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WAR, MOBILIZATION, AND FISCAL CAPACITY: TESTING THE BELLICIST THEORY IN GREECE, 1833-1939

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ABSTRACT

Constructing a new dataset of Greek public revenues and expenditures for the years 1833 to 1939, this paper finds that war mobilizations undermined tax revenues in the short run, but helped the Greek state increase its fiscal capacity in the long run. Tax revenues increased on the heels of major spikes in defense expenditures, even in cases where mobilizations did not escalate to war. But even in normal times, changes in military expenditures had a stronger effect on taxes, compared to similar changes in civilian outlays. The paper thus provides both data and evidence in support of bellicist theories of state formation for Greece, while also proposing a new approach to testing for the effects of war on fiscal capacity.

JEL-Classification: N43, N44, H6

Keywords: war, taxation, fiscal capacity, military expenditures, state-formation

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> "War involves in its progress such a train of unforeseen and unsupposed circumstances that no human wisdom can calculate the end. It has but one thing certain, and that is to increase taxes." – Paine, Thomas (1787) *Prospects on the Rubicon: or, an investigation into the causes and consequences of the politics to be agitated at the meeting of Parliament*. London: J. Debrett. p. 5.

1. Introduction

The Balkan states that emerged in the nineteenth and early twentieth centuries were both bellicose – notoriously "producing more history than they can consume"[1] – and weak, in terms of their despotic and infrastructural power. Like Latin America, where several new states also gained their independence at this time, the Balkans have thus been used to challenge the applicability of "bellicist" theories of state formation (Maleševic, 2012; 2020), which link state capacity to interstate warfare (Tilly, 1975; Mann, 1986). Unlike Latin America, however, which has received extensive attention (Centeno, 2002; Soifer, 2015; Schenoni, 2021), Southeastern Europe has hitherto been excluded from empirical investigations, not least due to existing data limitations.

This paper seeks to redress part of this imbalance by focusing on Greece from the 1830s to the eve of the Second World War.[2] Greek historiography has long lamented the cycles of public borrowing, overspending and default associated with Greece's military (mis)adventures during this time (Dertilis 2020). In this context, defense expenditures have invariably been seen as detrimental to economic development and state modernization.[3] This paper takes a different view, arguing that wars increased the Greek state's fiscal capacity, i.e., its ability to raise taxes.

To this end, I construct a new dataset of public revenues and expenditures, offering improved estimates of taxes, civilian and military expenditures. Aggregates are reconstructed from primary data to reflect standard definitions and ensure consistency. The paper thus contributes to recent attempts to increase the availability of quantitative

[1] Incorrectly attributed to Winston Churchill, the quip – which targets "the people of Crete", rather than the Balkans, in the original – belongs to a fictional character in a short story titled "The Jesting of Arlington Stringham", published in *The Westminster Gazette* on August 20, 1910 by British humorist Hector Hugh Munro's (or Saki) and later included in Munro (1911).

[2] Extending the analysis beyond 1939 would have been neither simple, nor interesting. Foreign occupation, civil war and extensive foreign aid inflows render data compilation and interpretation difficult for more than a decade. By the time the situation is normalized, the relative importance of military expenditures has declined substantially.

[3] Only recently, have some historians attempted to highlight the state-building aspects of Greece's irredentism and military expenditures (Kostis, 2018).

information on Southeastern Europe (Lazaretou, 2014; Morys, 2021). The dataset and methodology are discussed in Appendix A.

While most applications of bellicist theory test the effect of *actual* wars on fiscal capacity (Besley and Persson, 2009; Dincecco and Prado, 2012; Sabate, 2016; Goenaga *et al*., 2023), this paper focuses on a broader set of *mobilization episodes*, defined as periods of heightened military spending. The innovation is inspired by the Balkan experience, where war threats and saber-rattling were commonplace in the nineteenth century. Greek history alone offers several examples of large-scale military mobilizations – some with profound fiscal implications (Kakridis, 2018) – that did *not* escalate into war. My contention is that, if expensive enough, such episodes can produce the same fiscal pull as actual wars. From this perspective, the paper also interacts with the literature on the role of war threats and rivalries on state-building (Thies, 2004; 2005).

The paper proposes two methods for detecting mobilization episodes and identifies five such episodes in the Greek data. In line with bellicist theory, mobilizations are found to increase tax revenues in the long run. In Greece, the effect seems to be driven by indirect, rather than direct taxation. By contrast, contemporaneous effects are negative: tax revenues subside during mobilizations, presumably because of weaker enforcement and limited foreign trade. These findings seek to complement existing research on the effect of wars in the long nineteenth and early twentieth century, albeit through a case study, rather than a panel comparison (Sabate, 2016; Goenaga et *al*., 2023).

The above findings are confirmed when tax revenues, military and civilian outlays are included in a vector autoregression (VAR), along with mobilization episodes as exogenous shocks. Treating all three variables as endogenous while controlling for mobilizations, the VAR shifts emphasis to the effect of defense spending in normal times. Impulse response functions suggest that, even outside mobilization episodes, an increase in military outlays had a stronger positive effect on revenues, compared to an equal increase in civilian expenditures. While the use of multi-equation models to study the dynamic interaction of revenues with expenditures has a long history (Furstenberg et *al*., 1986), its use to test for bellicist effects is novel but constitutes a natural extension of this paper's emphasis on defense expenditures.

A final methodological innovation concerns the use of indicator saturation methods (Castle and Hendry, 2019) and the *autometrics* selection algorithm (Doornik, 2009) to identify potential outliers and structural breaks, such as mobilization episodes. The method is flexible enough to accommodate different specifications and is completely agnostic; as such, it not only improves specification, but it also provides an interesting complement to historically informed approaches to identifying exogenous shocks.

The rest of the paper is structured as follows. Section 2 reviews the relevant literature and explains the emphasis on mobilization. Section 3 provides some historical context on Greece and highlights its importance as a case study. Section 4 introduces the new data and applies two complementary methods to identify mobilization episodes. Section 5 then tests different aspects of the bellicist theory during, after and in-between these mobilizations, confirming the relevance of bellicist theory to the Greek case.

2. War and fiscal capacity

2.1 Bellicist theories of state formation

The nexus between war and taxation figures prominently in bellicist theories of state formation (Emmenegger and Walter, 2021). These are primarily (though by no means exclusively) associated with the work of Charles Tilly (1975; 1985; 1992), who considered warfare as a key vehicle of state transformation in early modern Europe. His famous dictum, "war made the state and the state made war" (Tilly, 1975: 42) hints at a process whereby wars force states to invest in the infrastructure and institutions necessary to extract more resources – or die trying; wars thus act both as a transformative and a selective force, increasing the powers and capacity of (surviving) states.

In this context, wars can impact several dimensions of state capacity, broadly defined as the "the institutional capability of the state to carry out various policies" (Besley and Persson, 2011: 6). Wars have thus been known to stimulate significant legal, financial, and organizational innovations. Attention is usually focused on their effect on fiscal capacity, defined as states' ability to extract resources through taxation. This is usually proxied by normalized tax revenues, without some controversy on the most appropriate metric (Savoia and Sen, 2015). Empirical support for the theory usually

takes the form of a positive conditional correlation between the past incidence of wars and modern taxation.

While several variants of the bellicist theory have been put forward, most rely on some push/pull interaction. On the pull side, wars impose significant burdens, forcing the state to marshal additional resources to finance war efforts and compensate victims; on the push side, mobilization extends the state's despotic and infrastructural powers, which are then used to extract more revenue (Finer, 1975; Mann, 1986). The latter process may not be coercive, if war also increases people's tolerance for higher taxes; if these taxes persist *after* the war is over, states ratchet up their resources over time (Peacock and Wiseman 1961).

In the decades since its original formulation, the bellicist thesis has been steadily challenged and refined. In the process, many authors have proposed various scope conditions and elaborations. Thus, Besley and Persson (2008; 2009; 2011; 2012) modelled state-building as the outcome of strategic, forward-looking interactions between competing political factions, each deciding how much to invest in a common-interest public good. While external threats encouraged the build-up of state capacity, civil war, political instability, and ethnic heterogeneity worked against it. Karaman and Pamuk (2013) argued that mismatches between economic structure and political regime determined whether wars increased fiscal capacity: authoritarian regimes performed better in rural economies, while representative ones succeeded in urban settings. For their part, Gennaioli and Voth (2015) highlighted the importance of military technology and state fragmentation. Thus, wars only encouraged state-building *after* the Military Revolution, when money became important for military success; even so, divided states rationally dropped out of the race, producing divergent patterns of taxation.

2.2 Extending the theory to the nineteenth century

Attempts to extend the bellicist theory beyond Western Europe and the early modern period have yielded mixed results (Goenaga and Hagen-Jamar, 2018). Rather than seeking to confirm the theory's transhistorical validity, modern research aims to uncover the circumstances when it applies. This has been easier to do for twentieth century conflicts, not least due to the significant impact of the two World Wars. By contrast, the nineteenth century has been given shorter shrift.

Industrialization, railroads, and mass conscription transformed warfare (Hoffman, 2015: 179-196), just as nationalism and the gradual expansion of the franchise altered the relationship between states and societies. There are thus good reasons to believe the dynamics of state-building changed in the nineteenth century. Yet several of these changes may well have *strengthened* the impact of warfare on fiscal capacity. Mass conscription and schooling extended the state's administrative reach and socialized the population. In the age of nationalism, people became more willing to contribute toward national defense (Posen, 1993). New technologies increased the importance of money in warfare, thus increasing war's fiscal implications. Indeed, by reducing the cost of mobilization, railways increased military outlays (Hoffman, 2015: 195).

Building on these insights, Sabaté (2016) uses data on 16 countries from 1816 to 1995 to confirm that changes in military tactics and technology maintained the effect of warfare on fiscal capacity, at least until the nuclear age. More recently, Goenaga *et al*. (2023) extend the sample to 27 American and European countries and focus on the years 1816-1913. Their results suggest only intense wars – as measured by the number of fatalities – triggered important increases in public revenues. Such wars, however, were rare at the time, due to the uneven diffusion of military technology.

