long-term investments in the provision of public goods, such as defense and infrastructure (Yuping and Uebele, 2015).

Table 3: Natural disasters by country, 1900-90

Country	Number of disasters	Total deaths	Deaths per incident	Country name	Number of disasters	Total deaths	Deaths per incident
Argentina	32	11079	346	Ireland	7	23	3
Australia	88	1260	14	Italy	63	119533	1897
Austria	18	322	18	Japan	172	216647	1260
Belgium	29	111	4	Netherlands	12	2020	168
Bolivia	24	568	24	New Zealand	32	7210	225
Brazil	89	8568	96	Norway	3	73	24
Bulgaria	7	142	20	Peru	75	81258	1083
Canada	53	51671	975	Poland	9	82	9
Chile	45	60136	1336	Romania	17	3911	230
Colombia	60	28615	477	South Africa	24	906	38
Czechoslovakia	9	24	3	Spain	31	1771	57
Denmark	8	12	2	Sweden	6	24	4
Egypt	8	10406	1301	Switzerland	22	251	11
Finland	2	0	0	Turkey	72	71159	988
France	55	676	12	United Kingdom	22	415	19
Germany	22	64	3	USA	326	34325	105
Greece	34	2055	60	Uruguay	2	8	4
Hungary	3	304	101	Venezuela	19	771	41
Yugoslavia	22	1432	65				

Source: EM-DAT Database of the Centre for the Epidemiology of Disasters (CRED, 2017).

making fiscal reforms easier. Given that my disasters variable overlaps with my fiscal capacity indicators, whereas the conflict data precedes the observation period, the argument has potential traction. However, it is ultimately unconvincing because the historical incidence of natural disasters is correlated with a lower fiscal capacity also nowadays.[28]

The second objection is that most disasters in my sample were not large enough to cause a significant displacement of resources. For over half of the countries, the average death toll of each disasters was below 100 people. For the period 1900-26, more than two-thirds of the total death toll is accounted for by just three epidemics in India, and over half of the disasters led to under 500 casualties, while the mean population size of the countries in the sample was over 20 million. The second channel I propose addresses all these concerns and also offers a robust and intuitive mechanism through which disasters affect fiscal capacity.

The argument goes as follows. First, certain geographic features of countries make them more or less prone to experience natural disasters. More precisely, the interaction between land size and the presence of volcanoes, the proclivity for seismic activity, the vulnerability to storms and floods, etc. will determine the number of disasters to a hit a country. Second, most natural disasters are small scale events affecting limited areas of a country and shares of the population. Third, this means that localized relief might be better suited – for example because of local level specialization in areas vulnerable to specific types of disasters – and quicker to reach the affected area compared to centrally financed and coordinated efforts. Local governments might also be held more easily accountable by citizens with regard to the provision of relief. Moreover,

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[28]Interestingly, Dincecco and Prado's preferred fiscal capacity indicator, the share of direct taxes in total tax revenue, is positively associated with historical disasters (but not long-run disaster proclivity) both today and in the interwar period, which once again highlights the different informational content of different fiscal capacity indicators.

even large scale disaster relief undertaken by central governments relies on local level monitoring and infrastructure in order to be timely and effective, as evidenced by India's famines (Drezè and Sen, 1989; Besley and Burgess, 2002).[29] Fourth, the need to finance local level disaster relief will stimulate the accumulation of local-level fiscal capacity. Indeed, there is a positive and statistically significant correlation between the number of natural disasters and the share of taxes raised at the sub-national level in the 1914-38 period.[30] Fifth, the local nature of disasters, of relief and of the institutions created to deal with them will make the centralization of fiscal resources more difficult in disaster-prone countries, leading to the observed negative relationship between disasters and fiscal capacity.

The reasoning can also be applied from the standpoint of the citizens of areas of a country unaffected by natural disasters. These might be less willing to mutualize resources through the central government, since part of these would fund a pubic good – disaster relief – that only benefits the citizens of the affected area and is very likely characterized by low spillovers. Under these conditions – heterogeneous preferences over public goods and low spillovers – decentralized political systems outperform centralized systems, a result know as the Decentralization Theorem (Oates, 1972; Besley and Coate, 2003). As above, this reasoning applies to recurring disasters due to a region's geographical characteristics, which make it more vulnerable to certain types of events, rather than to idiosyncratic occurrences of disasters.

An obvious rebuttal of this argument is the possibility of reverse causality: countries might experience fewer natural disasters thanks to better infrastructure and other means of disaster prevention made possible by a higher level of fiscal capacity. However, the consensus in the literature appears to be that "good institutions", and economic development more generally, strongly affect the severity of the consequences of disasters, but not their frequency (Kahn, 2005; Strömberg, 2007; Lin, 2015). In other words, disasters are indeed *natural*, in the sense that they are caused by geographical features, but there is ample scope for policies to reduce the number of people they affect and the material damage they cause.

A further potential problem with the disasters instrument is that a lower fiscal capacity might simply reflect lower tax revenues because of the direct incidence of disasters on the tax base. However, this would mean that the effect of disasters on the tax base is not captured by changes in output, which is the denominator of my fiscal capacity indicators. This is possible, but very unlikely, particularly for the income taxes capacity indicator, given that nominal GDP is precisely a measure of income. Moreover, by analyzing a century of disasters data in the US, Boustan, Kahn, Rhode, and Yanguas (2017) show that only major disasters tend to have significant economic repercussions. Finally, I find absolutely no direct relationship between the incidence of disasters and revenue volatility in my data.

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[29]In the case of large disasters, countries might also expect to be able to draw on international assistance, as was common also in the pre-WWII era, leading to the need to accumulate less fiscal capacity to provide relief.

[30]These are Austria, Belgium, Bulgaria, Switzerland, Germany, Denmark, France, UK, Hungary, Italy, Latvia, the Netherlands, Norway, Poland, Sweden, USA. The data furthermore features a positive correlation between disasters and the share of income taxes in total tax revenue. This is also compatible with the idea that disasters might stimulate the creation of local level capacity, making it easier for local governments to raise direct taxes. This, in turn, may also open the way for centralized direct taxation, but not high overall levels of taxation.

6 Results

6.1 Revenue elasticity

Table 4 illustrates the elasticity of tax revenues and government financing to changes in nominal GDP for 1927-38. The first two columns feature OLS estimations for tax revenues and government financing, while columns 3 and 4 contain the within (FE) estimations and columns 5 and 6 present first differences (FD) results. As expected, fiscal aggregates and nominal GDP strongly co-move. The key result of the exercise, however, is that the coefficient is close to 1 when tax revenues are considered, but becomes around half of that when government financing is the outcome variable. These results indicate the existence of a strong smoothing effect of non-tax revenues.[31]

The rest of the analysis in this section shows that this smoothing effect is due to the degree of fiscal capacity countries possessed at the eve of the Great Depression. In Section 7, I dig deeper into the channels, showing that fiscal capacity granted an easier access to borrowing to more fiscally capable countries.

Table 4: The elasticity of tax revenues and government financing to changes in output

VARIABLES	(1) OLS ΔTaxRevenue	(2) OLS ΔGovtFinancing	(3) FE ΔTaxRevenue	(4) FE ΔGovtFinancing	(5) FD ΔTaxRevenue	(6) FD ΔGovtFinancing
ΔNGDP	0.932***	0.565***	1.017***	0.620***	0.877**	0.495***
	(0.239)	(0.118)	(0.357)	(0.133)	(0.358)	(0.164)
Constant	0.0443	0.0301***	0.0443***	0.0302***	0.00321	-0.00314
	(0.0280)	(0.00942)	(0.000156)	(5.84e-05)	(0.0457)	(0.0137)
Country FE			✓	✓	✓	✓
Observations	231	231	231	231	193	193
Number of countries	31	31	31	31	31	31
R^2	0.033	0.101	0.038	0.101	0.012	0.044

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Time frame: 1927-38. Countries included are: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Netherlands, Norway, Poland, Romania, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, the United States of America and Yugoslavia. All changes (Δ) are percentage changes.

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[31] In the table, I only use observations for which both financing and tax revenues data are available, so the result is not due to differences in the composition of the financing and tax revenues samples. I have repeated the exercise for 1927-38 and for an extended time period (1920-38) using all observations available and obtained remarkably similar results (see Appendix A). This indicates that the smoothing role of non-tax revenues was present throughout the whole interwar period.

6.2   OLS results

I continue the analysis by adopting the interaction model described by equation 2 and by introducing the main variables of interest – the two fiscal capacity indicators – alongside the controls. These are: the Polity 2 score from the POLITY IV database (Marshall and Jaggers, 2005), to capture potential differences between more or less democratic countries; GDP per capita (GDPPC) from the Maddison Project database (Bolt and van Zanden, 2013), to capture differences between more and less economically developed countries; openness to trade as provided by Klasing and Milionis (2014), which accounts for the degree of vulnerability to external shocks and the potential positive relationship between openness and government size (Rodrik, 1998; Epifani and Gancia, 2009). These controls are extremely important because the level of democracy, economic development and trade openness are likely correlated with both fiscal development and changes in revenue. I also control for the structure of tax revenues. This is important in order to identify the causal effect of fiscal capacity and separate it from the mechanical response of changes of various tax revenues to changers in income. As discussed above, I enter all these variables as 1914-26 averages. I have experimented by adding other controls – such as gold standard membership, and the terms of trade – finding practically identical results throughout the analysis.

Table 5 reports the pooled OLS estimation results. While these estimates clearly suffer from two potential sources of bias – omitted variables and reverse causality – which rule out any causal interpretation of the coefficients, they illustrate some informative correlations. Coherently with the interpretation of the elasticity results outlined above, once I introduce the fiscal capacity indicators and the controls in the regressions, the responsiveness of government financing and of tax revenues to changes in economic activity become very similar. This strongly suggests that the variables in the regressions capture the lion's share of the smoothing effect of non-tax government revenues.

In all specifications, the interaction term between the fiscal capacity measure and NGDP comes out as strongly significant and negative. This indicates a countercyclical and non-linear association between fiscal capacity and changes in both tax revenues and government financing in the size of the shock to NGDP. However, the latter is substantially larger than the former. While the rest of the analysis confirms the finding for government financing, the one for tax revenues is not robust, suggesting, once again, that the smoothing effect of fiscal capacity took place via non-tax revenues.

6.3   Fixed effects results

An important step towards a causal interpretation of the results is to include country fixed-effects in the regressions. As discussed above, these account for the myriad of potentially important time-invariying and slow-moving country characteristics both observable and not. Examples include geography, demographic and economic structure and the presence of natural resources. I also include time fixed-effects to account for common shocks across countries.

Table 6 and Table 7 present the results of the panel estimations for tax revenues and gov-

Table 5: Pooled OLS estimation for tax revenues and government financing

VARIABLES	(1) ΔTaxRevenue	(2) ΔTaxRevenue	(3) ΔGovtFinancing	(4) ΔGovtFinancing
ΔNGDP	2.813***	3.226***	3.314***	3.638***
	(0.693)	(0.609)	(0.678)	(1.010)
Tax/NGDP	-0.296		-0.672**	
	(0.265)		(0.262)	
ΔNGDP*Tax/NGDP	-11.64**		-20.40***	
	(4.789)		(4.179)	
IncomeTax/NGDP		-0.650		-1.102**
		(0.643)		(0.436)
ΔNGDP*IncomeTax/NGDP		-28.54***		-43.42**
		(6.822)		(16.34)
Constant	-0.0142	0.00641	0.114***	0.120***
	(0.0429)	(0.0472)	(0.0348)	(0.0375)
Additional controls				
Polity2	✓	✓	✓	✓
GDPPC	✓	✓	✓	✓
Openness	✓	✓	✓	✓
TradeTaxShare	✓	✓	✓	✓
IndirectTaxShare	✓	✓	✓	✓
ΔNGDP*Controls	✓	✓	✓	✓
Observations	208	208	219	219
R^2	0.336	0.335	0.190	0.172

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Time frame: 1927-38. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes.

ernment financing respectively. In both tables, columns 1 and 2 provide the FE estimates and columns 3 and 4 feature the FD results. Both estimators require time-invariant regressors to be dropped. Columns 5 and 6 present the results of the HT (Hausman and Taylor, 1981) estimator, which allows me to recover the coefficients of time-invariant regressors even in the presence of fixed effects.

The panel results for tax revenues only partially confirm the OLS findings. Whereas the results for the within (FE) and Hausman taylor (HT) estimator are practically identical to the estimation without fixed effects, the first difference (FD) coefficients for the fiscal capacity indicators – Tax/NGDP and IncomeTax/NGDP – are drastically smaller and statistically insignificant. Importantly, unlike FE and HT, the FD estimator does not require strict exogeneity and therefore allows for feedback loops between the error term and the regressors, if these take more than one period to operate, without leading to bias. This makes inference based on FD substantially more robust than that based on FE. It follows that we cannot conclude that fiscal capacity had any smoothing effect on tax revenues. This is confirmed by the IV analysis.