2.3 Wars, threats of war and mobilization episodes

Does state-building require actual war, or is the threat of war just as effective at producing the hypothesized effect? Conscious of the difficulty in measuring the perceived threat of war, most empirical researchers focus on actual wars, defined as episodes of sustained violence involving significant fatalities. Thus, the Correlates of War (CoW) project sets a threshold of 1,000 battle-related deaths to distinguish wars from other types of conflict (Sarkees 2010).

Focusing on battle-deaths, however, produces a rather narrow concept of war. The point is best made by Thomas Hobbes, who reminds readers of his *Leviathan* (1651) that foul weather did not consist in "a shower or two of rain", but in a general inclination to rain; similarly, "warre, consisteth not in Battell onely, or the act of fighting; but in a tract of time, wherein the Will to contend by Battel is sufficiently known" (Part I, chapter 13). What is more, the bellicist argument does not hinge on rainfall, but on people's efforts to protect themselves against it. Thus, early

formulations of the theory also emphasized war preparation. As Centeno (2002, p. 266) notes: "it is not necessarily war itself, but the threat of war that often produces the positive state-building consequences".

But how can the threat of war be measured? One approach relies on the CoW list of Militarized Interstate Disputes (MIDs), which records all instances where one state has threatened, displayed, or used force against another since 1816. Drawing on this data, Cameron Thies (2004; 2005) used the concept of "interstate rivalries" (Diehl and Goertz, 2000) to identify strings of disputes that posed significant threats and found that while *internal* rivalries tended to undermine states, *external* rivalries increased their extractive capacity. The method has since been refined and applied to different regions and times.

While the rivalry approach represents an important departure from narrow definitions of war, it faces three important limitations. *First*, rivalries endure over longer periods of time, whereas war-induced changes in fiscal capacity are often punctuated (Peacock and Wiseman, 1961; Rasler and Thomson, 2018). Testing his theory in Latin America, Thies (2005) finds evidence of a positive impact of rivalries on fiscal capacity, but admits these to be "long-term, slow-moving processes" (p. 463). Periods of rivalry may thus account for incremental changes, not major discontinuities in tax burdens.

Second, rivalries are still defined in terms of actual disputes, some of which escalate into war. This means that no rivalry can pre-date the first dispute, or – as Hobbes might put it – there can be no foul weather without the first drop of rain. This is not always realistic: actual displays of hostility may well be the result of long-brewing interstate tension. Nor is it necessarily relevant for the bellicist argument to work: people have been known to carry umbrellas, even on occasions when the sky looks menacing, but the weather stays dry. In fact, war preparations may end up averting outright conflict, something umbrellas unfortunately haven't been able to do for rain!

Finally, low-hostility disputes, such as threats or displays of force, do not necessarily cause an increase in resource mobilization, not least because reactions depend on how each threat is perceived. But why focus on disputes, when the bellicist argument is driven by how states perceive and – most importantly – *respond* to those disputes? Why not focus directly on that response, i.e., on the resources mobilized to defend against any threat – irrespective of whether it leads to war?

This is the approach taken in this paper, where defense spending is used to capture fiscal pull. While the use of military expenditures to proxy episode intensity is not new to the literature (Sabaté, 2016), it has hitherto only been applied to pre-defined war episodes. In other words, given the outbreak of war, military spending has been used to measure intensity. Here we follow the opposite course: we use changes in military outlays to identify "mobilization episodes", i.e., instances where interstate hostility is accompanied by increased fiscal pressure.

3. War and state formation in Greece

Having fought a protracted war against the Ottoman empire in the 1820s, Greece emerged as a tiny independent kingdom on the tip of the Balkan peninsula in 1830. Its borders were finalized two years later, after Britain, France and Russia interceded with the Ottomans; the three Great Powers also guaranteed a sizeable loan to the new state – not least to help convince the Bavarian prince Otto to accept the country's throne. Greece was thus born as part of the Eastern question, which concerned the fate of the ailing Ottoman Empire and its European lands. Its own irredentist aspirations were soon pitted against those of its neighbors, as nationalism spread across the Balkans (Koliopoulos and Veremis, 2009). Thus, the country strove to modernize and become a "model [Western] kingdom in the East" (Skopetea, 1988).

Modernization proved challenging. Ravaged by war, Greek lands were sparsely populated, predominantly agrarian and extremely poor. The new state edifice had to erected from scratch and with minimal resources (Kostis, 2018). What is more, it had to be established to mark a break, rather than continuity with the Ottoman past: longstanding rules and institutions were thrown out, as Western legal, military, and administrative practices were imported. The significant expenses and setbacks that marked the first years of the Bavarian regency are telling of the difficulties involved in grafting western institutions onto a Balkan agrarian society. State-building proceeded apace with nation-building (Mishkova, 1994). Mass schooling was introduced as early as 1834, but implementation remained sketchy for almost a century. The regency attempted to replace irregular armed bands with a modern army and introduced mass conscription as early as 1837; both reforms were heavily resisted, and army modernization only got underway in earnest in the late nineteenth century (Malesis, 2018).

Despite facing several setbacks, Greece succeeded in gradually expanding its borders to include the Ionian islands (1864), Thessaly (1881) and – in the aftermath of the Balkan wars of 1912-13 – Epirus, Crete, and most of Macedonia. Rapid territorial expansion strained the existing state apparatus and sowed the seeds of discontent, which germinated during the 1915-17 period of "National Schism". A dispute between the king and his government concerning Greece's role in the First World War divided the country: while the "old" territories in the south remained loyal to the king, who favored neutrality, the "new lands" sided with the Prime Minister Eleftherios Venizelos, who invited Entente troops to land in Macedonia. By 1917, Venizelos had prevailed, and Greece joined the war on the winning side, making additional territorial gains in the Aegean and Thrace, and establishing a foothold in Asia Minor. Defeat in the Greek-Turkish war of 1920-22, however, pushed the Greek border back and displaced hundreds of thousands of Christians. The Treaty of Lausanne (1923) settled countries' borders and formalized the forced population exchange between Greece and Turkey. This marked the end of Greece's irredentist aspirations and a shift in its foreign policy, which henceforth sought to temper the revisionism of its neighbors.

Several aspects of this story render the first century of Greece's history an interesting case. The belligerence that came part and parcel with the country's precarious geopolitical position and territorial revisionism is the most obvious one. Drawing on data from the Correlates of War project, Figure 1(a) shows the distribution of war-years by state for the 1816-1939 period. Out of a total of 93 sovereign states recognized during those years, 60 became involved in at least one war; multiplying by the number of years yields a total of 380 war-years. With five episodes and 14 war-years, Greece thus ranks eighth globally – the first country on the list to not be a major power.[4]

A similar pattern emerges if we use a lower hostility threshold to include all Militarised Interstate Disputes (MIDs), not just wars. Figure 1(b) shows the distribution of MID-years across states. Factoring in dispute duration yields a total of 2,118 dispute-years, distributed across 79 (of the 93) sovereign states; Greece now ranks fifteenth, flanked by several Latin American states, while major powers still top the list.

[4] The Greek War of Independence, which took place before Greece was recognised as a sovereign state (1821-28), is *not* included in this calculation. The full list of the 32 Greek MIDs (and 45 dispute-years) can be found in Appendix B.

The adjustment to include "lesser" disputes is particularly pertinent to Greece, where most nineteenth century episodes were not outright wars: diplomatic disputes and revolts by Greek orthodox populations living in Ottoman lands (Thessaly, Macedonia, Crete, etc.) regularly prompted the Greek state to mobilize its military. Sabre-rattling was commonplace, border skirmishes sometimes broke out and irregular troops were often sent to support insurgents (Koliopoulos, 1987; Batalas, 2003). Some episodes escalated into more serious conflagrations, as in 1897, but fatalities were few and most disputes ended swiftly – often with the intercession of the Great Powers.

Yet "lesser" militarized disputes also cost money. Focusing on the defense expenditures of 16 (mostly) European states between 1870 and 1913, Eloranta (2007) estimates a mean "military burden" between 2–4% of GDP, with a standard deviation close to one percentage point. By contrast, even if one were to exclude the Balkan wars of 1912-13, Greece's military burden over the same period is 6.8%, with a standard deviation of 4.4% (Section 4) – more than any country in Eloranta's sample. Thus, even in relatively peaceful times, Greece faced considerable fiscal pressure from its military outlays.

4. (New) data and the identification of mobilization episodes

This paper uses on a new set of Greek public finance data for 1833-1939, derived from published "Statements of Revenues and Expenditures of the Greek state". These report annual central government outturns, published intermittently until 1940. Deriving consistent historical series from thousands of disparate entries made over a century of shifting accounting and reporting standards is no easy task. Neither is reading about it, so details have been relegated to a lengthy Appendix A, which also explains why other revenue and expenditure aggregates are not sufficiently reliable to use in some econometric applications.

4.1 Revenues

On the revenue side, the dataset builds on Dertilis (1993) and Prontzas *et al*. (2011), who compiled the first historical revenue dataset for 1833-1939. This comprised approx. 25,000 data points of different revenues, which were used as a starting point. After some initial corrections, each revenue type was re-classified into one of several

categories to derive consistent aggregates (Appendix A, Section A3.1). Given the paper's emphasis on fiscal capacity, priority was given to distinguishing taxes from everything else.

The most important aggregates are shown in Figure 2. Revenues have been normalised by GDP. The overall pattern shows a slow decline until the early 1860s, followed by an unsteady increase; the 1915-17 civil war and concomitant Entente blockade takes a toll on state income, particularly tariffs; revenues recover in the 1920s, which witness a staggering increase in tax burdens, only tempered by the consequences of the Great Depression and the collapse of foreign trade. The share of income extracted by taxes is significant, compared to rich countries at the time (Piketty, 2014: figure 13.1); taking local taxes into consideration, raises the tax burden further (Kostis, 2006). As for the tax structure, the data confirms the increase of indirect over direct taxes identified by Dertilis (1993) and Kammas and Sarantides (2020). Direct taxes consist primarily of taxes on agricultural products and land; income taxes were gradually introduced in the early twentieth century, but their role remained minimal.