The results for government financing, instead, are strong and clear cut. The interaction

Table 6: Panel estimation for tax revenues

VARIABLES	(1) FE ΔTaxRevenue	(2) FE ΔTaxRevenue	(3) FD ΔTaxRevenue	(4) FD ΔTaxRevenue	(5) HT ΔTaxRevenue	(6) HT ΔTaxRevenue
ΔNGDP	2.427**	2.943***	-0.929	-0.305	2.252***	2.858***
	(0.877)	(0.758)	(1.648)	(1.769)	(0.800)	(0.693)
Tax/NGDP					-0.398	
					(0.272)	
ΔNGDP*Tax/NGDP	-11.00*		-0.763		-10.10*	
	(6.194)		(10.70)		(5.696)	
IncomeTax/NGDP						-0.783
						(0.640)
ΔNGDP*IncomeTax/NGDP		-29.19***		-11.23		-28.64***
		(9.170)		(23.27)		(8.827)
Constant	0.152***	0.154***	-0.00836	-0.00779	-0.0710	-0.0555
	(0.0464)	(0.0463)	(0.0568)	(0.0563)	(0.0479)	(0.0544)

Additional controls						
Polity2					✓	✓
GDPPC					✓	✓
Openness					✓	✓
TradeTaxShare					✓	✓
IndirectTaxShare					✓	✓
ΔNGDP*Controls	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Observations	208	208	184	184	208	208
Number of countries	23	23	23	23	23	23
R^2	0.379	0.383	0.124	0.126		

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Time frame: 1927-38. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes.

term between the fiscal capacity indicators and changes in GDP is large, statistically significant, negative and generally close to the pooled OLS estimates (the exception being the FD coefficient on the IncomeTax/NGDP indicator, which is somewhat smaller). The statistically significant negative coefficients of the non-interacted fiscal capacity indicators obtained with the HT estimator further suggest that the interaction term coefficients represent a lower bound of the smoothing effect of fiscal capacity on government financing. The non-linearity of the effect of fiscal capacity in the size of the NGDP shock is also evident: the smoothing effect of fiscal capacity increases as the size of the output shock increases. In summary, the countercyclical effect of fiscal capacity on government financing is clearly visible and very sizable.

Table 7: Panel estimation for government financing

VARIABLES	(1) FE ΔGovtFinancing	(2) FE ΔGovtFinancing	(3) FD ΔGovtFinancing	(4) FD ΔGovtFinancing	(5) HT ΔGovtFinancing	(6) HT ΔGovtFinancing
ΔNGDP	3.169***	3.657***	2.649***	2.802***	3.030***	3.549***
	(0.786)	(0.986)	(0.687)	(0.768)	(0.796)	(1.037)
Tax/NGDP					-0.592**	
					(0.252)	
ΔNGDP*Tax/NGDP	-17.31***		-14.07***		-17.80***	
	(3.350)		(2.603)		(3.576)	
IncomeTax/NGDP						-1.076**
						(0.499)
ΔNGDP*IncomeTax/NGDP		-40.50***		-27.86***		-41.94***
		(13.70)		(6.999)		(14.71)
Constant	0.147***	0.154***	0.0548	0.0577	0.0639	0.0688
	(0.0293)	(0.0297)	(0.0432)	(0.0429)	(0.0487)	(0.0557)
Additional controls						
Polity2					✓	✓
GDPPC					✓	✓
Openness					✓	✓
TradeTaxShare					✓	✓
IndirectTaxShare					✓	✓
ΔNGDP*Controls	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Observations	219	219	210	210	219	219
Number of countries	23	23	23	23	23	23
R^2	0.253	0.249	0.118	0.115		

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Time frame: 1927-28. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes.

6.4 Asymmetry between recessions and expansions

A natural question that arises from the results of the analysis so far is whether the impact of fiscal capacity on the smoothing of government financing was the same in recessions and expansions. Due to the relatively small number of observations, splitting the sample is potentially problematic. However, this exercise is important in order to investigate the role of fiscal capacity in smoothing government financing when this is most needed, namely during recessions.

I define a recession year as one in which the growth in real GDP per capita was zero or negative, and an expansion year as a one with positive growth. I then let all coefficients vary between recession and expansion years and present the results in Table 8. In three specifications out of four, the analysis indicates that the smoothing effect was stronger in recession than expansion years. In column one, which employs the FE estimator and the Tax/NGDP fiscal

capacity indicator, for example, the negative coefficient on the interaction between the fiscal capacity indicator and changes in GDP is larger and more precisely estimated for recession years. The same is true in columns 2 and 4, where I employ the IncomeTax/NGDP fiscal capacity indicator and the FE and FD estimators respectively. The only specification in which the result is reversed and the smoothing effect appears to be stronger and more precisely estimated in expansion years is column 3, in which I use the Tax/NGDP indicator and the FD estimator. The reason behind this not completely robust result is probably the small size of the split sample. In any case, the evidence points more strongly to the smoothing affect being stronger in recession years. This suggests that fiscally weak countries were unable to counter the collapse in government financing when they needed it most.

Table 8: Recessions vs expansions

	(1)	(2)	(3)	(4)
	FE	FE	FD	FD
VARIABLES	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing
		Panel A: *Expansions*		
ΔNGDP	3.048	2.220	2.409	1.612
	(1.882)	(1.712)	(1.570)	(1.544)
ΔNGDP*Tax/NGDP	-16.92*		-15.52*	
	(9.542)		(7.723)	
ΔNGDP*IncomeTax/NGDP		-19.57		-17.05
		(13.86)		(15.13)
		Panel B: *Recessions*		
ΔNGDP	2.721	4.622**	1.391	2.750
	(1.716)	(1.669)	(1.543)	(1.627)
ΔNGDP*Tax/NGDP	-18.25**		-4.158	
	(7.488)		(8.588)	
ΔNGDP*IncomeTax/NGDP		-66.68***		-31.07*
		(19.75)		(17.58)
		Additional controls		
Constant	✓	✓	✓	✓
ΔNGDP*Controls	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Observations	219	219	210	210
Number of countries	23	23	23	23
R^2	0.267	0.266	0.131	0.127
		Robust standard errors in parentheses		
		*** p<0.01, ** p<0.05, * p<0.1		

Time frame: 1927-38. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes. A year is defined as a recession year if $\Delta GDPPerCapita \leq 0$.

6.5 IV Results

Table 9 and Table 10 feature the panel IV results for tax revenues and government financing respectively. I run the regressions employing the instruments both one at a time and in conjunction. In both Tables, columns 1-4 present the FE and FD estimates using the warfare instrument, columns 5-8 contain the results for the natural disasters instrument and columns

9-12 feature the instruments used in conjunction.[32] In the two-instrument set-up, I use the Fuller-k estimator, rather than 2SLS, because of its greater robustness in the presence of weak instruments and the inclusion of multiple instruments (Stock, Wright, and Yogo, 2002; Stock and Yogo, 2005).[33]

The critical F-stat values for robust estimation for the Fuller-k estimator with two instruments for a maximal 5% and 10% bias over OLS are 15.5 and 12.55 respectively (Stock and Yogo, 2005). These are met for Tax/NGDP, but weak instruments are a potential issue for the estimations using the IncomeTax/NGDP fiscal capacity indicator. However, the fact that these results are very similar to the non-instrumented results is very reassuring.

Table 9 illustrates the usefulness of the IV approach: the coefficients of the interacted fiscal capacity indicators are smaller than in the standard panel framework, and statistically indistinguishable from zero in all specifications except one (FE using natural disasters as instrument). When I use the instruments in conjunction and the more robust FD estimator, the coefficients even turn positive (albeit still insignificant). In any case, the general conclusion is that no robust causal impact of fiscal capacity on tax revenues emerges from the analysis. This indicates that the IV approach might be correcting a source of bias that links a high tax procyclicality to low fiscal capacity. A compelling possibility is reverse causality: high tax revenue volatility might have made investments in fiscal capacity more difficult.

The results in Table 10, instead, are clear-cut, large and highly statistically significant. In the interwar period, fiscal capacity had a strong smoothing effect on government financing, and this was evidently due to non-tax revenues. Moreover, this effect was highly non-linear and increased in magnitude with the size of the economic shock. As I will show below, borrowing is likely to have played the dominant role in determining this effect.

Three further robust results emerge from the estimation. First, countries with a higher per capita GDP were able to smooth their government financing more effectively than lower income countries. Second, countries with more democratic institutions were subject to a higher volatility in government financing. Third, countries more open to trade smoothed their financing more. Exploring these results further is beyond the scope of this paper, but one can reasonably speculate that richer countries found it easier to borrow on financial markets and thus smooth their revenues, as also confirmed by the analysis in Section 7. More democratic countries, instead, might have found it more challenging to borrow because of the political constraints and

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[32]In the IV estimations, I use 1914-38 averages as fiscal capacity, rather than the 1914-26 averages used above, in order to decrease concerns over bias due to weak instruments. The 1914-38 averages have a higher correlation with the instruments which, incidentally, also supports the idea that fiscal capacity develops gradually over time. Given that I use instrumental variables, the simultaneity between changes in revenues and capacity which was concern in the estimations above is no longer an issue. This is as also confirmed by the fact that the estimates are practically identical qualitatively and quantitatively when the 1914-26 indicators are employed instead.

[33]The Fuller-k, estimator is inconsistent in the presence of heteroskedasticity and many instruments (Hausman, Lewis, Menzel, and Newey, 2011), and although the many instruments condition is not met in this application, I perform robustness checks with both the two stage least squares (2SLS) and Continuously Updated Generalized Method of Moments estimators (CUE). The latter, in particular, is consistent when errors are non-normal in the presence of many instruments. Both estimators yield very similar results to the Fuller-k. When the equation is exactly identified (one instrument and one endogenous regressor), all these estimators are equivalent.

delays involved in a parliamentary budgeting process.[34] In the interwar context, less democratic countries might have also found it easier to engage in financial repression, with the aim of channeling resources towards government borrowing. This was notoriously the case in Nazi Germany, for example (Poole, 1939; Childs, 1958).

The third result is more puzzling. Intuition would suggest that more open countries should be more vulnerable to external shocks and thus more volatile, particularly during the Depression, which was characterized by a huge contraction in world trade. Rodrik (1998) argues that, for this reason, countries will increase the size of their government as a form of self insurance. However, I am controlling for government size, as well as other potential channels behind this effect, like the level of economic development or the degree of reliance on trade taxes. Therefore the channel through which openness is so stronlgy correlated with the cyclical volatility of government financing is, at this stage, unclear. The crucial point, however, is that the effects of fiscal capacity, economic development, democratic institutions and openness on the smoothing of government financing can all be identified separately, suggesting different underlying mechanisms.

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[34]Empirical evidence on the link between democracy and fiscal policy procyclicality is mixed. By analyzing OECD countries, Lane (2003) finds a positive link between the dispersion of political power and fiscal policy procyclicality, but evidence from a country transitioning from autocracy to democracy – Spain – demonstrates that the relationship between democratic institutions and the cyclicality of policy is potentially more intricate (Battilossi, Escario, and Foreman-Peck, 2013).

Table 9: Panel IV estimation for tax revenues

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	FE	FE	FD	FD	FE	FE	FD	FD	FE	FE	FD	FD
VARIABLES	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue	ΔTaxRevenue
					Panel A: Second Stage							
ΔNGDP	1.683	1.776	-0.917	-1.076	2.926***	3.396***	1.126	1.445	2.146**	2.281**	-0.350	-0.446
	(1.055)	(1.119)	(1.390)	(1.676)	(0.682)	(0.750)	(0.980)	(0.901)	(0.837)	(0.888)	(1.238)	(1.455)
ΔNGDP*Tax/NGDP	-4.929		6.402		-15.45***		-10.22		-8.843		1.788	
	(7.831)		(10.93)		(4.379)		(7.374)		(5.819)		(9.662)	
ΔNGDP*IncomeTax/NGDP		-10.07		13.57		-34.23***		-22.61		-17.61		4.536
		(14.58)		(25.26)		(10.60)		(14.18)		(10.73)		(21.57)
Constant			0.0683**	0.0710*			0.0555	0.0507			0.0647*	0.0659*
			(0.0342)	(0.0364)			(0.0422)	(0.0442)			(0.0361)	(0.0381)
					Additional controls							
ΔNGDP*Polity2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*GDPPC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*Openness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*TradeTaxShare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*IndirectTaxShare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	208	208	184	184	208	208	184	184	208	208	184	184
Number of countries	23	23	23	23	23	23	23	23	23	23	23	23
R^2	0.369	0.375	0.141	0.131	0.347	0.362	0.118	0.134	0.366	0.376	0.142	0.138
					Panel B: First stage							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ΔNGDP*YearsAtWar	0.000616***	0.000302***	0.000615***	0.000290***					0.000497***	0.000251***	0.000532***	0.00025***
	(0.000124)	(0.0000963)	(0.0000997)	(0.0000853)					(0.0000662)	(0.0000583)	(0.0000547)	(0.0000559)
ΔNGDP*NatDisastNu					-0.000244***	-0.000110**	-0.000231***	-0.000104**	-0.000164***	-0.0000694***	-0.000149***	-0.0000652***
					(0.0000741)	(0.0000519)	(0.0000735)	(0.0000501)	(0.0000419)	(0.0000246)	(0.0000364)	(0.0000228)
F-Stat	24.58***	9.79***	38.12***	11.58***	10.88***	4.52**	9.84***	4.33**	52.21***	10.15***	87.17***	10.98***
Hansen J-Stat									1.695	2.509	2.776*	2.713*
Endogeneity test	0.001	0.544	0.521	2.931*	4.776**	3.879**	3.748*	1.334	4.256**	1.411	1.013	0.430

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Time frame: 1927-28. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes. Results with more than one instrument are obtained with the Fuller-k estimator, with $k = 1$. Since errors are clustered at country level, I report the Kleibergen-Paap first stage F-Statistic.