4.2 Expenditures

Data challenges were greatest on the expenditures side, where no detailed historical dataset has been published. The existing estimates included in the SEEMHN database (Lazaretou, 2014) draw on unpublished data from Antoniou *et al*. (1999), whose methodology is opaque (see Appendix A). Thus, a further 10,000 data points were copied manually from published outturns and used to derive new estimates of military and civilian spending. Military expenditures were compiled in line with the SIPRI/NATO definition and are the first such historical estimates for Greece; its principal components are outlays by defense ministries, military pensions, and transfers to special Defense Funds.

Civilian expenditures were calculated residually. A key problem arose from the fact that debt service expenditures included payments of both interest and principal, even though the latter do not alter the central government's net worth; similarly, loans to third parties and asset purchases were also recorded as expenses, distorting the totals. Disentangling these effects meant going over individual accounts to determine whether they concerned interest payments, fees, capital, or amortization. Thus, the new dataset

is the first to distinguish between primary civilian expenditures, interest on public debt and other transactions that do not alter the state's net worth, such as loans to third parties.

Figure 3 plots the main aggregates and calculates the defense share (Eloranta, 2007), i.e., the share of military expenditures in total outlays.[5] Public spending starts out high and declines until it reaches a plateau of around 15% of GDP in the mid-nineteenth century. This reflects the sizeable "setup costs" associated with early stages of state-building (Kostis, 2006: 295); in these early years, military outlays were inflated by the presence of a sizeable contingent of foreign troops, who had accompanied the new Bavarian king. Such profligacy was made possible by the 1832 loan; once that ran out, Greece defaulted on its foreign debt, and expenditures shrank. A settlement with foreign creditors came in the late 1870s and coincided with a second period of increased spending. These were partly loan-financed, at least until the country defaulted again in 1893. Public spending increased rapidly during the 1912-22 war period, albeit with a clear break during the civil war years of 1915-17.

4.3 Identifying mobilization episodes

On average, defense accounts for 37% of total public spending between 1833 and 1939. At times of military mobilization, however, military expenditures rise substantially. In line with the argument made in Section 2.3, spikes in military spending are used to identify mobilization episodes. Identification can either rely on a heuristic or a statistical algorithm; both require some help from history.

How much must military spending increase to mark the onset of a mobilization episode? A simple rule of thumb would be to compare military expenditures to some "normal times" baseline. This threshold could be an *n*-year moving average, provided it only takes into consideration the last *n* non-mobilization years, so it excludes past

[5] It is worth mentioning that this data diverges considerably from the unpublished Antoniou *et al.* (2001) data reproduced in the SEEMHN database. Correlation between two series is less than 80%, dropping to 50% when it comes to military expenditures. These are substantial differences, especially when it comes to empirical applications. While Antoniou doesn't explain his methodology in sufficient detail, comparison with our data suggests those series includes outlays for refugee settlement, but ignore the substantial outlays siphoned to off-budget "special funds", used to pay for most military procurement in the early twentieth century (see Appendix A).

episodes.[6] Figure 4 plots the share of military expenditures in GDP (military burden), along with a 3-year adjusted moving average, which serves as the baseline.[7] Whenever military outlays exceed last year's baseline, the chart also reports the relative size of the excess (bar chart, right axis).

The next step is to determine the appropriate threshold: the higher the bar, the fewer episodes are identified. Here is where the historical context helps, not least to minimize the risk of endogeneity: identifying only those episodes associated with exogenous shocks. In the Greek case, a 100% threshold – signaling a doubling of military spending relative to the baseline – captures all war episodes, along with two low-hostility episodes: one is the prolonged mobilization between 1879-81, when Greece pressed the Ottomans to cede Thessaly, as stipulated in the Berlin Treaty of 1878. Military outlays spiked and the conscription laws were overhauled, even though not bullet was fired until Thessaly joined Greece, in 1881.

The second episode starts in 1885, following Bulgaria's annexation of Northern Thrace, which Greece and Serbia protested. Seeking equal territorial compensation, Greece mobilized its army and threatened to invade the Ottoman empire. The intercession of the Great Powers eventually forced Greece to stand down, but mobilization took a heavy toll on public finances. The incident is remembered as the "peaceful war" of 1885-86. A similar mobilization after the 1867 revolt on Crete fell short of the threshold. On the other hand, 1914 and 1923 were both flagged, even though they came immediately *after* the end of major wars. Their defense expenditures probably capture the fiscal aftershock of recent wars.

A more technical approach would be to model military expenditure as an AR(n) autoregressive process, and then test the stability of the intercept to identify potential breaks. Given the uncertainty in the number, timing and type of breaks, this paper relies on indicator saturation (Castle et al., 2012). The method essentially treats each data point as a potential outlier and uses the *autometrics* selection algorithm (Doornik, 2009) to arrive at the smallest number of potential outliers. A further advantage of the

[6] A simple moving average would drift upwards during an episode, and thus fail to identify the later years of a protracted incident.
[7] One implication of eliminating (past) mobilization episodes when estimating the moving average is that this makes the average dependent on the threshold set to identify mobilization years; in Figure 4, the threshold is set at 100%.

approach is that it also tests for contiguous impulses of the same sign and magnitude, replacing them with steps (Castle *et al*., 2015).

Up to four lags were tested, with the algorithm opting for AR(1), along with several impulses and steps selected at .1% significance. The full regression results are reported in Appendix C, but Figure 5 plots the estimated intercept adjustments. Given the persistence inherent in any AR process, the method is best at detecting the onset of each episode. The end is only identified when accompanied by sharp drops in outlays (1882, 1887, 1898); when the decline is smoother, it is absorbed by the autoregressive component. More generally, some high-expenditure years are not flagged, because of the lagged effect of the previous (high-expenditure) year (e.g. 1885, 1920, 1922). Indicator saturation also flags 1916 as a year with a negative shock in expenditure, no doubt due to the National Schism.

Both algorithms thus converge on the same five episodes, some of which bundle successive wars together. By placing defense burdens centre-stage, the algorithms also ignore most low-hostility MIDs: of the 45 dispute-years on Figure 1(b), only 13 belong to mobilization episodes.

The proposed approach is more data intensive, compared to the conventional use of wars and fatalities, but offers two main advantages. First, it identifies those disputes that are most likely to impact fiscal capacity, even if they do not escalate into outright war. Second, it can also be used to measure episode intensity, not in terms of fatalities, but in terms of the additional defense burden imposed. Defining this in percentage points of GDP over the benchmark, Table 1 ranks the five episodes by their "fiscal intensity". Episodes such as the 1879-81 mobilization, which imposed an extra 47.1 percentage points of GDP in military expenditures now appear to have greater fiscal implications than some actual wars, such as the brief 1897 Greek-Turkish war.

5. Hypotheses and results

Having defined and identified mobilization episodes, we can now test different aspects of the bellicist theory on the new data for Greece. The core contention is that fiscal capacity – proxied by tax revenues as a percentage of GDP – increases after mobilization episodes. Thus, if a country experiences war from t_1 to t_2, most models test whether revenues have increased at some later time t_n (Figure 6). But as temporal

distance increases, the causal link between war and taxation becomes weaker (Goenaga and Hagen-Jamar, 2018). What is more, this long-term, legacy effect says nothing about the transition from one state to the other, or the taxes used to make it happen.

In what follows we distinguish between the contemporaneous and permanent, or legacy effects of mobilization episodes. Starting with the latter, our basic hypothesis is that *post-mobilization tax revenues are higher than those prevailing before* (RT2>RT1). What is more, the aggregate legacy effect can be divided between direct and indirect taxes.

Contemporaneous effects are harder to pin down. On the one hand, hostilities may have a disproportionately negative impact on some types of tax revenue (e.g., tariff revenues when war disrupts trade). Alternatively, increased fiscal pressure may lead to new taxes or increased collection effort. One can thus envision at least three distinct scenarios, which Figure 6 presents in a stylized fashion. Two are consistent with Peacock and Wiseman's (1961) displacement effect but differ in the extent to which wartime revenues (a) over- or (b) under-shoot their post-war levels. Scenario (c) entails a revenue dip *during* the mobilization episode, followed by disproportionate post-war increase.

5.1 Mobilization episodes and tax capacity in Greece

To test the legacy effect of each mobilization and distinguish between the three scenarios, we first use OLS to estimate the following model:

$$TR_t = a_o + a_1 TR_{t-1} + \sum_{i=1}^{n} c_i\, W_{it}(I_i) + \sum_{i=1}^{n} p_i\, PW_{it}(I_i) + \boldsymbol{a}_3 \boldsymbol{z}_t + \varepsilon_t \qquad (1)$$

where TR_t are tax revenues in year *t*, expressed in percentage points of GDP. Normalization by GDP not only helps overcome the challenge posed by Greece's shifting borders, but also ensures stationarity.[8] The autoregressive component is a staple feature (Sabaté, 2016) that helps tackle autocorrelation. W_{it} are indicator variables that take the value one *during* episode *i*, while PW_{it} are step variables set to unity *after* episode *i* (total episodes *n*). Thus, assuming a_1<0, each mobilization episode can have a contemporaneous effect c_i, which will dissipate over time, as well as permanent effect that will increase long term revenue by $p_i/(1 - a_1)$. The variable I_i stands for episode intensity.

[8] All normalized series were tested for stationarity; given the nature of the series, unit root tests with one and two unknown breaks (Vogelsang and Perron, 1998; Lee and Strazicich, 2003) were preferred over conventional tests.

Control variables are captured by the vector $\boldsymbol{z}_t$. This includes indicator variables to single out civil war years 1915-17, as well as two step indicators capturing the aftermath of the 1893 and 1932 defaults. The log of real per capita GDP is also included, to capture potential Wagner-style effects, although those are unlikely, given how new territories usually had lower living standards, causing temporary setbacks in per capita GDP.

The results are reported in Table 2.[9] Model 1 offers the baseline specification without taking intensity into consideration ($I_i = 1$); Models 2-4 scale episode effects by intensity (so I_i take the values in Table 1); this doesn't alter the model fit, but helps coefficient comparisons. Models 3 and 4 replace total tax revenues with direct and indirect taxes respectively.

Several interesting results emerge. First, far from boosting fiscal capacity, mobilization episodes tend to reduce revenues. The effect tends to be stronger on direct taxes, suggesting a possible easing of tax yields from and/or tax pressure on agriculture in periods when much of the peasantry is also called upon to serve in the army.

Second, the "legacy" effects of mobilization episodes are consistent with bellicist theory. All five mobilization episodes seem to *increase* tax revenues by 0.75% to 3.7% of GDP, compared to their starting point; the effects are significant in all but the brief 1897 war.[10] In most cases, this ratcheting of total revenues was driven by indirect, rather than direct taxation. After 1922, when tax revenues increased rapidly, indirect taxes climbed even faster to compensate for a drop in direct taxes, caused by a mixture of low yields and tax leniency toward refugee farmers (Petmezas 2012).

Third, not all mobilization episodes are the same. Scaling by intensity brings impact coefficients closer together, but differences persist.[11] The Greek-Turkish war of 1920-22 may have had the largest total impact, but – when scaled by intensity – had a lower "bang per buck", compared to 1885-86. Most importantly, non-war episodes do not seem to have systematically smaller effects, compared to outright wars. Greek fiscal

[9] The results are robust to alternative specifications, such as the inclusion of additional lags (up to four lags were tested, but none but the first one was found significant) and the exclusion of non-significant controls; inclusion of "borderline" episodes, such as the Cretan Revolt of 1867-68 was also attempted but found insignificant. Residuals were normal in all specifications.

[10] These estimates are based on the $p_i/(1 - a_1)$ formula, i.e. they are the long-run multipliers.

[11] F-tests on all contemporaneous ($c_i = \bar{c}$) and legacy ($p_i = \bar{p}$) coefficients reject the null hypothesis of equality.

capacity thus seems to have expanded in two waves. The first came in the mid-1880s, after competition with other Balkan states for Ottoman lands increased, although no war broke out; this is the time of the Trikoupis reforms, many of which were explicitly aimed at both military preparation and tax reform (Kostis 2018). The second wave the watershed of the First World War and the failed Asia Minor campaign, which imposed an unprecedented fiscal burden on the Greek economy.

The Greek evidence also seems consistent with Scenario (c): mobilizations cause a temporary drop in tax revenues, followed not only by full recovery, but a permanent increase in revenues. Different revenue trajectories are related to different strategies of war finance: raising more taxes is only one way of paying for increased military expenditure, with alternatives ranging from foreign loans and war bonds to money printing and cut-backs in civilian spending (Capella-Zielinski, 2016).

Greece's revenue trajectories, as well as more detailed historical evidence suggest military mobilizations were loan financed (Kakridis, 2018). Within the bellicist literature, several authors have suggested that the availability of credit loosens the pull of military spending. Thus, Centeno (2002) has famously argued that Latin American warfare in the nineteenth century led to cycles of "blood and debt" rather than state-building (cf. Thies, 2005). In practice, however, most wars are primarily financed through some form of borrowing (Capella-Zielinski, 2016). Besides being politically expedient, this is also the optimal response to a temporary increase in expenditure, given how taxes are distortionary (Barro, 1979). What is more, the Ricardian equivalence suggests that even loan-financed expenses will – sooner or later – mandate higher taxes. Conversely, Queralt (2019) has argued that the Ricardian equivalence does not hold in the presence of external debt relief or nontax revenues; using nineteenth-century data from 100 countries, he finds that wars were only conducive to stronger states when tax financed.

By contrast, the Greek case suggests even debt-financed mobilizations increase fiscal capacity. Of course, greater reliance on tax-finance might have boosted post-war gains in fiscal capacity even further – a counterfactual our case study cannot rule out. At the very least, however, our evidence suggests that link between war and taxation is not broken by the presence of credit. Before issuing new loans, Greece's nineteenth century creditors invariably asked for guarantees, in the form of pledged revenue streams. Thus, in a pattern common to Balkan states, even though military preparations were loan financed, these loans invariably stimulated discussions of new taxes and

monopolies, that could be pledged to improve access to credit (Tunçer, 2015; Kakridis, 2018).

5.2 Military expenditure and tax revenue: a VAR approach

The previous section focused on the effects of mobilization episodes. But what about military preparation and defense spending in normal times? Do they influence tax revenues? If so, is their influence any different from that of civilian expenditures? To answer this question, this section models the dynamic interaction of tax revenues, military, and civilian expenditures through vector autoregression (VAR).

The principal advantage of the VAR approach is that it treats all variables as (potentially) endogenous. Endogeneity concerns are easier to dismiss when focusing on sharp discontinuities like mobilization episodes, whose outbreak is rarely driven by tax revenue or civilian spending. This is not true outside mobilization years, when the size of the defense budgets may not only influence tax policy, but also be determined by the available fiscal space. As a matter of fact, this question underpins much of the tax-and-spend vs. spend-and-tax literature in public finance (Furstenberg *et al.*, 1986), which relies on similar methods, albeit without distinguishing between different types of spending. Recently, Kolias *et al.* (2021) used seemhn public expenditure data to test for the effect of military spending on growth (not tax revenues); data quality issues aside, the use of a single-equation autoregressive distributed lag (ARDL) model fails to address endogeneity concerns as effectively as the VAR approach does.

Starting with an unknown number of lags k, the VAR(k) specification can be written as an extension of the autoregressive model used in the previous section:

$$\boldsymbol{y}_t = \boldsymbol{a}_0 + \boldsymbol{A}_1 \boldsymbol{y}_{t-1} + \cdots + \boldsymbol{A}_k \boldsymbol{y}_{t-k} + \boldsymbol{C}\boldsymbol{w}_t + \boldsymbol{P}\boldsymbol{p}\boldsymbol{w}_t + \boldsymbol{\Phi}\boldsymbol{Z}_t + \boldsymbol{\varepsilon}_t$$

Where $\boldsymbol{y}_t = (TR_t, M_t, C_t)'$ is the vector of endogenous variables, where TR_t, M_t and C_t to denote tax revenues, military and civilian expenditures (as p.p. of GDP). $\boldsymbol{A}_i$ are 3×3 fixed coefficient matrices, $\boldsymbol{w}_t = (W_{1t}, W_{2t}, \dots, W_{nt})'$ and $\boldsymbol{p}\boldsymbol{w}_t = (PW_{1t}, PW_{2t}, \dots, PW_{nt})'$ are vectors of the familiar indicator variables for the contemporaneous and legacy effects of each of n mobilization episodes. $\boldsymbol{C}$ and $\boldsymbol{P}$ are $3 \times n$ fixed coefficient matrices, while $\boldsymbol{Z}_t$ is a vector of exogenous controls, such as the 1893 and 1932 trade crises/defaults and the 1915-17 civil war.

The inclusion of mobilization episodes as exogenous shocks is important to the model's interpretation: impulse responses using this VAR highlight the effect of increases in military expenditure in normal times, while the effect of mobilization episodes are mopped up by $\boldsymbol{w}_t$ and $\boldsymbol{pw}_t$. Indeed, estimates for $\boldsymbol{C}$ and $\boldsymbol{P}$ confirm the *negative* contemporaneous but *positive* legacy effect of mobilizations (see Table D.2 in Appendix D). In other words, the results found in a single-equation framework hold up in the three-equation model.

While up to five lags were tested, VAR(1) was ultimately selected. Consistent with the tax-and-spend hypothesis, Granger causality tests found evidence of taxes influencing civilian spending; the same was *not* true of defense outlays, suggesting that – even in normal times –fiscal space was a lesser consideration when determining military expenditures. At the same time, there is some evidence to suggest that military spending influenced tax revenues.[12]

The dynamic is further explored in Figure 7, which plots the cumulative response of tax revenues to identical shocks to military or civilian expenditures. Following Pesaran and Shin (1998), generalised impulses are used to detract the effects of endogenous variable ordering. The results suggest that, even in normal times, an increase in military outlays would have a stronger cumulative effect on revenues. Specifically, one p.p. of GDP of extra spending on defense would raise tax revenues by .85 p.p. within five years; conversely, the same amount spent for civilian purposes would only raise tax revenues by 0.47 p.p. of GDP. The evidence thus points to a "slow-moving process" whereby military outlays fuel fiscal capacity outside periods of war mobilization.

5.3 Using indicator saturation to derive exogenous shocks

So far, our analysis has proceeded sequentially: mobilization episodes were first identified and later treated as exogenous in a three-equation model with tax revenues, military and civilian expenditures. But why not combine the two processes? Indicator saturation can be used directly on the VAR model to determine both the appropriate length and any exogenous shocks (Castle and Hendry, 2019). What is more, this approach would not only identify shocks to military expenditures, but also any outliers or

[12] The effect is significant only at 10%, unlike the effect of taxes on civilian spending, which is significant at .1%; details of Granger causality tests can be found in Appendix D, Table D3.

discontinuities in the other two series (tax revenues and civilian spending), which may lead to misspecification in the original VAR.

The previous VAR(k) model was thus re-estimated without any *a priori* exogenous controls, using impulse saturation and the *autometrics* selection algorithm (Doornik, 2009). As before, up to four lags were tested but the final model only included one. Figure 8 identifies the shocks found significant at the .1% level in each of the three series, along with their impact on the model intercept. As expected, the shocks in the military expenditure series match the mobilization episodes identified in section 4.3, albeit with some minor timing differences. The impact of the 1915-17 civil war is evident in all three series, while defaults mainly affect civilian outlays (because of the effect on interest payments). Most significantly, when it comes to the tax revenues series, the algorithm picks up on the two waves of exogenous tax increases, one in the mid-1880s and the other in the aftermath of the First World War. Estimation via impulse saturation improved the three-equation VAR model diagnostics, without altering any of the main conclusions (Appendix C, Section 2). The immediate effect of mobilization episodes on tax revenues remained negative, while legacy effects remained positive. The results of the Granger causality tests are broadly in line with those of the previous VAR model, with one additional finding: military outlays do not only affect taxes, but taxes also seem to feed back into military outlays. By contrast, civilian expenditures are influenced by taxes but don't seem to affect their future trajectory.

Much like the original VAR(1) model, the impulse response function confirms the difference in the response of tax revenues to a one p.p. of GDP increase to military vs. civilian outlays. The estimated difference increases slightly (Figure 9), not least due to the feedback-loop between taxes and military outlays identified by the Granger causality tests.