Table 10: Panel IV estimation for government financing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Panel A: Second Stage											
	FE	FE	FD	FD	FE	FE	FD	FD	FE	FE	FD	FD
VARIABLES	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing	ΔGovtFinancing
ΔNGDP	2.915***	3.244***	2.083***	2.320***	3.739***	4.219***	2.515***	2.778***	3.182***	3.561***	2.206***	2.463***
	(0.856)	(0.988)	(0.736)	(0.804)	(1.188)	(1.517)	(0.681)	(0.803)	(0.866)	(1.054)	(0.688)	(0.760)
ΔNGDP*Tax/NGDP	-15.09***		-9.211***		-22.37**		-12.75***		-17.45***		-10.22***	
	(5.521)		(2.952)		(10.70)		(2.977)		(6.451)		(2.297)	
ΔNGDP*IncomeTax/NGDP		-31.76**		-19.27***		-47.00*		-25.74***		-36.72**		-21.29***
		(13.11)		(5.983)		(26.63)		(8.646)		(16.32)		(5.558)
Constant			-0.00886	-0.00873			-0.00998	-0.00966			-0.00918	-0.00902
			(0.0244)	(0.0238)			(0.0246)	(0.0239)			(0.0244)	(0.0239)
	Additional controls											
ΔNGDP*Polity2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*GDPPC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*Openness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*TradeTaxShare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*IndirectTaxShare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	219	219	210	210	219	219	210	210	219	219	210	210
Number of countries	23	23	23	23	23	23	23	23	23	23	23	23
R^2	0.236	0.232	0.112	0.110	0.215	0.213	0.110	0.107	0.231	0.227	0.112	0.109
	Panel B: First stage											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ΔNGDP*YearsAtWar	0.000661***	0.000314***	0.000688***	0.000329***					0.000533***	0.00025***	0.00055***	0.000260***
	(0.000129)	(0.0000984)	(0.000103)	(0.0000917)					(0.0000771)	(0.0000586)	(0.0000626)	(0.0000528)
ΔNGDP*NatDisastNu					-0.000248***	-0.000118**	-0.000269***	-0.000133***	-0.000148***	-0.0000706***	-0.0001407***	-0.0000732***
					(0.0000778)	(0.0000521)	(0.0000714)	(0.0000507)	(0.0000253)	(0.)	(0.0000397)	(0.0000254)
F-Stat	26.38***	10.17***	44.76***	12.86***	10.13***	5.12**	14.17***	6.87**	57.34***	11.06***	113.77***	15.53***
Hansen J-Stat									0.856	0.955	0.633	0.600
Endogeneity Test	1.598	1.660	0.601	1.385	1.966	1.945	1.619	2.811*	1.426	1.287	0.633	4.283*

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Time frame: 1927-28. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes. Results with more than one instrument are obtained with the Fuller-k estimator, with $k = 1$. Since errors are clustered at country level, I report the Kleibergen-Paap first stage F-Statistic.

6.6 Quantitative impact

This section offers an overview of the economic magnitude of the findings. I first report some concrete examples of the impact of fiscal capacity under various assumptions. I then offer some admittedly naive, but suggestive counterfactuals through which I illustrate the path of revenues over the course of the Great Depression in the United States, by assigning its federal government different levels of fiscal capacity.

Table 11 presents the summary statistics of the dependent variables and the principal regressors employed in the estimations above. The range of values taken by both sets of variables is large and offers much scope for investigating the quantitative effects of fiscal capacity on government financing. For the rest of this section, I consider only negative changes in GDP for illustrative purposes, but the effects for positive changes are assumed to be symmetric.[35]

Table 11: Summary statistics of the principal variables

	1st Percentile	1st Quartile	Mean	Median	3rd Quartile	99th Percentile
Δ TaxRevenue	-32.8	-3.3	4.9	2.9	8.9	42.2
Δ TaxRevenue (< 0)	-41.5	-12.3	-8.8	-5.6	-2.2	-0.2
Δ GovtFinancing	-36.1	-4.3	2.3	2.1	8.3	59.7
Δ GovtFinancing (< 0)	-37.7	-13.7	-10.1	-7.4	-2.8	-0.1
Δ NGDP	-25.6	-3.4	1.3	2.4	6.6	25
Δ NGDP (< 0)	-30.5	-11	-7.4	-5.6	-2.2	-0.1
Tax/NGDP (%)	1.5	5.0	6.5	6.2	8.0	14.4
IncomeTax/NGDP (%)	0.2	1.1	2.1	2.0	2.6	8.5

All changes (Δ) are percentage changes. The fiscal capacity indicators are 1914-26 averages, while ΔNGDP, Δ TaxRevenue and Δ GovtFinancing are for the 1927-38 period.

Table 12 illustrates how the predicted changes in government financing change given different degrees of fiscal capacity. I use five capacity levels: the smallest found in the sample, the first quartile, the median, the third quartile and the maximum (see the Table for details). To explore the non-linearity of the results I also investigate how the results change for different magnitudes of GDP contractions; I use three values well within the observed range: -5%, -8.5% and -15%.

The results show that, despite the fact that fiscal capacity's smoothing effect increases with the size of the income shock, this non-linearity cannot fully compensate the income loss's effect on government financing. For the median level of the Tax/NGDP fiscal capacity measure, moving from a -5%r to a -8.5% loss in NGDP (a 70% larger shock) leads to a 130% larger loss in revenue. Nonetheless, the quantitatively important impact of fiscal capacity on the smoothing of government finance is evident. For a -5% income shock, bringing a country from the first quartile of the capacity distribution to the third, reduces the predicted fall in government financing by more than 30%. For a -8.5% shock the reduction is 23.3%, and for a -15% shock around 21%. Given a -5% shock and the largest level of fiscal capacity in the sample, the loss in government

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[35]I investigate the possibility of differential effects of fiscal capacity for negative and positive income shocks in Appendix A, but the relatively small number of observations when the sample is split between recession and expansion years makes it difficult to interpret these results with confidence.

financing could have been rendered practically zero. The results are similar, albeit somewhat smaller in magnitude, for the IncomeTax/NGDP indicator.

Table 12: Predicted changes in government financing for different levels of fiscal capacity and changes in NGDP

$\Delta NGDP = -5$		$\Delta NGDP = -8.5$		$\Delta NGDP = -15$	
Tax/NGDP	$\Delta \widehat{GovtFinancing}$	Tax/NGDP	$\Delta \widehat{GovtFinancing}$	Tax/NGDP	$\Delta \widehat{GovtFinancing}$
smallest	-7.3	smallest	-15.2	smallest	-29.8
$1^{st}quartile$	-5.3	$1^{st}quartile$	-12	$1^{st}quartile$	-24.2
median	-4.7	median	-10.8	median	-22.1
$3^{rd}quartile$	-3.7	$3^{rd}quartile$	-9.2	$3^{rd}quartile$	-19.2
largest	-0.1	largest	-3.1	largest	-8.6
IncTax/NGDP	$\Delta \widehat{GovtFinancing}$	IncTax/NGDP	$\Delta \widehat{GovtFinancing}$	IncTax/NGDP	$\Delta \widehat{GovtFinancing}$
smallest	-13.5	smallest	-23.6	smallest	-42.4
$1^{st}quartile$	-12.1	$1^{st}quartile$	-21.3	$1^{st}quartile$	-38.3
median	-10.9	median	-19.2	median	-34.6
$3^{rd}quartile$	-10	$3^{rd}quartile$	-17.6	$3^{rd}quartile$	-31.8
largest	-1.4	largest	-3	largest	-6.1

All changes (Δ) are percentage changes. The coefficients used correspond to the FE estimates. For Tax/NGDP, $smallest = 1.5\%$, $1^{st}quartile = 5\%$, $median = 6.2\%$, $3^{rd}quartile = 8\%$ and $largest = 14.4\%$. For IncTax/NGDP, $smallest = 0.2\%$, $1^{st}quartile = 1.1\%$, $median = 1.9\%$, $3^{rd}quartile = 2.6\%$ and $largest = 5.6\%$.

Counterfactuals offer an even more straightforward way to grasp the size of the effect of fiscal capacity on government financing. These compare countries' predicted government financing paths based on different fiscal capacity scenarios to their actual paths. The analysis of this paper is not structural, so fully fledged counterfactuals are simply not obtainable. However, the examples below are both intuitive and suggestive as to how much the path of government financing was influenced by the level of fiscal capacity countries possessed on the eve of the Great Depression.

While going through the counterfactuals, it is useful to recall what the optimal path of fiscal aggregates over the business cycle would look like according to standard economic theory. Both in a Keynesian and tax-smoothing framework tax revenues should fall during recessions. In the tax-smoothing world, tax revenues should not change as a share of GDP over the business cycle, while in the Keynesian world they can fall further than output to stimulate aggregate demand. In both cases, this would imply counter-cyclical borrowing to smooth government financing and fund the acyclical, or counter-cyclical – here the tax-smoothing and Keynesian doctrines potentially differ again – government expenditure (Barro, 1979; Lucas and Stokey, 1983; De Long and Summers, 1986). Recalling a broader view of public revenue and expenditure is also useful. In countries where states collect little revenues as a share of GDP, sharp falls in public financing and expenditure can endanger the very ability of states to function. This can have potentially severe economic and political consequences in both the short and long run. In summary, the optimal path of government financing should be less procyclical than that of tax

revenues – or even countercyclical – in order to, at the very least, not exacerbate business cycle volatility or affect the functioning of the state infrastructure.

I use the example of the United States to provide general intuition (Figure 5). The US was one of the worst hit countries in the Great Depression, with nominal GDP contracting by approximately 46% and real GDP per capita by 31% between 1929 and 1933. Government financing and tax revenues followed a similar path, contracting cumulatively by 47% and 35% respectively between 1929 and 1933. The path of US government financing was thus markedly pro-cyclical during the worst years of the Great Depression and non-tax revenues provided no smoothing. What prevented an outright collapse in spending was an increase in short-term borrowing, which led to the general fiscal policy stance being essentially neutral. Fiscal deficits reached less than 6% of GDP by 1933 and were, for the most part, due to the failure to agree on policies to balance the budget (De Long, 1998).

The New Deal introduced by the newly elected Franklin D. Roosevelt in 1933 marked a break in this pattern. A number of new public expenditure programs were implemented to help combat the Depression. These also paved the way for a dramatic expansion of the Federal Government, and not just on the expenditure side (Wallis and Weingast, 2005; Fishback and Wallis, 2013).[36] A centralization and expansion in tax revenues – in other words, an increase of fiscal capacity – accompanied the introduction of new policies on the expenditure side. The income tax, in particular, was strengthened at both national and state level and became the main source of tax revenue.[37]

Given the average response of government financing to changes in NGDP embedded in my estimates, how different could the path of financing, and therefore fiscal policy, have looked like during the slump had the US entered the Great Depression with a different level of fiscal capacity? As a first counterfactual, I assign to the US government in 1927 the fiscal capacity it had towards the end of my period of analysis, more precisely in 1937, when the drastic centralization of fiscal resources and expansion in income taxation described above was already well under way. The result is a significant reduction in the fall of government financing in the Depression years and a general decrease in its procyclicality. In the second counterfactual, I transform the US into a fully fiscally centralized country by assigning the fiscal capacity of local governments (states and municipalities) to the federal government. The result is to further reduce the cyclical volatility of government financing. The final counterfactual assigns to the US federal government the fiscal capacity of the United Kingdom, the most fiscally capable nation in my sample. In this case, government financing becomes markedly counter-cyclical. Therefore, given even the extremely underwhelming average fiscal policy response to the Great Depression, my findings indicate that the United States could have been able to run a markedly less pro-cyclical, and even a counter-cyclical, fiscal policy in the acute Great Depression years

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[36]Some economic programs were funded by national sources and administered by sub-national bodies, while the national system of defense and old age was run by the central government. National collection and federal expenditure became standard for education, highways, water and sewage, and public welfare (Wallis, 2000).

[37]National income tax collection fell in 1929-33, and subsequently rose for the rest of the decade, shooting up during WWII with the reduction of personal deductions, increases in marginal rates and the beginning of withholding (Wallis, 2000).
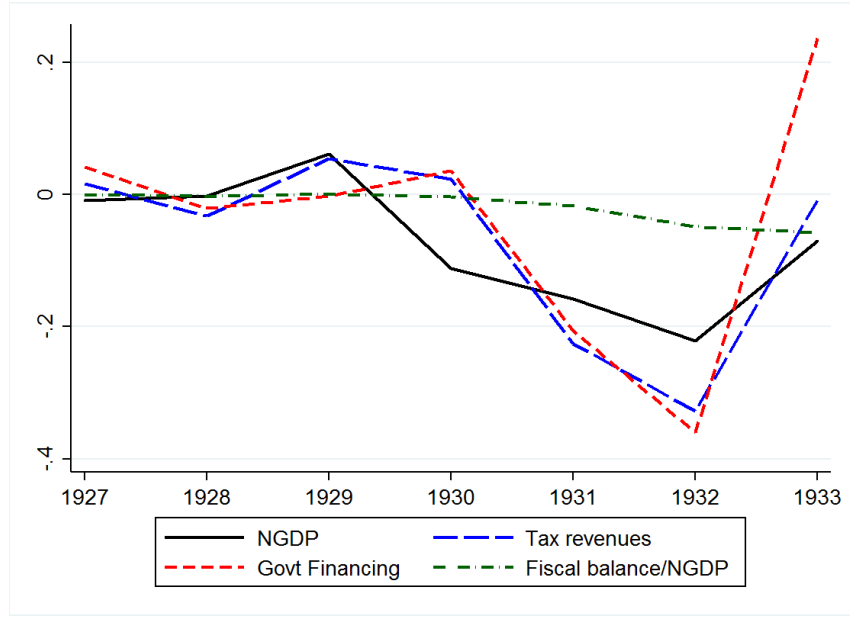
(a) Dynamics of economic activity and fiscal aggregates
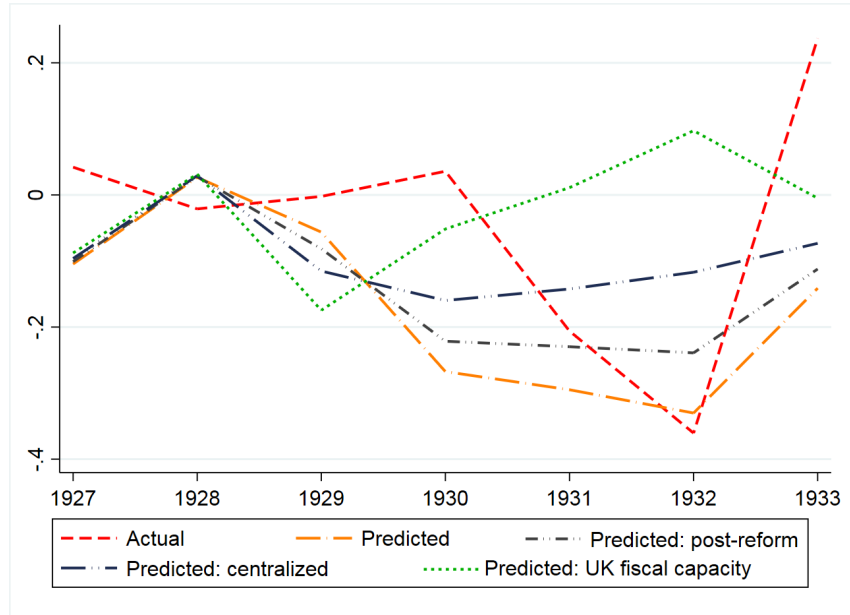
(b) Government financing counterfactuals

Figure 5: US counterfactual, 1927-33

The NGDP, government financing and tax revenues are annual percentage changes. The fiscal balance a share of GDP is in levels. The counterfactuals are based on results obtained with the FE estimatorand the TAX/NGDP fiscal capacity indicator

had it possessed a higher level of fiscal capacity on the eve of the slump.