6. Conclusion

A state in state-building overdrive, born in a volatile geopolitical environment and plagued by wars of different intensity and duration, Greece presents an interesting test subject for the effect of war on fiscal capacity. And yet the country, much like the Balkans in general, has been excluded from most empirical tests, not least because of data limitations.

Constructing a new dataset of Greek public revenues and expenditures for the years 1833 to 1939, this paper finds that war mobilizations undermined tax revenues in the short run, but helped the Greek state increase its fiscal capacity in the long run. Overall tax revenues increased in two "waves", one in the 1880s and one in the 1920s. Both came on the heels of major spikes in defense outlays; both relied primarily on indirect, rather than direct taxes and were linked to expectations of new loans, to help refinance (expensive) wartime debt. What is more, even in normal times, military expenditures seem to have had a stronger impact on taxes, at least when compared to civilian outlays.

Greek historians have long taken a grim view of the country's military (mis)adventures in the long nineteenth and early twentieth centuries, which diverted resources from civilian uses and fueled cycles of debt and default (Dertilis, 2020). This paper argues that, despite the waste and disruption they caused, if not because of them, mobilization episodes helped the Greek state impose and collect higher taxes. It thus offers a *quantitative* complement to the argument made by Kostis (2018), who points at several *qualitative* changes in the Greek state's infrastructural powers, stimulated by military needs: improved population statistics for conscription, improved public health policy, new transport infrastructure, police reform, and other measures that are less easy to quantify and test empirically.

While focused on Greece, the paper also hopes to contribute to the broader bellicist literature. First, by shifting attention from war *per se* to mobilization episodes, defined as significant shocks to military outlays, capable of exerting similar fiscal pressure. Secondly, by proposing the use of indicator saturation and the autometrics selection algorithm, along with vector autoregression, to identify (exogenous) mobilizations and distinguish between their effects and the "slow and gradual process" whereby military build-up may influence fiscal capacity in normal times. Future research can test whether these methods can be usefully extended to other regions – and add a few Greek data points to their samples!

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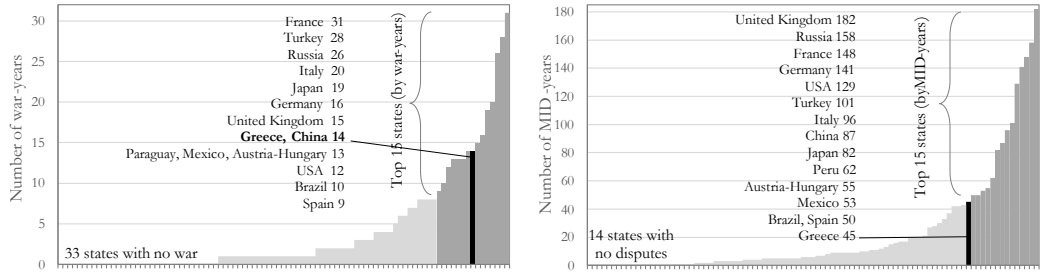
Figures



(a) War-years (b) Militarised Interstate Disputes (MIDs)

Figure 1. Sovereign states ranked by number of years involved in wars or MIDs, 1816-1939

Source: Appendix B.

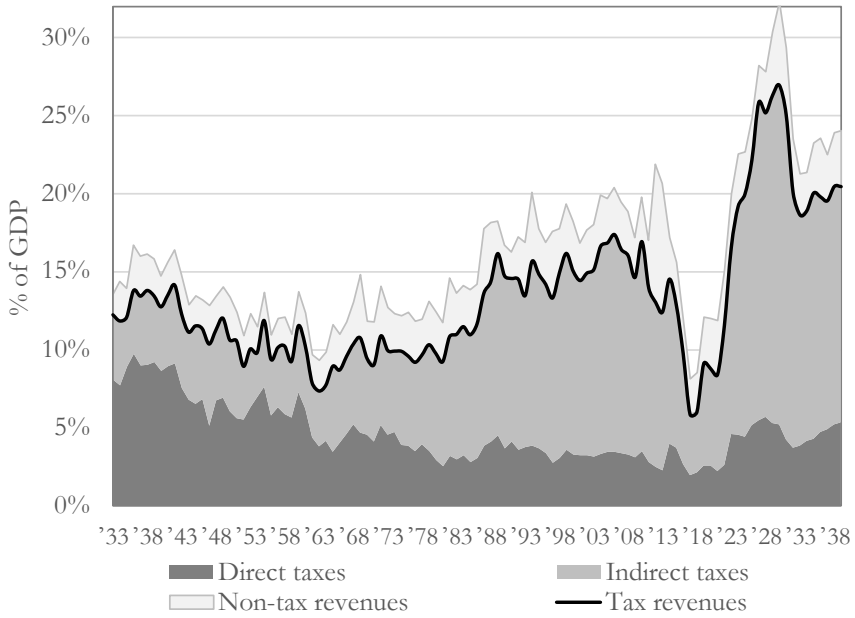


Figure 2. Central Government revenues in Greece, 1816-1939 (% of GDP)

Source: Appendix A. Non-tax revenues include fines/dues, income derived from state assets, etc.; receipts due to loans, reparations etc. are excluded.

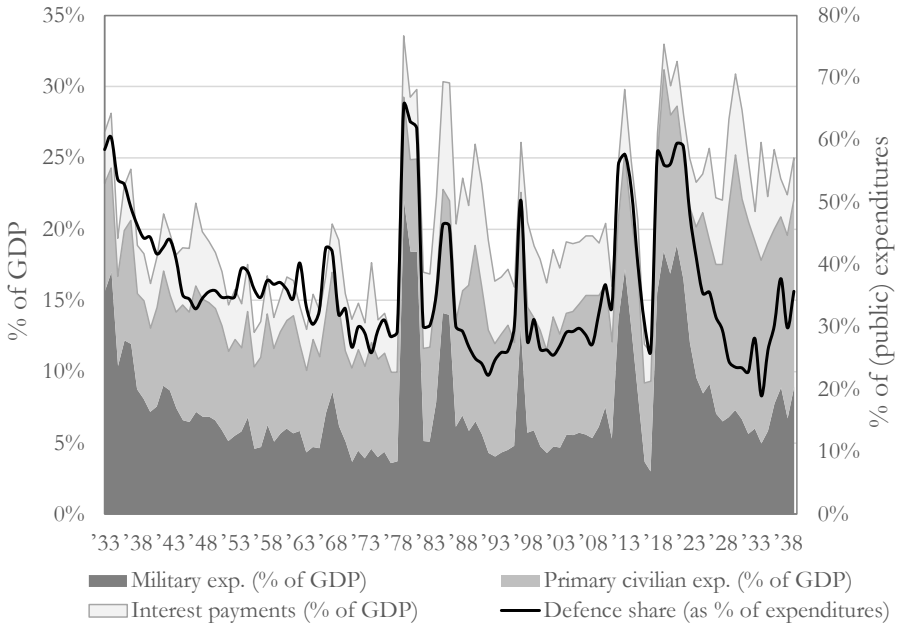


Figure 3. Central Government expenditures in Greece, 1816-1939 (% of GDP) and defense share (% of military expenditures in total public expenditures).

Source: Appendix A. Other payments, such as loan principals, loans/credits to other entities and asset purchases are excluded.

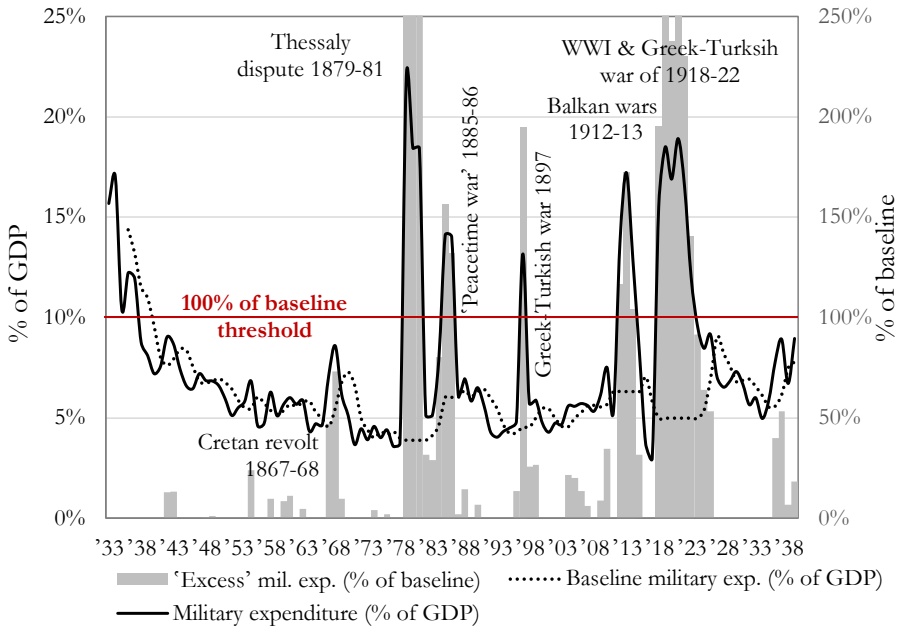


Figure 4. Identifying military mobilization episodes in Greece: heuristics

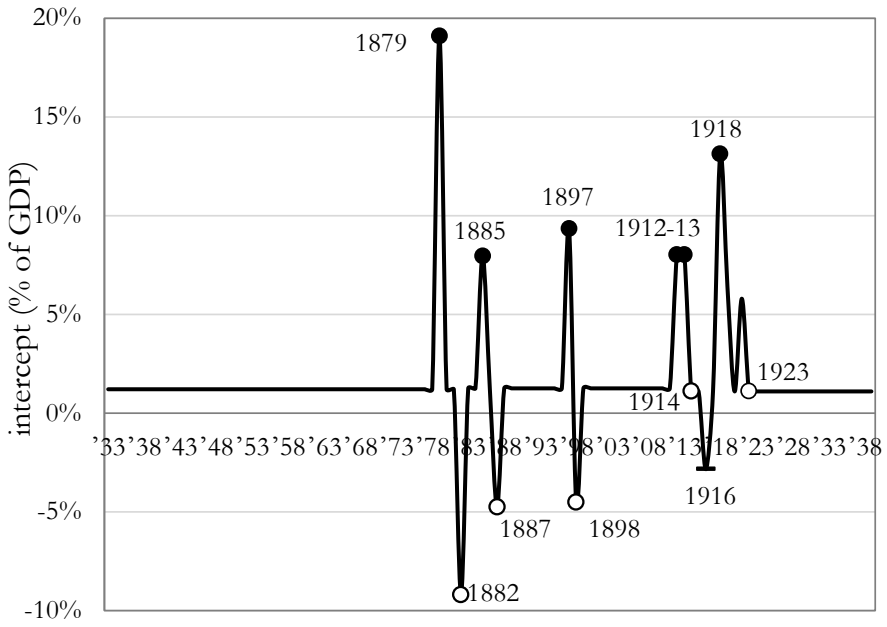


Figure 5. Identifying military mobilization episodes in Greece: statistics

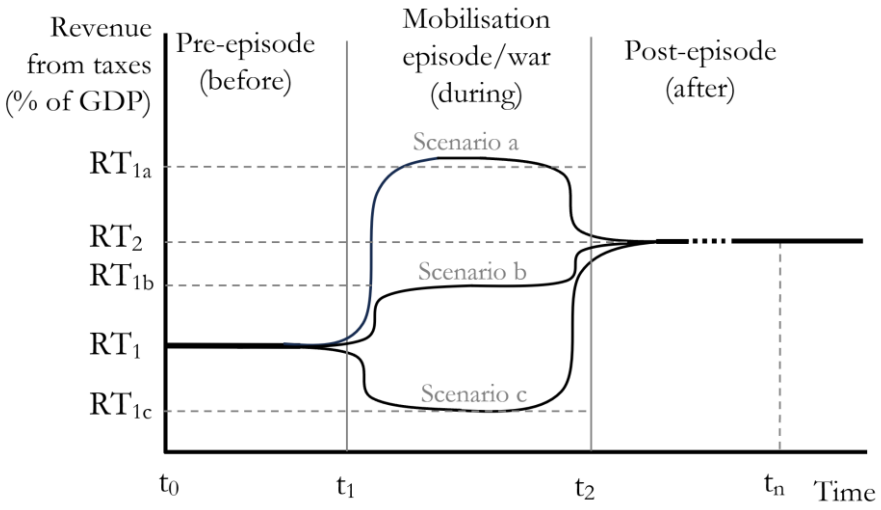


Figure 6. Mobilization episodes and tax revenue: variants of the bellicist argument

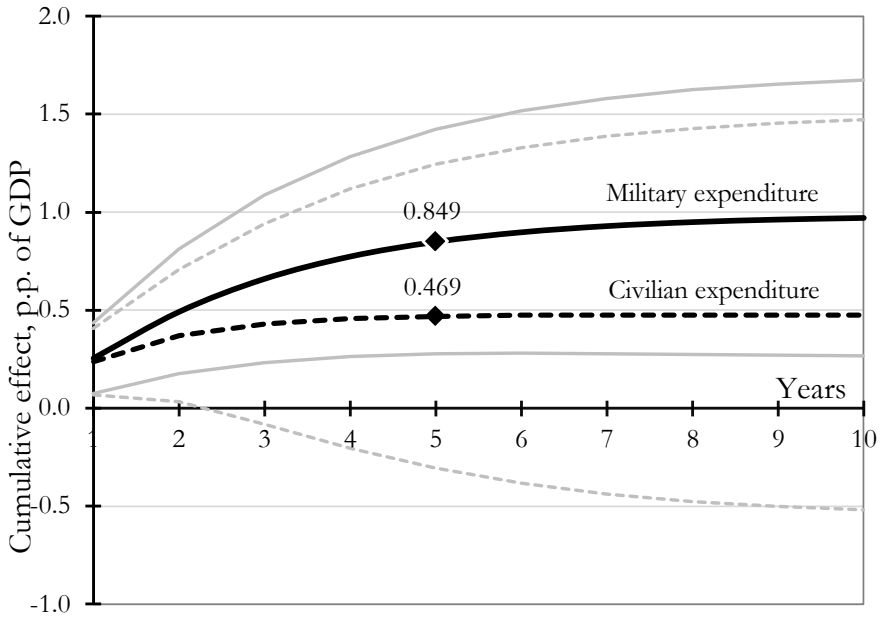


Figure 7. Cumulative response of taxes to a one p.p. of GDP impulse in expenditures (±2 std. errors)

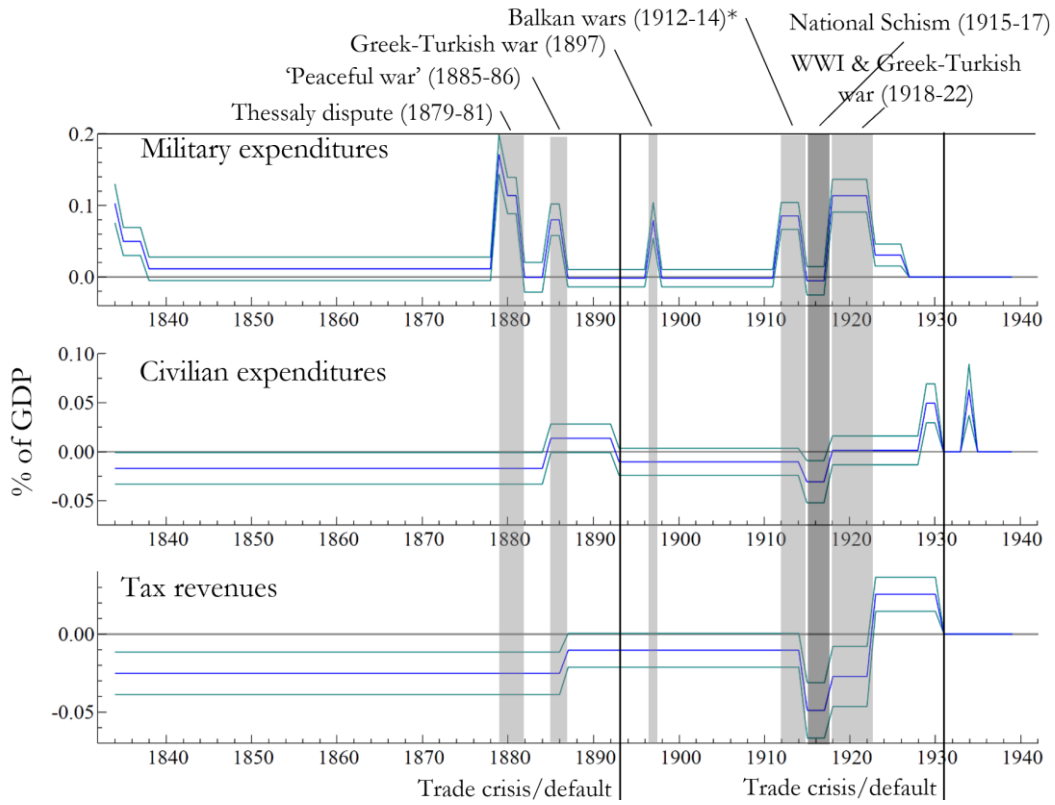


Figure 8. Intercept shocks selected by impulse saturation of VAR(k) model, using autometrics algorithm at .1% significance (±2 std. errors)

Note: * algorithm flagged 1914 as a mobilization year, part of the Balkan wars (which ended in 1913).

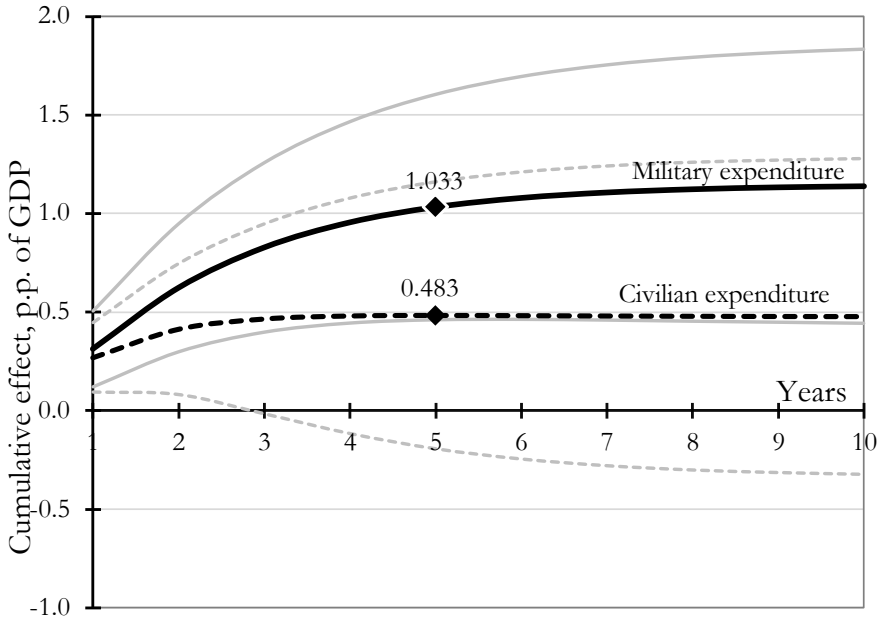


Figure 9. Cumulative response of taxes to a one p.p. of GDP impulse in expenditures (±2 std. errors)

Tables

Table 1. *Mobilization episodes in Greece, ranked by fiscal intensity 1833-1939*

Episode	From	To	Fiscal Intensity	Fatalities
WWI & Greek-Turkish war	1918	1922	0.605	>1,000
Thessaly dispute	1879	1881	0.471	None
Balkan wars	1912	1913	0.183	>1,000
"Peacetime war"	1885	1886	0.174	None
Greek-Turkish war	1897	1897	0.088	500-1000

Note: Intensity measured in percentage points of GDP of military expenditure above benchmark (divided by 100), summed over all episode years; fatalities are taken from the Correlates of War database, which only counts battle-related deaths.