7 Exploring the channels: fiscal capacity and borrowing

The results of the analysis so far indicate that fiscal capacity affected the revenue smoothing ability of countries in the interwar period by influencing non-tax revenues. The most natural candidate for performing this function is borrowing.
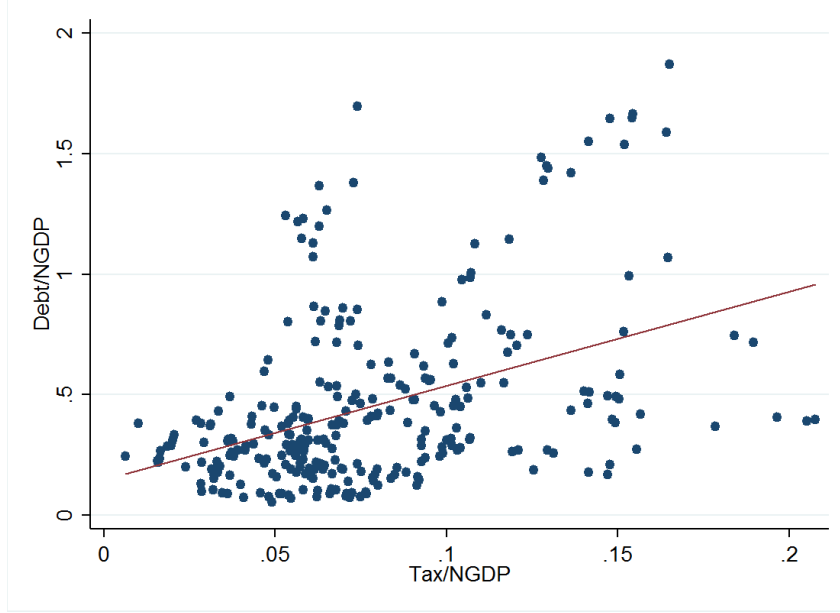
Figure 6: Fiscal Capacity and Government Debt, 1927-38

Source: for details on the tax revenue data see B, the debt data is from Papadia (2017); the nominal non-PPP adjusted GDP data is from Klasing and Milionis (2014)

Figure 6 illustrates the positive relationship between fiscal capacity and borrowing in the interwar period by presenting the correlation between fiscal capacity (as measured by tax revenue over GDP) and the debt-to-GDP ratio at the central government level for 1927-38. In the analysis below, I formally test this relationship, finding it to be robust, and also explore the two principal mechanisms that could explain it. One is that a higher fiscal capacity simply signaled a higher present value of future tax revenues available for debt repayment. The other is that fiscal capacity signaled institutional quality and credibility making access to borrowing easier. The results support the latter. Finally, I show that higher fiscal capacity countries also faced lower borrowing costs.

7.1 Fiscal capacity and borrowing capacity

I relate fiscal capacity to debt levels through the following basic model:

$$Debt/NGDP_{i,t} = \beta_0 + \beta_1 FiscalCapacity_{i,t} + \mathbf{x_{i,t}}\gamma + \epsilon_{i,t} \tag{3}$$

which takes the more general form:

$$Debt/NGDP_{i,t} = \beta_0 + \mathbf{A}(\ell)\{Debt/NGDP_i + FiscalCapacity_i + \mathbf{x_i}\} + c_i + l_t + \epsilon_{i,t} \quad (4)$$

when dynamics and fixed effects are introduced. $\mathbf{A}$ is a matrix of polynomials in the lag operator, ℓ is an aribitrary number of lags, l and c are country and time fixed effects respectively, and ϵ is the idiosyncratic error term.

Making the analysis dynamic while controlling for fixed effects is important for several reasons. First, the debt-to-GDP ratio exhibits persistence; failing to account for this would lead to miss-specification and bias in the estimates. Second, by introducing lagged terms of the dependent variable in the model in conjunction with fixed effects, I allow these variables to interact with each other, reducing the possibility of omitted variable bias. Third, dynamic estimation using Generalized Method of Moments (GMM) estimators allows me to instrument the regressors with more distant lags of themselves, further reducing the possibility of bias.

Table 13 illustrates the results of the estimation. In columns 1 and 2, the 1927-38 average debt-to-GDP ratio is regressed against the 1914-26 average fiscal capacity indicators, debt level and controls. In columns 3-4, I repeat the exercise using annual values of the debt-to-GDP ratios and fiscal capacity (entered with a lag, as the other controls). Columns 5-8 feature the dynamic panel estimation in which the debt-to-GDP ratio is regressed on the instrumented contemporaneous fiscal capacity indicators and controls.[38] In the last two columns I also control for time fixed effects.

I find that, even after controlling for the lagged debt-to-GDP ratio, changes in NGDP, the structure of tax revenues, economic development (as measured by GDP per capita) and the level of democracy (as measured by the Polity2 score), as well as country and timed fixed effects, higher fiscal capacity countries were able and/or willing to borrow more. More precisely, the results indicate that: 1) high capacity had a larger debt stock, 2) they were able to borrow relatively more on a yearly basis, 3) debt levels responded dynamically to changes in fiscal capacity taking place in the interwar years.

In order to identify the channel through which fiscal capacity led to more borrowing, I proceed with two further steps. The first is to split the debt burden into long-term borrowing and short-term borrowing. This exercise is informative because long-term borrowing and institutional quality are tightly linked. Long-term borrowing in the interwar period was the result of a planning and budgeting process, while short-term borrowing was often associated with emergency funds needed to cover shortfalls in revenues. Moreover, countries normally accessed long-term borrowing by floating bonds on capital markets, both international and domestic, and thus by submitting themselves to the scrutiny, however imperfect, of underwriters and lenders. The association between long term borrowing and creditworthiness is still relevant today: developing countries often choose to borrow short term because it tends to be cheaper, particularly during crises. This is due to the higher credit risk and uncertainty associated with long-term investments in counties with weak institutions and volatile macroeconomic funda-

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[38]The effect of the lagged fiscal capacity indicator would be fully captured by lagged debt-to-GDP indicator.

Table 13: Pooled and dynamic panel estimations for debt-to-GDP ratios

	(1) OLS 27-38 Debt/NGDP	(2) OLS 27-38 Debt/NGDP	(3) OLS Debt/NGDP	(4) OLS Debt/NGDP	(5) DiffGMM Debt/NGDP	(6) DiffGMM Debt/NGDP	(7) DiffGMM Debt/NGDP	(8) DiffGMM Debt/NGDP
14-26 Debt/NGDP	0.605*** (0.173)	0.534*** (0.165)	0.722*** (0.146)	0.641*** (0.155)				
L.Debt/NGDP					0.344*** (0.120)	0.407*** (0.139)	0.365*** (0.123)	0.413*** (0.113)
14-26 Tax/NGDP	5.855*** (1.998)							
14-26 IncomeTax/NGDP		17.72*** (4.058)						
L.Tax/NGDP			3.974*** (0.786)					
L.IncomeTax/NGDP				10.85*** (2.075)				
Tax/NGDP					3.656*** (0.821)		3.526*** (1.166)	
IncomeTax/NGDP						12.75*** (3.652)		12.21*** (3.400)
Constant	-0.254 (0.335)	-0.785** (0.291)	0.0130 (0.189)	-0.365** (0.171)				
Additional controls								
Polity2	✓	✓	✓	✓	✓	✓	✓	✓
GDPPC	✓	✓	✓	✓	✓	✓	✓	✓
Openness	✓	✓	✓	✓	✓	✓	✓	✓
TradeTaxShare	✓	✓	✓	✓	✓	✓	✓	✓
IndirectTaxShare	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP			✓	✓	✓	✓	✓	✓
Country FE					✓	✓	✓	✓
Time FE							✓	✓
Observations	23	23	257	257	248	248	248	248
Number of countries	23	23	28	28	29	29	29	29
R^2	0.843	0.859	0.767	0.757				

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Time frame: columns 1 and 2 contain a cross sectional regression of the 1927-38 debt-to-GDP ratio on 1914-26 average values of the regressors; Columns 3 and 4 are pooled regressions of the annual value of the debt-to-GDP ratio from 1927 to 1938 on lags of the regressors; columns 5-8 are dynamic panel regressions run for all available observations between 1914 and 1938. Countries included in columns 1-2: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States; columns 3-4 additionally feature Brazil, Greece, Ireland, Poland and Romania; columns 5-8 additionally feature Hungary. For the dynamic panel estimations, I employ the two-step difference GMM estimator exploiting orthogonal differences (Arellano and Bover, 1995) rather than first differences (Arellano and Bond, 1991) in order to preserve sample size in the presence of gaps in the data. I employ the difference GMM estimator because, while the system estimator (Blundell and Bond, 1995) is more efficient, it requires the debt-to-GDP to be stationary. I insert one lag of the dependent variable as a regressor and use the 3rd lag of the regressors as instrument for their contemporaneous value. Arellano-Bond and Hansen test confirm the validity of these choices. Standard errors are clustered at country level in all specifications and small sample adjustments are employed. The results are robust to different lag structures and instrumenting. See Roodman (2009) for details on the Stata command used in the estimations. L. stands for lagged. All changes (Δ) are percentage changes.

mentals (Broner, Lorenzoni, and Schmukler, 2013).[39] The second step is to test whether the

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[39]Another explanation is that short-term borrowing serves as a commitment mechanisms, which disciplines

source of tax revenues matters. As discussed in detail in Section 2, income taxation is strongly associated with fiscal capacity whereas a high reliance on trade taxes proxies a low level of fiscal development. Finding that not only the level, but also composition of revenues mattered would be a strong indication that the channel through which fiscal capacity influenced the ability to borrow in the interwar period was institutional quality, rather than simply a higher present value of future tax receipts.

Table 14 illustrate the results of the estimations. Column 1 and 2 relate long-term borrowing to the two fiscal capacity indicators, while columns 3 and 4 do the same for short-term borrowing. Columns 5-7 relate the three debt indicators – total, long-term and short-term – to IncomeTax/NGDP and TradeTax/GDP contemporaneously in order to compare their impact on borrowing.

The results are clear cut. Columns 1-4 indicate that fiscal capacity, however measured, is robustly associated with more long-term borrowing. It is also statistically associated with more short-term borrowing, but the effect for long-term borrowing is 8-10 times larger, confirming the tight link between this variable and institutional quality. When comparing the impact of income and trade taxes (columns 5-7), the tight link between total debt, long-term debt and income taxes emerges clearly once again, whereas trade taxes are only weakly associated with borrowing: the coefficient is substantially smaller than for income taxes and weakly significant only for long-term borrowing. In this specification, neither income nor trade taxes are associated with short-term borrowing. In simple terms, these findings indicate that, in the interwar period, each unit of income taxes was worth more in terms of borrowing capacity compared to each unit of trade taxes. Thus, these findings suggest, once again, that fiscal capacity proxies institutional quality rather than just higher tax receipts.

7.2   Fiscal capacity and borrowing costs

To complete the analysis of the effect of fiscal capacity on borrowing, I turn to analyzing borrowing costs. The outcome variable is the spread of domestic bond yields over the US domestic bond yield (see Appendix B for details on this data). The underlying assumption is that yields reflect the expected probability of default, and that yield spreads reflect the expected probability of default relative to a baseline bond or country of issue with very low or zero default risk (Tomz and Wright, 2013).[40] The US yield is a natural choice as the baseline because the country's economic might and high level of financial development contributed to making it my samples' lowest domestic yield for the entire period under consideration (Figure 7).[41] The other

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countries into following sound policies due to avoid rollover crises, see references in Broner, Lorenzoni, and Schmukler (2013), page 63)

[40]Tomz and Wright (2013) also point out some pitfalls of working with bond yields. First, the assumption is that borrowing takes place in the form of the emission of bonds on competitive markets. this however is not always the case. Alternative sources of borrowing are banks, although this was uncommon in the interwar period, but also international organizations and central banks which do not necessarily lend at market rates. Second, not all sovereign bonds are actively traded on liquid markets.Third, contractual features can vary across countries and different bond issues, impacting yields.

[41]See Basile, Landon-Lane, and Rockoff (2010) for a thorough discussion of interest rates in the US in the interwar period.