Table 2. *Regression results of tax revenues during and after mobilization episodes, 1834-1939*

Dependent variable		Model 1 Tax revenues (no scaling, I_i=1)	Model 2 Tax revenues (Mobilization episodes scaled by intensity)	Model 3 Direct taxes (Mobilization episodes scaled by intensity)	Model 4 Indirect taxes (Mobilization episodes scaled by intensity)
Thessaly dispute	During	–0.295	–0.626	***–1.600	***1.662
(1879-81)		(0.353)	(0.749)	(0.429)	(0.522)
	After	****0.740**	****1.571**	**–0.233**	*****2.616**
		(0.312)	**(0.663)**	**(0.509)**	**(0.597)**
"Peaceful war"	During	–0.325	–1.865	–1.632	–1.007
(1885-86)		(0.278)	(1.593)	(1.073)	(1.046)
	After	****0.994**	****5.703**	**0.113**	****3.678**
		(0.420)	**(2.411)**	**(1.495)**	**(1.665)**
Greek-Turkish war	During	***–0.963	***–10.855	***–7.030	–2.483
1897		(0.272)	(3.063)	(1.359)	(2.837)
	After	**0.471**	**5.314**	**0.085**	**5.129**
		(0.341)	**(3.844)**	**(1.384)**	**(3.483)**
Balkan wars	During	***–1.388	***–7.598	–1.575	***–5.975
(1912-13)		0.453	(2.482)	(1.139)	(2.138)
	After	*****1.031**	*****5.646**	*****8.668**	**–1.644**
		0.275	**(1.506)**	**0.501**	**(1.401)**
WWI & Greek-	During	***–2.481	***–4.098	***–2.635	–1.227
Turkish war		(0.468)	(0.774)	(0.095)	(0.891)
(1918-22)	**After**	*****2.518**	*****4.160**	*****–1.785**	*****4.286**
		(0.570)	**(0.942)**	**(0.385)**	**(0.958)**
Lagged dependent		***0.681	***0.681	***0.853	***0.714
		(0.056)	(0.056)	(0.075)	(0.079)
Constant		5.189	5.189	2.087	–0.930
		(5.657)	(5.657)	(4.046)	(4.490)
Trade crisis/default		–0.418	–0.418	–0.167	–0.245
1893		(0.435)	(0.435)	(0.239)	(0.307)
Civil war/Schism		***–5.016	***–5.016	***–2.251	***–2.895
1915-17		(0.614)	(0.614)	(0.139)	(0.468)
Trade crisis/default		***–2.500	–2.500	–0.253	***–1.992
1931		(0.653)	(0.653)	(0.271)	(0.745)
Per capita income		–0.351	–0.351	–0.244	0.435
(log)		(1.102)	(1.102)	(0.753)	(0.866)
Observations		106	106	106	106
R^2		0.943	0.943	0.890	0.965
Durbin Watson		2.153	2.153	2.092	2.251

Notes: *** 1% significance, ** 5% significance, * 10% significance; Newey-West heteroscedasticity & autocorrelation consistent standard errors reported in brackets.

Appendix A: Data construction methodology

A1. Introduction

This paper relies primarily on a new series of public finance data, derived from published *Statements of Revenues and Expenditures of the Greek state* (*Απολογισμοί των εσόδων και εξόδων του ελληνικού κράτους*). These report central government actual revenues and expenditures *outturns* during each fiscal year (FY), often alongside the original budget *estimates*. The compilation of such information only became systematic after the 1843 transition to a constitutional monarchy, with 1845 marking the first year a budget (*προϋπολογισμός*) was submitted to parliament. In the same year, the first outturns covering the years 1833-42 were also published. These were followed by a somewhat unsteady trickle of outturn statements, released over subsequent decades. Unlike budget estimates, which were submitted annually, outturns were generally published with significant delays and rarely received parliamentary approval. Nevertheless, despite frequent delays and differences in methodology, a complete series of such statements spanning the 1833-1939 period can be reconstructed from individual publications.

The first to collect outturn statements and integrate them in a single series was Dertilis (1993), who produced annual revenue series from 1833-1933, albeit with a handful of missing observations. His work was extended by Prontzas *et al.* (2011), who filled the gaps and compiled a detailed *revenue* database for 1833-1939, including aggregate series on total and tax revenues (divided into direct and indirect taxes). Unfortunately, a parallel effort by Antonis Antoniou to compile a series of public *expenditures* was left incomplete. Subsequent research has thus relied on the unpublished, preliminary results of Antoniou *et al*. (1999) for three main aggregates: total expenditures, defense spending and what is often treated as "interest payments", though it combines both interest and capital repayment.

These series have been incorporated into the SEEMHN database, arguably the most detailed compilation of Greek historical statistics available to date (Lazaretou, 2014). Authors using the expenditure series, however, are usually unaware that they are derived from preliminary results, whose construction methodology is left unexplained. Thus, the public finance data in the SEEMHN database face several challenges, which render them inappropriate for some applications. To highlight the most important ones:

(a) Total revenues include both operating revenue (e.g., taxes) as well as loans, war reparations, foreign aid etc. This produces inordinate revenue spikes on years when the Greek state obtained sizable loans and invalidates estimates of budget deficits.

(b) Tax revenues exclude the sale of state monopoly goods, which were the primary means by which the Greek state sought to bolster its finances in the late nineteenth century. Thus, the existing revenue series tends to *underestimate* the fiscal capacity of the Greek state, particularly after the 1880s.

(c) Total expenditures combine operating outlays and debt servicing, including one-off disbursements to offset existing liabilities, which also produce *ad hoc* expenditure spikes that do not alter the public sector's net worth.

(d) The defense expenditure series includes outlays for welfare provision and refugee settlement, which do not conform to conventional definitions of military spending.

(e) All data splice figures from different time periods, when different accounting standards were used, with no compensating adjustments e.g. for different durations, cash- vs. accrual basis reporting, etc.

While many of these challenges are inherent in the original data, they are compounded by the absence of methodological notes explaining how aggregates were constructed. For these reasons, this paper had compile a new dataset. Specifically, detailed (per item) revenues recorded in the Prontzas *et al.* (2011) were used to reconstruct several new revenue series, while a expenditure data was reconstructed from scratch, using the original outturn statements. This appendix describes the methodology used to construct the data.

A2. Key challenges present in Greek historical public finance data

A2.1 Variation in data quality and methodology

Despite the existence of a full set of published statements of total revenues and expenditures spanning the years 1833 to 1939, data quality is not consistent throughout, not least due to significant changes in public accounting rules and institutions. Law 212 (ΣΙΒ) of 1852 was a key milestone, which laid down the accounting framework for the rest of the long nineteenth century (Prontzas *et al.*, 2011: pp. 58–68). Outturn statements published *before* 1852, covering the fiscal years 1833-45 are thus somewhat different

from those published later, which conform to similar rules and standards. Most of those rules were modelled on French public accounting (Diomidis, 1905; Allix and Lambropoulos, 1931).

Over time, the level of detail increased, improving the statements' overall transparency. Nevertheless, key weaknesses persisted, not least the inclusion of transactions in assets (notably, loans) in state revenues and expenditures. In 1912, an Italian expert, Federico Zapelloni, was invited to direct the Treasury office. His efforts led to several improvements in public accounting, including a distinction between transactions of Category I, which included operating revenues and expenses, and Category II, which comprised asset transactions that did *not* affect the state's overall net worth (e.g., loans, property sales/purchases, etc.). The distinction was formally introduced in the outturns of fiscal year 1915; in 1916, the Treasury also published a series of historical tables covering the years 1863-1915, which provided summary data using the new methodology. While not detailed enough to replicate all the series used in this paper, these "Zapelloni tables" were used for data validation and error checking.

Transparency increased further after the sweeping reforms introduced into public accounting by Law 1555 of 1918, the product of Zapelloni's reformist zeal. The new system shifted the fiscal year by three months and introduced several innovations, which affected the outturn statements for fiscal years 1915-34 (Section A2.2). Unfortunately, the dissolution of parliament by the Metaxas dictatorship (1936) halted the release of detailed financial information. In the fiscal years 1935 to 1939, only interim outturn statements (*προσωρινοί απολογισμοί*) were ever published. These provide far fewer details and omit key accounts introduced by the reform, notably, those tracking payments/receipts out of arrears.

In summary, except for the years 1935-39, data quality and transparency increased steadily in the period under review, with 1852 and 1918 marking significant accounting reforms that mandate caution when compiling a unified time series.

A2.2 Cash vs. accruals and the duration of the (extended) fiscal year

Modelled on the French system of public accounting, Greece's public finances in the nineteenth century were meant to produce outturn statements on an accrual basis (*compatibilité par exercice*), i.e., include all claims and obligations that originated

during the fiscal year, which lasted from 1.1 to 31.12, regardless of when those claims/obligations were settled. Theoretically, the duration of each of these "extended fiscal years" (*exercise*, in French; *χρήσις* in Greek) extended until all claims/obligations had either been settled or had lapsed.[13] In practice, accounting laws usually stipulated an extension period (*période complémentaire)* after 31.12; payments/receipts made during that extension would still count toward the fiscal year when the corresponding obligations/claims were created. After the extension period was over, accounts were closed and subsequent payments/receipts were transferred to the next fiscal year, under the heading of "revenues/expenditures of past [extended] fiscal years".

Thus, historical public finance data for Greece combine accrual- and cash-basis reporting. Each annual figure represents obligations/claims that originated during a 12-month fiscal year and were settled during a longer period (the extended fiscal year). Importantly, variations in the duration of the extension period need to be taken into consideration when constructing a longer time series of public finance data.

The 1852 accounting law set the extension period (*période complémentaire)* to ten months, i.e. until 31.10 of the year after. Thus, outturn statements for the fiscal years 1846-1917 (all published *after* 1852) conform to the same standard. Revenues and expenditures recorded therein represent the accruals of each fiscal year, settled within a period of 22 months.