Table 14: Long-term vs short-term borrowing and income vs trade taxes

	(1) DiffGMM LT Debt/NGDP	(2) DiffGMM LT Debt/NGDP	(3) DiffGMM ST Debt/NGDP	(4) DiffGMM ST Debt/NGDP	(5) DiffGMM Debt/NGDP	(6) DiffGMM LT Debt/NGDP	(7) DiffGMM ST Debt/NGDP
L. LT Debt/NGDP	0.332** (0.122)	0.439*** (0.123)				0.525*** (0.141)	
L.ST Debt/NGDP			0.596*** (0.0796)	0.606*** (0.0735)			0.651*** (0.0758)
L.Debt/NGDP					0.523*** (0.113)		
Tax/NGDP	3.404*** (0.705)		0.346*** (0.119)				
IncomeTax/NGDP		9.012*** (2.085)		1.112** (0.490)	7.056** (3.251)	5.353** (2.596)	0.696 (0.446)
TradeTax/GDP					3.319 (2.080)	3.231* (1.683)	0.381 (0.395)
				Additional controls			
Polity2	✓	✓	✓	✓	✓	✓	✓
GDPPC	✓	✓	✓	✓	✓	✓	✓
Openness	✓	✓	✓	✓	✓	✓	✓
TradeTaxShare	✓	✓	✓	✓			
IndirectTaxShare	✓	✓	✓	✓			
ΔNGDP	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓
Observations	236	236	249	249	248	236	249
Number of countries	29	29	29	29	29	29	29

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Countries included are: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States; columns 3-4 additionally feature Brazil, Greece, Ireland, Poland and Romania; columns 5-8 additionally feature Hungary. Regressions run for all available observations between 1914 and 1938. I employ the two-step difference GMM estimator exploiting orthogonal differences (Arellano and Bover, 1995) rather than first differences (Arellano and Bond, 1991) in order to preserve sample size in the presence of gaps in the data. I insert one lag of the dependent variable as a regressor and use the 3rd lag of the regressors as instrument for their contemporaneous value. Arellano-Bond and Hansen test confirm the validity of these choices. Standard errors are clustered at country level in all specifications and small sample adjustments are employed. The results are robust to different lag structures and instrumenting. See Roodman (2009) for details on the Stata command used in the estimations. L. stands for lagged. All changes (Δ) are percentage changes. L.y represents the lag of the dependet variable. See Roodman (2009) for details on the Stata command used in the estimations. L. stands for lagged. All changes (Δ) are percentage changes.

fundamental hypothesis of this exercise is that the strength and credibility of fiscal systems cannot be captured by introducing short-term policy variables, such as budget deficits, as is commonly done in the literature. I argue, instead, that my fiscal capacity indicators capture the deeply-rooted characteristics of countries that determine their fiscal development and broader institutional quality, and are thus the main variables of interest.

I focus on domestic financial markets, for two reasons. The first is that the availability of data on domestic bond yields is greater. More important, however, is the fact that with the onset of the Great Depression, which all but froze international financial markets, domestic credit became the main source of government financing. In fact, the domestic share of debt for central governments in my sample increased from around 52% in 1927-29 to around 61% in
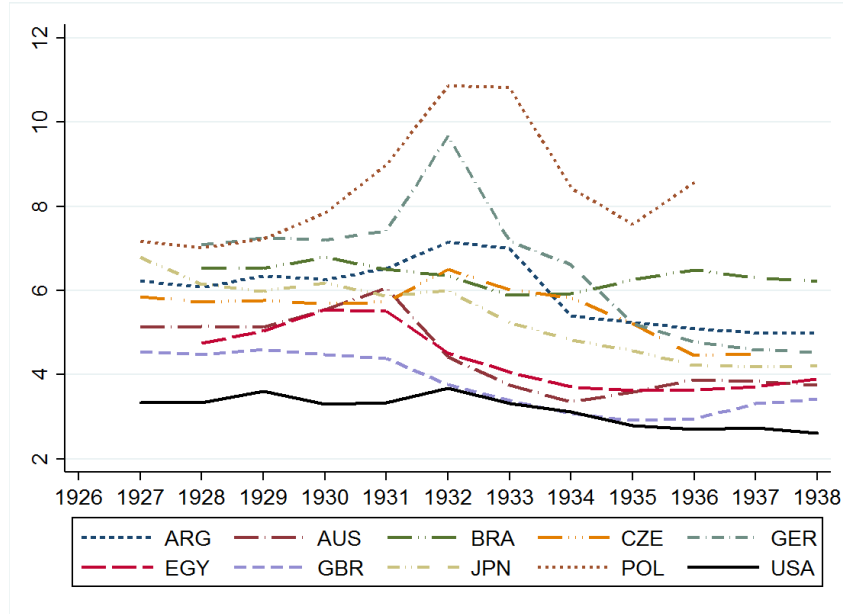
Figure 7: Domestic bond yields in selected countries, 1927-38

Yields expressed in percentage points. ARG=Argentina, AUS=Autralia, BRA=Brazil, CZE= Czechoslovakia, GER=Germany, EGY=Egypt, GBR= United Kingdom, JPN=Japan, POL=Poland, USA=United States of America. Source: League of Nations (1936/37, 1937/38, 1939/40); see Appendix B for details.

1933-38.[42]

The estimating equation is as follows:

$$DomSpread_{i,t} = \beta_0 + \beta_1 FiscalCapacity_{i,t} + \mathbf{x_{i,t}}\gamma + c_i + l_t + \epsilon_{i,t} \tag{5}$$

where $\mathbf{x}$ is a vector of controls, c and l are country and time fixed effects respectively and $\epsilon_{i,t}$ is the idiosyncratic error term.

I run my analysis both by pooling countries on and off the Gold Standard, and by estimating separate coefficients for the the two. I make this distinction because of the potentially important role Gold Standard membership had on borrowing costs by acting as a "good housekeeping seal of approval".[43]

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[42]Countries included in this calculation are: Austria, Belgium, Bulgaria, Czechoslovakia, Denmark, Finland, Germany, UK, Greece, Hungary, Ireland, Italy, Norway, Poland, Romania, Sweden, Switzerland, Argentina, Bolivia, Brazil, Chile, Colombia, Peru, Uruguay, Venezuela, Australia, Japan, Canada, Egypt, New Zealand, US, South Africa and Spain.

[43]Bordo and Kydland (1995); Bordo and Rockoff (1996) argue that, during the heyday of the classical Gold Standard (1870-1913), long-standing adherence to this international monetary system signaled the pursuit of orthodox policies, which significantly lowered borrowing costs. Bordo, Edelstein, and Rockoff (1999) find a similar effect for countries returning to gold in the 1920s, particularly if this was done at the pre-WWI parity, which, the authors argue, was a strong signal of financial rectitude. Obstfeld and Taylor (2003) confirm these results of the pre-WWI era, but not for the 1920s, for which they record the rising importance of debt burdens and British Empire membership. The effect of British Empire membership is another controversial topic. Ferguson and Schlularick (2006), for example, find that colonies enjoyed lower borrowing costs than non-colonies while Accominotti, Flandreau, and Rezzik (2011) argue that colonies were structurally different from non-colonies because of the implicit monitoring by the British government. The authors thus refute the idea of Empire being a "marginal" effect to be identified though a dummy *ceteris paribus*. Flandreau and Zumer (2004) and Alquist

Unlike much of the literature, however, I do not control for Gold Standard adherence using a simple dummy. This is informed by Accominotti, Flandreau, and Rezzik (2011)'s argument for British Empire membership before WWI that differences between Empire and non-Empire countries were structural and cannot be captured by just allowing for a different intercept. The same is likely for the interwar Gold Standard. Indeed, the coefficient of the Gold Standard dummy turns out to be statistically indistinguishable from zero whereas, once separate estimations are run for countries on and off gold, a different pattern emerges.

Shocks to interest rates are likely to have broad based economic repercussions. This gives the rise to the possibility of feedback effects between the error term and the regressors. For this reason, I run my analysis using the fixed-effects estimator that is most robust to these: the first differences (FD) estimator. As long as the error term for the contemporaneous, one step ahead and one step behind periods is uncorrelated with the regressors, this yields unbiased estimates.[44] Despite potential issues with feedback loops, the inclusion of fixed effects is very important. Besides reducing the risk of omitted variable bias, these also minimizes issues of cross-country comparability of the data. Given that the bonds of different countries featured different contractual characteristics, studying the evolution of bond yields through time offers a far better indicator of default probabilities than cross-sectional comparisons across countries.

Table 15 presents the results of the analysis. Columns 1-2 illustrate the pooled results, while columns 3 and 4 distinguish between on gold and off gold countries by allowing their parameters to be different. The bond yield spread is regressed against the Tax/NGDP and IncomeTax/NGDP fiscal capacity indicators and a series of controls: the size of the default and and the debt-to-GDP ratios computed by Papadia (2017),[45] the growth rate of nominal GDP calculated from data provided by Klasing and Milionis (2014), openness as measured by the share of trade in GDP provided by the same authors, GDP per capita from Bolt and van Zanden (2013), the Polity2 score and, for pooled regressions, an on gold dummy based on gold adherence dates summarized by Crafts and Fearon (2013).[46]

I find that, when countries on and off gold are pooled, a higher fiscal capacity – measured by the IncomeTax/NGDP indicator – is related to a lower spread (Panel A). The coefficient of the Tax/NGDP indicator is negative, but not estimated precisely enough to be statistically significant. An interesting pattern emerges when coefficients are allowed to vary between countries on and off gold. For countries on gold (Panel B), these become substantially smaller in absolute terms for both the Tax/NGD and IncomeTax/NGD indicators and are statistically indistinguishable from zero for both. For countries off gold (Panel C), the coefficient for Tax/NGDP is

and Chabot (2011), instead, find that sound policies and common risk factors were more important than Gold Standard adherence even before WWI.

[44]The within (FE) estimator, on the other hand, implausibly assumes that the error terms are unrelated with the regressors at any point within the observation period.

[45]The default size is the share of the principal of dollar denominated bonds in default over the total principal dollar-denominated bonds. The measure is developed in the paper as a measure of default size on impact, which purposely does not take into account ex-post elements such as the final haircut imposed on creditors, which in most cases of defaults in the interwar period was only finalized after long negotiations, some of which wee settled only after the end of WWII.

[46]I consider countries to be off gold if they have officially left the Standard or have introduced exchange controls.

larger in absolute terms than in the pooled estimation, albeit still insignificant. The coefficient of the IncomeTax/NGDP indicator, instead, becomes statistically significant once again.

These results indicate that, for countries not on gold, fundamentals such as fiscal capacity mattered more than for countries still on gold. More precisely, the estimates indicate that a 1% increase in fiscal capacity led to a 0.23% decrease in the yield spread vis-a-vis the US on average, and a 0.28% decrease for countries off gold. One can hypothesize that, without Gold Standard adherence to rely on, the strength of the fiscal system became more important as a guiding principle for investors. An indication that this is plausible is the fact that, as the interwar debt crisis unfolded and the Gold Standard disintegrated, rating agency Moody's increased the amount of data it supplied in its investment manuals (Moody's, 1924-37), with tax revenues being a big part of this.[47] This means that, while fiscally stronger countries might have benefitted from an easier access to borrowing once free of the *golden fetters*, weaker ones might have actually experienced an increase in their bond yield spreads. This finding qualifies much of the literature, which argues that the Gold Standard was the only constraint on countries' policy responses to the Depression. At least on the fiscal side, my results suggest that leaving gold had potentially negative repercussions for fiscally weak countries. The quantitative impact of fiscal capacity is fairly large.

This result also qualifies findings by Bernanke and James (1991) and Bernanke (1995), who show that economic conditions in countries that left the Gold Standard in 1931 and those that did not were quite similar, while the recovery was much more robust in leavers. The authors, in line with Temin (1989) and Eichengreen (1992), attribute this to the policy freedom that leaving the fixed exchange rate provided (although they stress monetary policy, whereas Eichengreen also outlined an important role for fiscal policy). The authors dismiss endogeneity concerns regarding the decision to abandon gold, highlighting that weaker countries should have left the standard earlier and would have recovered more strongly than those which actually left. This reasoning, however, rests on the assumption that macroeconomic fundamentals can be captured by looking at short-term indicators and that leaving the Gold Standard would have had similar effects in all countries, no matter their institutional characteristics. My findings indicate that, on the contrary, differences in deeply-rooted fundamentals like fiscal capacity might have led to asymmetric effects of the decision to abandon the Gold Standard. Therefore, the potential endogeneity of this decision remerges.

8   Conclusion

This paper has investigated the impact of fiscal capacity on the dynamics of public revenues, public debt and bond yields in the interwar period. To the best of my knowledge, this is a first. My findings show that a higher degree of fiscal capacity led to a lower volatility of government financing in response to economic shocks. The analysis further indicates that fiscal capacity

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[47]The comparison between the wealth of information in pre and post-Depression manuals is substantial and evident just by visually inspecting the manuals, however I have not carried out a systematic quantitative assessment of the increase in information supplied through time.

Table 15: Determinants of domestic government bond yield spreads vis-a-vis the US

VARIABLES	(1) FD DomSpread	(2) FD DomSpread	(3) FD DomSpread	(4) FD DomSpread
Panel A: *Pooled On & Not On Gold*				
Tax/NGDP	-16.66			
	(10.37)			
IncomeTax/NGDP		-23.41**		
		(10.59)		
Panel B: *On Gold*				
Tax/NGDP			-4.196	
			(10.37)	
IncomeTax/NGDP				-16.05
				(11.05)
Panel C: *Not On Gold*				
Tax/NGDP			-19.55	
			(13.76)	
IncomeTax/NGDP				-28.17*
				(16.45)
Constant	0.578	-0.0604	0.129	-0.0865
	(0.396)	(0.184)	(0.224)	(0.230)
Additional controls				
On Gold	✓	✓		
Default size	✓	✓	✓	✓
ΔNGDP	✓	✓	✓	✓
Debt/NGDP	✓	✓	✓	✓
Openness	✓	✓	✓	✓
GDPPC	✓	✓	✓	✓
Polity2	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Observations	187	176	187	176
Number of countries	25	25	25	25
R^2	0.225	0.218	0.240	0.229

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

All changes (Δ) are percentage changes. Regression are run for all available observations for 1914-38. Countries included are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Greece. Hungary, Italy, Japan, Netherlands, Norway, Poland, Romania, Spain, Sweden, Switzerland, United Kingdom.

helped to smooth financing by providing an easier access to borrowing for governments, whereas there is no conclusive evidence of fiscal capacity lowering the volatility of tax revenues. Finally, the results reveal that how tax revenue was raised mattered. This suggests that fiscal capacity allowed countries to borrow more extensively by signaling higher institutional quality, rather than simply a higher present value of future tax receipts.

The findings of this paper speak to three main strands of literature. First, they suggest that the literature on the Great Depression should take more seriously into account the deep-rooted constraints under which countries operated when evaluating policy responses to the the slump. Gold Standard membership did impose a straitjacket on countries, which constrained their policy choices, but so did historically-determined factors, such as fiscal development. Moreover, the two might have interacted leading to asymmetric effects of shedding the *golden fetters*. Second, the paper illustrates a new channel through which fiscal capacity can affect economic outcomes besides fostering long-term economic development. I show that fiscal capacity affected cyclical fiscal outcomes in the interwar period, with deep potential repercussions on both the short and long-term economic and political health of countries. In countries where financing volatility led to fiscal crises, which affected the action of states or led to regime changes, long-term consequences might have been particularly severe. Third, the findings of the paper lend support to the hypothesis that institutionally determined borrowing constraints can contribute to fiscal policy pro-cyclicality, and that the size of governments can affect their ability to be a stabilizing force in the economy.

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A   Additional analysis and robustness checks

In this Appendix, I outline some further results, which integrate the analysis in the main body of the paper. Additionally, I perform a number of robustness checks.

A.1   Revenue elasticity: sensitivity to changing the sample and including local governments

Table 16 demonstrates that the relationships between economic activity and tax revenues and economic activity and government financing are very similar to that of 1927-38 if I extend my analysis to the period1920-1938 and include all available observations. Once again, economic activity and tax revenues co-move almost 1-to-1, while the coefficient of the change in nominal GDP is less than half the size when government financing is the outcome variable. When I use the FD estimator (column 6), the coefficient even becomes statistically insignificant. The results confirm that non-tax revenues played an important smoothing role in overall public revenue, and that this effect was consistently present during the whole interwar period.

Table 16: The elasticity of tax revenues and government financing, all observations 1920-38

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	FE	FE	FD	FD
VARIABLES	ΔTaxRevenue	ΔGovtFinancing	ΔTaxRevenue	ΔGovtFinancing	ΔTaxRevenue	ΔGovtFinancing
vspace4pt						
ΔNGDP	1.040***	0.424***	1.128***	0.431***	1.083***	0.208
	(0.213)	(0.120)	(0.278)	(0.129)	(0.355)	(0.132)
Constant	0.0473**	0.0332***	0.0464***	0.0331***	-0.00235	0.00158
	(0.0210)	(0.00830)	(0.00290)	(0.00129)	(0.00702)	(0.00428)
Country FE			✓	✓	✓	✓
Observations	296	452	296	452	243	407
R^2	0.052	0.047	0.066	0.051	0.027	0.009
Number of countries	33	35	33	35	33	35

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

All changes (Δ) are percentage changes. Countries included in columns 1, 3 and 5 are: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, India, Ireland, Italy, Japan, the Netherlands, Norway, Poland, Romania, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States and Yugoslavia; columns 2, 4 and 6 additionally feature Indonesia, New Zealand, and Uruguay, but exclude Egypt due to data availability.

It is harder to draw inference when I include both central and local governments in the analysis, because of the small size of the sample. Similarly to Table 4 in the paper, in Table 17), I include only 1927-38 observations that are available for both tax revenues and government financing. This reduces the sample to 11 countries and 46-35 observations. The results, which need to be taken with more than a grain of salt, suggest that: 1) total government revenues were less sensitive to changes in output than central government revenues, 2) the smoothing effect of non-tax revenues was concentrated at the central level, and ,might have been actually undone at the local level. The former is demonstrated by the smaller coefficient relating changes in nominal GDP to both tax revenues and government financing compared to that of central revenues; the latter is evident in the larger coefficient I find for government financing compared to tax revenues in two specifications out of three.

Table 17: The elasticity of central & local tax revenues and government financing

VARIABLES	(1) ΔTotTaxRev	(2) ΔTotGovFin	(3) ΔTotTaxRev	(4) ΔTotGovtFin	(5) ΔTotTaxRev	(6) ΔTotGovtFin
ΔNGDP	0.344***	0.468***	0.331**	0.330	0.249	0.402*
	(0.108)	(0.170)	(0.114)	(0.191)	(0.172)	(0.226)
Constant	0.00395	0.0233	0.00349	0.0184**	-0.0136	-0.0144
	(0.0123)	(0.0159)	(0.00401)	(0.00676)	(0.0216)	(0.0271)
Country FE			✓	✓	✓	✓
Observations	46	46	46	46	35	35
R^2	0.139	0.124	0.109	0.060	0.033	0.053
Number of countries	11	11	11	11	11	11

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Time frame: 1927-38. All changes (Δ) are percentage changes. Countries included are: Austria, Belgium, Denmark, France, Germany, Hungary, the Netherlands, Sweden, Switzerland, the UK and the USA.

A.2 Absolute values

As a next step, I reestimate my model using absolute values of the changes in GDP, taxes and revenues instead of the actual values. This model is closer to estimating whether, on average, high capacity countries had more or less volatile government financing. This is because the fixed-effects are not capturing the average effect of unobservables for positive and negative changes in taxes and financing, but simply their effect on cyclical volatility. I run this model using the HT approach which allows me to introduce time-invarying regressors, while controlling for fixed effects. The results are presented in Table 18 and indicate that, consistently with the results so far, high capacity countries had a lower cyclical volatility in government financing, as evidenced by the negative and statistically significant coefficients on my two fiscal capacity indicators. The biggest difference compared to previous estimations, is that the non-linear effect of fiscal capacity does not emerge in this specification. The coefficients on the interaction between the indicators and changes in NGDP are positive and statistically indistinguishable from zero.

A.2.1 Instrumenting changes in output

An important robustness check, which I also discuss in the paper, consists in instrumenting changes in output. I do this similarly to Ilzetzki and Vegh (2008) by using changes in output in trading partners weighted by the corresponding pre-Depression (1926) shares of exports going to each trading partner (see Appendix B for sources). I not only instrument the fiscal capacity indicators and the changes in output, but also all the other interaction variables using the weighted partners output changes interacted with the regressors. Moreover, because of diminished worries of reversed causality between the outcomes and GDP due to instrumenting, I also employ government expenditure as an outcome.

Table 19 outlines the result. Not all instruments are very strong, but most pass the threshold for a maximum bias of 10%.[48] The results are overall consistent with the main findings of the

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[48]The exceptions are: 1. in the FE government financing specifications only the changes in NGDP instrument

Table 18: Changes in absolute values panel estimation, 1927-38

VARIABLES	(1) HT $\mid \Delta GovtFinancing \mid$	(2) HT $\mid \Delta GovtFinancing \mid$
$\mid \Delta NGDP \mid$	2.176**	2.055*
	(1.012)	(1.078)
Tax/NGDP	-1.460***	
	(0.424)	
$\mid \Delta NGDP * Tax/NGDP \mid$	0.0911	
	(4.318)	
IncomeTax/NGDP		-3.365**
		(1.670)
$\mid \Delta NGDP * IncomeTax/NGDP \mid$		1.478
		(10.37)
Constant	0.225**	0.302**
	(0.106)	(0.142)
Additional controls		
Polity2	✓	✓
GDPPC	✓	✓
Openness	✓	✓
TradeTaxShare	✓	✓
IndirectTaxShare	✓	✓
$\mid \Delta NGDP * Controls \mid$	✓	✓
Country FE	✓	✓
Time FE	✓	✓
Observations	219	219
Number of countries	23	23

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Time frame: 1927-38. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States. All changes (Δ) are percentage changes. All time-varying variables are in absolute values.

paper. For government financing, the difference is that when the FD as opposed to the FE estimator is used, the coefficient are slightly smaller and the standard errors larger leading to the coefficient becoming insignificant. This is due to first differencing reducing the variability in the regressors making the estimation less precise. For expenditure, this is reversed. The FE coefficients are small in absolute terms and statistically insignificant, while they are large and strongly significant when the FD estimator is used. This can be explained by the fact that, when expenditure is the outcome variable, the strict exogeneity assumption required by the FE estimator is very likely violated. This is because shocks to expenditure contained in the error term will affect the other regressors, particularly changes in GDP, even of trading partners. The FD estimator only requires the error term not to be correlated with the regressors in the contemporaneous period and one period ahead and behind, a much less restrictive assumption.

A.2.2 Further robustness checks

I have carried out a number of further robustness checks, which I do not show because of the considerable length of this paper. The main result of the paper – the smoothing effect of fiscal

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does not pass the threshold; 2. in the FD government financing case, changes in NGDP and the indirect tax share do not pass the threshold; 3. In the FE expenditure case, only the changes in NGDP instrument doe snot pass the threshold; 4. in the FD expenditure case, only the indirect tax share does not pass the threshold.

Table 19: Panel IV estimation instrumenting changes in GDP

VARIABLES	(1) FE ΔGovtFin	(2) FE ΔGovtFin	(3) FD ΔGovtFin	(4) FD ΔGovtFin	(5) FE ΔGovtExp	(6) FE ΔGovtExp	(7) FD ΔGovtExp	(8) FD ΔGovtExp
ΔNGDP	6.058**	6.660**	5.817*	5.903*	3.565**	3.566**	5.666**	5.933**
	(2.375)	(2.793)	(3.056)	(3.337)	(1.759)	(1.680)	(2.497)	(2.444)
ΔNGDP*Tax/NGDP	-22.83*		-22.73		-0.700		-15.88***	
	(11.85)		(15.59)		(4.998)		(5.727)	
ΔNGDP*IncTax/NGDP		-45.52*		-37.22		-1.432		-30.56***
		(26.21)		(27.51)		(9.869)		(9.284)
Additional controls								
ΔNGDP*Polity2	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*GDPPC	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*Openness	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*TradeTaxShare	✓	✓	✓	✓	✓	✓	✓	✓
ΔNGDP*IndirectTaxShare	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	219	219	191	191	205	205	182	182
Number of countries	23	23	23	23	23	23	23	23
R^2	-0.102	-0.095	-0.062	-0.059	-0.195	-0.192	-0.107	-0.083

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Time frame: 1926-38. CUE estimation. All changes (Δ) are percentage changes. Time frame: 1927-38. Countries included: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States.

capacity for government financing – is robust to using an extended sample (1920-38) and to using 5 year moving averages for fiscal capacity indicators rather than 1914-26 averages. This is true for pooled OLS, Panel, IV and Panel IV estimations. As mentioned in the text of the paper, the inclusion of further controls – such as gold standard membership and the terms of trade – also do not affect the results.

B   Data description and sources

Nominal non-PPP-adjusted GDP (NGDP) and Openness: I use the nominal, non-PPP-adjusted GDP figures estimated by Klasing and Milionis (2014) for the period 1870-1949. These are based on Maddison's GDP estimates and obtained using the so-called "short-cut method". This method has a long history; Prados de la Escosura (2000) offers a detailed description. In essence, it exploits the relationship between PPP adjusted and non-PPP-adjusted GDP determined by the relative prices of traded and non-traded goods and the relative income level of the country compared to the benchmark country. In doing this, it makes use of the Balassa-Samuelson theorem. This data offers clear advantages compared to standard GDP figures in constructing measures of the debt burden, given that the latter are also in unadjusted nominal terms. They also capture an important additional feature of the Great Depression besides the contraction of output: the huge deflation that accompanied it.

Trade openness: Openness figures are from Klasing and Milionis (2014). The authors ob-

tain the openness figures by combining their estimates of nominal GDP with trade data from Barbieri, Keshk, and Pollins (2009).

Bilateral trade: I use bilateral trade data from Barbieri, Keshk, and Pollins (2009) and Barbieri and Keshk (2016) in 1926 to calculate the Pre-Depression weights to assign to changes in output of the trading partners with which I instrument changes on output.

GDP per capita (GDPPC): GDP per capita is taken from the Maddison's Project's latest update (Bolt and van Zanden, 2013), which incorporates the latest available estimates.

Polity2: This is the polity2 score from the POLITY IV database (Marshall and Jaggers, 2005). It is a combined score of autocracy and democracy (both measure between 0 and 10) and is obtained by subtracting the autocracy score from the democracy one. The two scores are weighed indicators of the competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executive.

Central & local debts and debt service: Papadia (2017).

Years at War: these are the years spent fighting major external conflicts by a country in the period 1816-1913 as reconstructed by Dincecco and Prado (2012) based on Clodfelter (2002)'s database of major external conflicts in Europe, Africa, the Middle East, Asia and Oceania between 1500 and 2000. The variable takes into account the fact that a country might be involved in more than one conflict per year and can thus exceed 97, as in the case of the United Kingdom.

Natural Disasters: is from the EM-DAT database of the Centre for the Epidemiology of Disasters based at the Université Catholique de Louvain (CRED, 2017), which is the most commonly used sources for studies on natural disasters. The data refers to all natural disasters to hit countries in the sample between 1900 – the starting state of the database – and 1926 – the starting date of the analysis. The CRED definition of natural disasters implies one of these conditions: 1) $\geq$ 10 casualties, 2) $\geq$ 100 people affected, 3) declaration of a state of emergency, 4) call for international assistance. I have enquired about the reliability of this data for the early 20th century directly with CRED. As discussed in the body of the paper, they believe that the data underestimates the number of disasters, particularly small disasters, in poorer countries. This indicates that a more accurate reporting would strengthen my results.

Domestic Bond Yields: This data is from various publications of the League of Nations: League of Nations (1939/40) pages 251-54, Table 117; League of Nations (1937/38), pages 256-60, Table 131; League of Nations (1936/37), pages 245-59, Table 127. Bond type (coupon %): Australia Government bonds (4); Austria Government Bonds (miscellaneous) Argentina Government (5); Belgium Government bonds (3); Brazil Government Unified (5); Canada Province of Ontario; Chile Internal Government (7); China Internal Loans; Colombia Internal Government (7); Czechoslovakia Government Bonds (miscellaneous); Denmark Perpetual Government Bonds (3.5); Egypt Government (3.5); Finland State Loans (miscellaneous); France Irredeemable Government Bonds (3); Germany Public Bonds (6 until 1935, then 4.5); Greece Refuge Loan (8); Hungary Forced Loan 1924 (5); India State Loan (4); Italy Government Bond (3.5); Japan Government Bonds (miscellaneous: average of public bonds); Netherlands Irredeemable Government bonds (2.5-3); New Zealand Government Bonds (4); Norway Miscellaneous Bonds (4.5); Poland 1919/20 Dollar Loan (6); Romania Government Bonds (miscellaneous); Spain Internal Debt (4); South Africa Inscribed (5); Sweden Government Bonds (3.25); Switzerland State and Federal Railways (miscellaneous); United Kingdom Consoles (2.5); United States Treasury (miscellaneous: average of all outstanding not callable for 12 years or more); Yugoslavia 1921 Loan (7).

Tax revenue categorization: I re-categorize the data in the original sources as follows. Income (direct) taxes= taxes on income, earnings and capital. Indirect taxes=taxes on capital transactions and transportation+ taxes on sales+ taxes on consumption; Custom duties; Non

divisible taxes.

Tax revenues and composition at central and local level: This data from is from various publications of the German Imperial Statistical Office, and is complemented by data from Moody's investment agency, the League of Nations and Ritschl (2002b). All data is in local currency. As a general rule, when the sources overlap and disagree, I use data from the later source. In order to minimize issues of reverse causality, when the fiscal year ends before the calendar year, I still consider this as a calendar year. For example, if the fiscal year ends in June 1924, I assign data from July 1923 to June 1924 to the year 1924. This inevitably introduces some noise in the data, but is preferable to increasing the risk of the tax data influencing the regressors, which would result in including data from 1925 in the 1924 data since higher frequency data is not available. The data refers to realized revenues rather than budgets. Data coverage could be expanded by using budgets, but these were notoriously unreliable in the interwar period, especially in poorer countries. The sources with the corresponding page numbers are: Statistisches Reichsamt (1930a) page 844-847, Statistisches Reichsamt (1924/25) page 349, Statistisches Reichsamt (1930b) Statistisches Reichsamt (1932) page 188*-189*, Statistisches Reichsamt (1933) page 214*-215*, Statistisches Reichsamt (1934) page 232*-233*, Statistisches Reichsamt (1936b) page 256*-257*, Statistisches Reichsamt (1937) page 270*-271*, Statistisches Reichsamt (1938) page 274*-283*, Statistisches Reichsamt (1939/40) page 310*-311*, Moody's (1933) and League of Nations (1936/37) page 264-273. The country by country breakdown of the sources is as follows.

Austria: central – 1925-27 Statistisches Reichsamt (1930a), 1928-30 Statistisches Reichsamt (1932), 1931-34 Statistisches Reichsamt (1937); local (states and local communities) – Statistisches Reichsamt (1933), 1931-34 Statistisches Reichsamt (1937).

Belgium: central – 1913, 1925, 1927 Statistisches Reichsamt (1930a), 1926, 1928-1935 Statistisches Reichsamt (1937); 1936 Statistisches Reichsamt (1938); 1937 Statistisches Reichsamt (1939/40); local – 1926, 1928-35 Statistisches Reichsamt (1937).

Bulgaria: central 1914, 1925-28 Statistisches Reichsamt (1930a); 1929-30 Statistisches Reichsamt (1932), 1932 Statistisches Reichsamt (1937), 1934-37 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40); local – 1932 Statistisches Reichsamt (1937).

Czechoslovakia: central – 1926 Statistisches Reichsamt (1930a); 1927-28 Statistisches Reichsamt (1932); 1934 Statistisches Reichsamt (1936b), 1935-36 Statistisches Reichsamt (1938).

Denmark: central – 1914, 1927 Statistisches Reichsamt (1930a); 1926, 1928, 1930-34 Statistisches Reichsamt (1937); 1936-37 Statistisches Reichsamt (1939/40); local – 1926, 1928, 1930-34 Statistisches Reichsamt (1937).

Estonia: central – 1925, 1927-30 Statistisches Reichsamt (1934).

Finland: central – 1925-27 Statistisches Reichsamt (1930a), 1928-29 Statistisches Reichsamt (1932), 1930-31 Statistisches Reichsamt (1933), 1932 Statistisches Reichsamt (1934) , 1934-35 Statistisches Reichsamt (1938), 1936-37 Statistisches Reichsamt (1939/40).

France: central – 1912, 1925-27 Statistisches Reichsamt (1930a), 1928-30 Statistisches Reichsamt (1932), 1931-32 Statistisches Reichsamt (1934), 1933-35 Statistisches Reichsamt (1937), 1936 Statistisches Reichsamt (1938); local (departments and municipalities) 1929-30 Statistisches Reichsamt (1932), 1931-32 Statistisches Reichsamt (1934), 1933-35 Statistisches Reichsamt (1937).

Germany: central – revenue only 1921-24 Statistisches Reichsamt (1924/25) , 1925-29 Statistisches Reichsamt (1930b), revenue only 1930-38 Ritschl (2002b) Tabelle A.1, composition 1936 Statistisches Reichsamt (1936b); local (States, municipalities and hanseatic cities) – revenue only 1926-38 Ritschl (2002b) Tabelle A.10.

United Kingdom: central – 1914, 1926-28 Statistisches Reichsamt (1930a), 1929-31 Statistisches Reichsamt (1932), 1932 Statistisches Reichsamt (1933), 1933 Statistisches Reichsamt (1934),

1934-35 Statistisches Reichsamt (1937), 1936-37 Statistisches Reichsamt (1938), 1938 Statistisches Reichsamt (1939/40); local – 1930-31 Statistisches Reichsamt (1932), 1932-33 Statistisches Reichsamt (1934), 1934-34 Statistisches Reichsamt (1937).

Greece: central – 1929-30 Statistisches Reichsamt (1932), 1931 Statistisches Reichsamt (1933), 1933-34 Statistisches Reichsamt (1936b), Statistisches Reichsamt (1938).

Hungary: 1913, 1927-31 Statistisches Reichsamt (1933), 1932-35 Statistisches Reichsamt (1937), 1936 Statistisches Reichsamt (1939/40); local (counties, cities and municipalities) 1929-31 Statistisches Reichsamt (1933), 1932-35 Statistisches Reichsamt (1937).

Ireland: central – 1929-31 Statistisches Reichsamt (1932), 1932 Statistisches Reichsamt (1934), 1934 Statistisches Reichsamt (1936b), 1935-37 Statistisches Reichsamt (1939/40).

Italy: central – 1914, 1926-28 Statistisches Reichsamt (1930a), 1929-31 Statistisches Reichsamt (1932), 1932-33 Statistisches Reichsamt (1937), 1934 Statistisches Reichsamt (1936b), 1936-37 Statistisches Reichsamt (1939/40); local (provinces and municipalities) 1928 Statistisches Reichsamt (1932) and Statistisches Reichsamt (1937), 1932-33 Statistisches Reichsamt (1937).

Latvia: central – 1926, 1928, 1930-35 Statistisches Reichsamt (1937), 1927, 1929 Statistisches Reichsamt (1933); local – 1926, 1928, 1930-35 Statistisches Reichsamt (1937).

Lithuania: central – 1925-31 Statistisches Reichsamt (1933), 1932 Statistisches Reichsamt (1934), 1933-34 Statistisches Reichsamt (1936b),, 1935-36 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40).

Netherlands: central – 1913, 1926 Statistisches Reichsamt (1930a), 1925, 1927, 1929-34 Statistisches Reichsamt (1937), 1935 Statistisches Reichsamt (1938), 1936 Statistisches Reichsamt (1939/40); local – 1925, 1927, 1929-34 Statistisches Reichsamt (1937).

Norway: central – 1914, 1927 Statistisches Reichsamt (1930a), 1926, 1928, 1930-35 Statistisches Reichsamt (1937), 1936 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40); local – 1926, 1928, 1930-35 Statistisches Reichsamt (1937).

Poland: central – 1925, 1927-28 Statistisches Reichsamt (1930a), Poland 1929-30 Statistisches Reichsamt (1932), 1931-32 Statistisches Reichsamt (1934), 1933-34 Statistisches Reichsamt (1937), 1935-36 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40); local – 1933-34 citetReichsamt37.

Romania: central – 1928 Statistisches Reichsamt (1932), 1929-30 Statistisches Reichsamt (1933), 1934 Statistisches Reichsamt (1936b), 1935-36 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40).

Spain: central – 1914,1925-27 Statistisches Reichsamt (1930a), 1928-29 Statistisches Reichsamt (1933), 1932-33 Statistisches Reichsamt (1936b).

Sweden: central – 1913, 1927 Statistisches Reichsamt (1930a), 1926, 1928-33 Statistisches Reichsamt (1937), 1935 Statistisches Reichsamt (1936b), 1936-37 Statistisches Reichsamt (1938), 1938 Statistisches Reichsamt (1939/40); local – 1926, 1928-33 Statistisches Reichsamt (1937).

Switzerland: central – 1913, 1925-27 Statistisches Reichsamt (1930a), 1928-30 Statistisches Reichsamt (1932), 1931-33 Statistisches Reichsamt (1937), 1934-1937 Statistisches Reichsamt (1939/40); local (cantons and municipalities) – 1925-30 Statistisches Reichsamt (1934), 1931-33 Statistisches Reichsamt (1937).

Yugoslavia: central – 1929-20 Statistisches Reichsamt (1932), 1931-33 Statistisches Reichsamt (1934).

Argentina: central – 1925-34 Statistisches Reichsamt (1936b), 1935-37 Statistisches Reichsamt (1939/40).

Bolivia: central – 1925-31 Statistisches Reichsamt (1936b), 1932-35 Statistisches Reichsamt (1938).

Brazil: central – revenue only 1927-29 percentage changes Moody's (1933), 1930-37 Statistisches Reichsamt (1939/40).

Chile: central – 1926-27, 1929-30 Statistisches Reichsamt (1933), 1931-32 Statistisches Reichsamt (1934), 1934-36 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40).
Colombia: central – 1925-30 Statistisches Reichsamt (1934), 1934-36 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40).
Peru: central – 1925-32 Statistisches Reichsamt (1936b), 1933-36 Statistisches Reichsamt (1939/40).
Australia: central – 1914 Statistisches Reichsamt (1930a), 1926-31 Statistisches Reichsamt (1934), 1933-34 Statistisches Reichsamt (1936b), 1935-37 Statistisches Reichsamt (1938), 1938 Statistisches Reichsamt (1939/40).
Japan: central – 1914.1926-28 Statistisches Reichsamt (1930a), 1929-30 Statistisches Reichsamt (1932),1931-33 Statistisches Reichsamt (1934), 1934 Statistisches Reichsamt (1936b), 1935-36 Statistisches Reichsamt (1938), 1937-38 Statistisches Reichsamt (1939/40).
Canada: central – 1925-28 Statistisches Reichsamt (1930a), 1929-30 Statistisches Reichsamt (1932), 1931 Statistisches Reichsamt (1933), 1933-34 Statistisches Reichsamt (1936b), 1935 Statistisches Reichsamt (1938).
Egypt: central – 1913, 1926-31Statistisches Reichsamt (1933), 1935 Statistisches Reichsamt (1938), 1936-37 Statistisches Reichsamt (1939/40).
South Africa: central – 1926-31 Statistisches Reichsamt (1933), 1932 Statistisches Reichsamt (1934), 1934 Statistisches Reichsamt (1936b), 1935-36 Statistisches Reichsamt (1936b), 1937 Statistisches Reichsamt (1939/40).
USA: central – 1914, 1926, 1928 Statistisches Reichsamt (1930a), 1927 Statistisches Reichsamt (1937), 1929-31 Statistisches Reichsamt (1932), 1932 Statistisches Reichsamt (1933), 1933 Statistisches Reichsamt (1934), 1935-37 Statistisches Reichsamt (1938).
Turkey: central – 1925-27 Statistisches Reichsamt (1930a), 1928-30 Statistisches Reichsamt (1932), 1933 Statistisches Reichsamt (1936b), 1934 Statistisches Reichsamt (1938), 1935 Statistisches Reichsamt (1939/40).
India: central – 1926-30 Statistisches Reichsamt (1933), 1931 Statistisches Reichsamt (1934), 1934-35 Statistisches Reichsamt (1936b), 1936 Statistisches Reichsamt (1938), 1937 Statistisches Reichsamt (1939/40).

Government financing and expenditure at central and local level: data on government financing and expenditure also comes from publications of the German Imperial Statistical Office. All data is in local currency. As discussed in the paper, government financing is a composite of tax revenues, non-tax revenues and long-term (over 1 year maturity) borrowing, essentially it is the budgeted part of government revenues. Non-tax revenues include the profits of publicly owned corporations, public monopolies and unclassified revenues (such as the the sale abroad of certain commodities). As is the case with most public sector data in the interwar period, accounting standards tend to differ across countries As for tax revenues, when fiscal years do not correspond to calendar years I assign data from the year in which the fiscal end to the whole calendar year and the data all refer to realized revenues rather than budgets. The authors of the yearbooks made an effort to make the data more easily comparable across countries, but issues remain (e.g. in Spain short term borrowing cannot be separated out). In the analysis, the problem is minimized by exploiting the time-series rather that cross sectional variation in the data. For instances where only some local bodies are included for some years (provinces are included, but not municipalities), I use the information from years where data is available for all local bodies to estimate the missing revenue using the average ratio between central and local revenues. The common sources with page numbers are: Statistisches Reichsamt (1924/25) page 126* Statistisches Reichsamt (1935) page 229*-235*, Statistisches Reichsamt (1937), Statistisches Reichsamt (1936b), Statistisches Reichsamt (1938) page 274*-283*, Statistisches Reichsamt (1939/40) Statistisches Reichsamt (1941/42). The country by country sources are as follows.

Austria: central financing & expenditure – 1923-26 Statistisches Reichsamt (1936a) page 208, 1927-35 Statistisches Reichsamt (1937); local financing & expenditure (states and municipalities with population over 5000)– 1927-31 Statistisches Reichsamt (1935).

Belgium: central financing & expenditure – 1912 Statistisches Reichsamt (1924/25), 1920-33 Statistisches Reichsamt (1936a) page 43, 1936 (revenue only) Statistisches Reichsamt (1938), 1937 (revenue only) Statistisches Reichsamt (1941/42); local financing & expenditure (provinces and municipalities) – 1927-32 (municipalities only) Statistisches Reichsamt (1935), 1935-36 (municipalities only) Statistisches Reichsamt (1939/40), both integrated with proportions between provinces and municipalities from 1932-35 Statistisches Reichsamt (1938) .

Bulgaria: central central financing & expenditure – 1920–33 Statistisches Reichsamt (1936a) page 55, 1935-36 Statistisches Reichsamt (1938); local financing & expenditure (departments and municipalities) – 1928-33 Statistisches Reichsamt (1935), 1934-35 Statistisches Reichsamt (1938).

Czechoslovakia: central financing & expenditure – 1925-34 Statistisches Reichsamt (1936b), 1935-36 Statistisches Reichsamt (1937); local financing & expenditure – states and municipalities 1929-30 Statistisches Reichsamt (1935), only states 1935-38 Statistisches Reichsamt (1938).

Denmark: central financing & expenditure – 1912-13 Statistisches Reichsamt (1924/25), 1920-33 Statistisches Reichsamt (1936a) page 63, 1936 (revenue only) Statistisches Reichsamt (1938), 1938 (revenue only) Statistisches Reichsamt (1939/40); local financing & expenditure (municipalities) – 1920-27 estimate based on proportion between central and local in 1928-33 Statistisches Reichsamt (1935), 1934-36 Statistisches Reichsamt (1938).

Estonia: central financing & expenditure – 1926-27, 1933 Statistisches Reichsamt (1936b), 1928–32 Statistisches Reichsamt (1935), 1934 Statistisches Reichsamt (1937), 1937-38 (revenue only) Statistisches Reichsamt (1938); local financing & expenditure – 1928-33 Statistisches Reichsamt (1935).

Finland: central financing & expenditure – 1911-13 Statistisches Reichsamt (1924/25), 1920-33 Statistisches Reichsamt (1936a) page 84, 1934-35 Statistisches Reichsamt (1936b), 1936 (revenue only) Statistisches Reichsamt (1938), 1937 (revenue only)Statistisches Reichsamt (1939/40); local financing & expenditure (cities and rural municipalities) – 1925-31 Statistisches Reichsamt (1936a), 1932 Statistisches Reichsamt (1935), 1933-35 Statistisches Reichsamt (1938).

France: central financing & expenditure – 1911-13, 1920 Statistisches Reichsamt (1924/25), 1921-33 Statistisches Reichsamt (1936a) page 95, 1937 (revenues only) Statistisches Reichsamt (1941/42); local financing & expenditure (departments) – 1920-30 Statistisches Reichsamt (1936a) page 96, 1934 (revenues only) Statistisches Reichsamt (1939/40).

Germany: central & expenditure – 1925 Statistisches Reichsamt (1924/25), 1926-38 Ritschl (2002b); local financing & expenditure (states and municipalities) – 1926-34 Statistisches Reichsamt (1936a) page 18.

United Kingdom: financing & expenditure – 1912-14 Statistisches Reichsamt (1924/25), 1921-26 Statistisches Reichsamt (1936a) page 124, 1927-37 Statistisches Reichsamt (1937), 1938 (revenue only) Statistisches Reichsamt (1939/40); local financing & expenditure (England and Wales only) – 1921-33 Statistisches Reichsamt (1936a), 1934-35 Statistisches Reichsamt (1938), 1936 (revenues only), 1937-38 (expenditure only) Statistisches Reichsamt (1939/40).

Greece: central financing & expenditure – 1928-34 Statistisches Reichsamt (1935), 1935-36 (revenue only) Statistisches Reichsamt (1938), 1938 (revenue only) Statistisches Reichsamt (1939/40); local financing & expenditure – 1928-33 Statistisches Reichsamt (1935), 1937-38 (revenue only) Statistisches Reichsamt (1939/40).

Hungary: central financing & expenditure – 1925-26 Statistisches Reichsamt (1936a) page 305, 1927-36 Statistisches Reichsamt (1937), 1938 (revenue only) Statistisches Reichsamt (1939/40).

Ireland: central financing & expenditure – 1922-34, 1935-36 (revenue only) Statistisches Reich-

samt (1936a), page 140, 1935 (expenditure only) Statistisches Reichsamt (1936b), 1938 (revenue only) Statistisches Reichsamt (1939/40); local financing & expenditure (municipalities) – 1929-33 Statistisches Reichsamt (1935).

Italy: central financing & expenditure – 1912-14 Statistisches Reichsamt (1924/25), 1921-34 Statistisches Reichsamt (1936a) page 145 1936-38 Statistisches Reichsamt (1938); local financing & expenditure (municipalities) – 1928 Statistisches Reichsamt (1935), 1935 Statistisches Reichsamt (1938).

Latvia: central financing & expenditure – 1927, 1934-35 Statistisches Reichsamt (1937), 1928-33 Statistisches Reichsamt (1935); local financing & expenditure – 1928-33 Statistisches Reichsamt (1935), 1935-37 1928-33 Statistisches Reichsamt (1938)

Lithuania: central financing & expenditure – 1926, 1932-1936 1928-33 Statistisches Reichsamt (1937), 1937 (revenues only) 1928-33 Statistisches Reichsamt (1938); local financing & expenditure – 1927-33 Statistisches Reichsamt (1935).

Netherlands: central financing & expenditure – 1911-13 Statistisches Reichsamt (1924/25), 1920-25 Statistisches Reichsamt (1936a) page 185, 1926-35 Statistisches Reichsamt (1937), 1937 (revenues only) Statistisches Reichsamt (1941/42); local financing & expenditure (provinces and municipalities) – 1927-32 Statistisches Reichsamt (1935), 1933-35 Statistisches Reichsamt (1938).

Norway: central financing & expenditure – 1921-26 Statistisches Reichsamt (1936a) page 198, 1927-35 Statistisches Reichsamt (1937). 1936 (revenues only) Statistisches Reichsamt (1938); local financing & expenditure (municipalities) – 1925-31 (revenues) Statistisches Reichsamt (1936a),1928-31 (expenditure), 1932 Statistisches Reichsamt (1935), 1934-36 Statistisches Reichsamt (1938).

Poland: central financing & expenditure – 1922-31 (revenues) 1922-28 (expenditure) Statistisches Reichsamt (1936a) page 222, 1932-37 (revenues) 1929-37 (expenditure) Statistisches Reichsamt (1937); local financing & expenditure (municipalities) – 1928-34 Statistisches Reichsamt (1935), 1936 Statistisches Reichsamt (1938).

Romania: central financing & expenditure – 1926-31, 1933-37 Statistisches Reichsamt (1937).

Spain: central financing & expenditure – 1927-34 Statistisches Reichsamt (1935), 1935 Statistisches Reichsamt (1936b); local financing & expenditure – 1927-31 Statistisches Reichsamt (1935).

Sweden: central financing & expenditure – 1911-13 (revenues) 1911-12 (expenditure) Statistisches Reichsamt (1924/25), 1920-26 Statistisches Reichsamt (1936a) page 261, 1927-34, 1936 Statistisches Reichsamt (1937), 1935 Statistisches Reichsamt (1936b); local financing & expenditure – 1921-32 Statistisches Reichsamt (1936a), 1933-34 Statistisches Reichsamt (1938).

Switzerland: central financing & expenditure – 1911-1913 Statistisches Reichsamt (1924/25), 1920-25 Statistisches Reichsamt (1936a) page 273, 1926-36 Statistisches Reichsamt (1937) except revenue 1936 Statistisches Reichsamt (1938); local financing & expenditure – 1920-33 Statistisches Reichsamt (1936a).

Yugoslavia: central – financing & expenditure 1928-32 (revenue) 1928-33 (expenditure) Statistisches Reichsamt (1935), 1933-38 (revenue) 1934-38 (expenditure) South-Eastern European Monetary Network (2014); local financing & expenditure – 1929-33 (revenue) 1928-33 (expenditure) Statistisches Reichsamt (1935), 1935-36 Statistisches Reichsamt (1938).

Argentina: central financing & expenditure – 1920-33 Statistisches Reichsamt (1936a) page 416, 1935-36 Statistisches Reichsamt (1939/40).

Bolivia: central financing & expenditure – 1920-33 Statistisches Reichsamt (1936a) page 424.

Brazil: central financing & expenditure – 1920-33 Statistisches Reichsamt (1936a) page 427, 1935 Statistisches Reichsamt (1939/40), 1936 Statistisches Reichsamt (1937); local financing & expenditure (states) – 1920-32 Statistisches Reichsamt (1936a).

Chile: central financing & expenditure – 1927-34 Statistisches Reichsamt (1935), 1937 Statistisches Reichsamt (1939/40); local financing & expenditure – 1929-33 Statistisches Reichsamt (1935).

Colombia: central financing & expenditure – 1920-33 Statistisches Reichsamt (1936a) page 466, 1936-37 Statistisches Reichsamt (1939/40); local financing & expenditure – 1927-33 Statistisches Reichsamt (1936a).

Peru: central financing & expenditure – 1920-33 Statistisches Reichsamt (1936a) page 482, 1935-36 (revenues only) Statistisches Reichsamt (1939/40), 1937 (revenues only) Statistisches Reichsamt (1941/42).

Uruguay: central financing & expenditure – 1923-31 Statistisches Reichsamt (1936a) page 490, 1935-36 (revenues only) Statistisches Reichsamt (1939/40).

Australia: central financing & expenditure – 1912-14 Statistisches Reichsamt (1924/25), 1921-25 Statistisches Reichsamt (1936a) page 526, 1926-36 Statistisches Reichsamt (1936b). 1937-38 (revenues only) Statistisches Reichsamt (1939/40); local financing & expenditure (states and municipalities) – 1921-34 (municipalities), 1937-38 Statistisches Reichsamt (1939/40), both integrated with 1928-33 Statistisches Reichsamt (1935) to calculate states and municipalities.

New Zealand: central financing & expenditure – 1920-26, 1928-34 Statistisches Reichsamt (1936a) page 536, 1938 (revenues only) Statistisches Reichsamt (1939/40).

Japan: central financing & expenditure – 1911-13 Statistisches Reichsamt (1924/25), 1921-34 Statistisches Reichsamt (1936a) page 377-78, 1935 (revenues) Statistisches Reichsamt (1936b), 1936 (revenues) Statistisches Reichsamt (1938), 1935-37 Statistisches Reichsamt (1937) ; local financing & expenditure – 1921-34 Statistisches Reichsamt (1936a) page 377-78.

Indonesia: central financing & expenditure – 1920-33 (1932 and 1933 are budget figures) Statistisches Reichsamt (1936a) page 389.

Canada: central financing & expenditure – 1912-14Statistisches Reichsamt (1924/25), 1921-34 Statistisches Reichsamt (1936a) page 454, 1935 Statistisches Reichsamt (1936b), 1936 Statistisches Reichsamt (1937), 1937 (revenues only) Statistisches Reichsamt (1939/40); local financing & expenditure (provinces and municipalities) – 1920-33 (provinces only) Statistisches Reichsamt (1936a) integrated with 1928-33 Statistisches Reichsamt (1935).

Egypt: local financing & expenditure – 1937-38 Statistisches Reichsamt (1939/40).

South Africa: central financing & expenditure – 1926-27, 1934 Statistisches Reichsamt (1936b), 1928-33 Statistisches Reichsamt (1935), 1935 Statistisches Reichsamt (1937), 1937 Statistisches Reichsamt (1941/42); local financing & expenditure (provinces and municipalities) – 1928-32 Statistisches Reichsamt (1935).

USA: central financing & expenditure – 1912-14, 1921-24 Statistisches Reichsamt (1924/25), 1926-27, 1933 (revenues), 1935 Statistisches Reichsamt (1936b), 1928-32 (revenues) 1928-34 (expenditure) Statistisches Reichsamt (1937), 1934 (revenues) 1936 (expenditure), 1937 Statistisches Reichsamt (1937), 1936, 1938 (revenues) Statistisches Reichsamt (1938); local financing & expenditure (states) – 1928-32 Statistisches Reichsamt (1935).

Turkey: central financing & expenditure – 1926-27 Statistisches Reichsamt (1936b), 1928-33 (revenues), 1928-32 (expenditure) Statistisches Reichsamt (1935), 1934-36 (revenues) 1933-36 (expenditure) Statistisches Reichsamt (1937), 1938 Statistisches Reichsamt (1939/40); local financing & expenditure (villages and municipalities) – 1928-31Statistisches Reichsamt (1935).

India: central financing & expenditure – 1926-27, 1933-35 Statistisches Reichsamt (1936b), 1928-32 Statistisches Reichsamt (1935), 1936 Statistisches Reichsamt (1937), 1937-38 (revenues only) Statistisches Reichsamt (1939/40); local financing & expenditure – 1928-32 (provinces, districts, local corporations and cities), 1933-34 (provinces) Statistisches Reichsamt (1935),1935 (provinces), 1936 (provinces and municipalities), 1937 (provinces) (revenues only) Statistisches Reichsamt (1939/40).