The same is not true of statements covering the years 1833-45, which were published before 1852. Thus, the outturns for 1833, published in 1849, include transactions made in 1843 (to settle claims/obligations from 1833). Inevitably, this raises comparability issues: an "extended fiscal year" lasting a decade is not the same as one lasting 22 months. The discrepancy is greater on the revenue side, where tax delays were commonplace.[14] In order to make 1833-45 data comparable to that of fiscal years 1846-1917, the figures must be adjusted accordingly. The approach taken was to use cash/accrual tables for 1833-45 to reconstruct accrual data based on a two year "extended fiscal year". In other words, claims/obligations originating in year *t* and collected/settled in years *t* and *t+1* were recorded in the outturns for year *t*; any subsequent transactions

[13] Each *exercice* (*χρήσις*) was thus longer than the fiscal year, which was identical to the *gestion* (*διαχείρισις*), which referred to payments and receipts made on a cash-basis.
[14] Thus, direct tax revenues for 1833 stand at 4.76 mil. drs.; of those, 1.87 mil. was collected in 1833; 2.58 mil. were collected in 1834 and the rest trickled into the public coffers over the subsequent eight years.

were netted out of the figures for year *t* and were added to the year when the receipt/payment was made.

The Greek extension period was considered inordinately long: accounts remained in limbo for 22 months, while authorities were reluctant to collect revenues by the end of the fiscal year, knowing that a full ten months were still available to them. To mitigate this, Zapelloni proposed switching to the Italian system by eliminating the extension period. This would force authorities to settle their accounts by the end of the fiscal year. Any outstanding balances would then be transferred to a separate set of accounts, called "active and passive residuals" (*residui attivi e passivi*) and monitored separately (Allix and Lambropoulos, 1931: pp. 82– 87; cf. Diomidis, 1905: pp. 216–229). Most significantly, payments into or out of those residuals would no longer be part of the expenditures or revenues of subsequent fiscal years. In other words, the proposed reform would not only eliminate the extension period, but delayed payments/receipts would no longer appear in subsequent outturns.

Greek lawmakers hesitated to embrace Zapelloni's proposals. Law 1555 of 1918 did not eliminate the extension period but shortened it to four months. At the same time, the fiscal year was shifted by three months, thus starting from 1.4 and lasting till 31.3 (of the year after); to produce this transition, fiscal year 1918 lasted for 15 months (1.1.1918 – 31.3.1919). Crucially (and unnecessarily, given the continued existence of an extension period), the new Law also introduced active and passive residuals. Hence, unlike those of the years 1846-1917, outturns after 1918 did *not* report revenues/expenditures of past (extended) fiscal years, as those were recorded separately. Any attempt to produce a consistent data series should address this discrepancy, by taking residuals into consideration. Unfortunately, residual payments/receipts are not reported in the interim outturn statements available for the 1935-39 period. Thus, data for the years 1935-39 inevitably under-reports revenues (and some expenditures) by omitting the settlement of past claims and obligations.

A2.3 Operating revenues/expenses, transactions in assets and ad hoc payments/receipts

Published outturn statements invariably included transaction in assets which did *not* change the state's net worth. Today, such transactions are *not* considered operating revenues/expenses, and are recorded separately (IMF, 2014: p. 69). The distinction

between Category I and II introduced in the 1915 outturns solved the better part of the problem. Applying it retroactively on pre-1914 data, however, is challenging. While transactions in *real* assets (e.g., land sales/purchases) are relatively minor, the same is not true of transactions in *financial* assets, notably loans. Interest payments and transaction fees are expenditures, but regular principal repayments or lump-sum payments to extinguish outstanding debt are not. This distinction is *not* made in the Antoniou *et al*. (1999) data reproduced in the SEEMHN database, which misleadingly describes debt service as "interest payments".

Sovereign loans are *not* the only transaction in financial assets that appear on the Greek budget. The state also advanced funds to other entities, such as railways and municipal authorities and helped raise capital for new public enterprises (e.g., the Agricultural Bank of Greece). Other *ad hoc* payments and receipts causing "irregular" spikes in the data include war reparations, foreign aid and the revenues raised in territories under military occupation. Each of those needs to be considered separately, depending on the requirements of the data series generated.

A2.4 Classification and reclassification of items

Any data series constructed from more than a century's worth of data is bound to face classification challenges: some items split up into multiple entries, others get merged or reshuffled over time. Most of these changes are innocuous and can be ignored at higher levels of aggregation. Some present more serious challenges, especially when items straddle different categories that defy classification.

The most frustrating cases involve problems inherent in the way accounts were held over several years. A good example is the additional expenditure associated with the devaluation of the drachma, whenever debt service payments were made in gold or foreign exchange. Such expenses were usually lumped under a single heading dubbed "monetary difference", that included both interest and principal.

Then there are temporary classification problems, caused by ad hoc changes. Thus, an emergency measure raising all taxes by a few points in 1925 led to a single entry comprising *all* additional revenue, regardless of the underlying tax source. This cannot be classified as either direct or indirect taxation. Similarly, revenues raised in

territories that had just been added to the Greek state were sometimes included as a single entry, without further breakdown.

Last, there are classification problems caused by missing data. To give another example, army and navy pensions, recorded separately until fiscal year 1934, suddenly became grouped with civilian pensions in 1935-39. Consistent military expenditure estimates thus required extrapolation based on the pre-1934 allocation between military and civilian pensions.

A2.5 Changes in units of account and the distinction between gold and paper drachmas

While outturn statements were all published in drachmas, not all drachmas were created equal. Greece joined the Latin Monetary Union in 1867, but only introduced the new drachma in 1882. The new monetary unit was 1.1168 times more valuable, which was the conversion necessary to make the gold drachma equivalent to the French franc. Outturn figures for 1833-1881 are thus expressed in old drachmas and need to be divided by 1.1168 to convert them to the 1882-1944 drachmas.

While the gold drachma was set on par with the French franc, *paper* drachmas circulating domestically were worth less during periods of inconvertibility, which were the rule, rather than the exception (Lazaretou, 2005; 2014). Thus, payments (or receipts) in foreign exchange corresponded to more paper drachmas. Treatment of this difference in public accounts was somewhat uneven: while some entries record the paper drachma equivalent, others record figures in gold drachmas and shift the difference into an aggregate "monetary difference" record (as in the case of interest and principal payments, mentioned above).

A2.6 Off-budget items: special funds

The existence of off-budget items is familiar to anyone studying the history of public finance. An oft-used method of keeping some transactions off-budget was the creation of a special fund (*ταμείον*), with its own revenue and expenditure streams. Their rationale was to ensure that funds earmarked for specific purposes (e.g. roadbuilding) were not diverted elsewhere. In practice, these funds undermined the integrity of the budgeting process and led to aggregate revenues and expenditures being underreported.

Two such funds are particularly important for the purposes of this paper: the National Navy Fund (NNF, est. 1900; Law 2774 [ΒΨΟΔ]) and the National Defense Fund (NDF, est. 1904; Law 3027 [ΓΚΖ]), both set up with a view to boosting defense expenditure. Private contributions and endowments aside, their main source of revenue were tranches of various taxes, e.g. the NDF received 10% of all tariff revenue. Occasionally, at times of emergencies, additional funds were transferred to them from the budget. Fortunately, both regular and irregular transfers were recorded as Ministry of Finance expenditures, so this type of military spending can be reconstructed from the outturn statements.

A3. Constructing the revenue series

A3.1 Focusing on the distinction between tax and other revenues

Per item revenues recorded in the Prontzas *et al*. (2011) data appendix were used to construct the revenue series used in the paper; aggregates were cross-checked against the Zapelloni series and published outturns. The numbers for fiscal year 1936-37 were found problematic and replaced by those in the published outturns.[15] Data for the period 1833-42 and 1845 were also amended on the basis of published outturns, due to discrepancies in the Prontzas *et al*. data. Each individual revenue stream was classified into one of eight groups, shown in the table below (details are available in the accompanying spreadsheet "Revenues"):

R. Revenues		
RT. Tax revenues		
RT1. Direct tax revenues	TaxD	Include most land/rural production taxes, as well as corporate, employment and income taxes.
RT2. Indirect tax revenues	TaxI	Excise duties, consumption taxes, sales taxes, tariffs, export duties and state monopoly revenues.
RT3. Tax revenues not classified	TaxN	Tax revenues that defy classification (e.g. "tax revenues from the island of Samos").
RO. Other revenues / receipts		
RO1. Non-tax revenues	NonTax	Revenues from fines/dues, income derived from state assets (rents, interest, licenses, etc.), receipts from the sale of state property, provision of services, etc.
RO2. Loans	Loan	Receipts from loans, foreign or domestic; includes both new loans issued by the Greek state and principal repayments on advances made by the state to third parties.

[15] The Prontzas *et al.* (2011) data appears to be relying on a Provisional Statement of Revenues and Expenditures covering the period from April 1, 1936 to February 28, 1937, thus falling one month short of the full year; the data was updated on the basis of the Provisional Statement published later in 1937, which included the March outturns.

RO3. Reparations & allied/foreign aid	Reparation	Receipts due to foreign/allied aid and reparations.
4. Other	Other	Other receipts (e.g. revenue from areas occupied by the Greek army, but not belonging to Greece).
RA. Arrears	Arrears	Revenues of past (extended) fiscal years

Given the paper's focus on fiscal capacity, as proxied by tax revenues, emphasis was placed on distinguishing between taxes and everything else. Taxes were divided into direct and indirect, based on their classification in the published outturns; the only exceptions were a handful of taxes that were reclassified over time, in which case the more recent classification was imposed. Unlike data in the SEEMHN database, tax revenues include state monopolies, which were used primarily for resource extraction.

A3.2 Adjustments necessary to produce a homogenous revenue series

As discussed in section 2, original outturn data for the 1833-1939 period was expressed in different currencies and followed different accounting practices. To derive the uniform series (details in the "Main" spreadsheet), the following adjustments were made:

- All figures were expressed in Latin Monetary Union (LMU) drachmas, so pre-1882 data was divided by 1.1168.
- Data for 1914 were published in two separate sections: one for Greece within its "old" borders and one for the new territories acquired after the Balkan wars; items were grouped by territory before producing a single number for the whole country.
- The 1918-19 fiscal year lasted from 1.1.918 to 31.3.1919, so figures were scaled by 12/15=0.8, to become comparable with other years. As of 1919-20, fiscal years started on April 1 and ran up to until March 31 of the next calendar year.
- Figures for the years 1833-45 were adjusted to correct for the fact that post-1845 "extended fiscal years" reflected a 22-month collection period, whereas previous "extended fiscal years" were almost indefinite.[16] The adjusted figures ensure that revenues for fiscal year *t* correspond to claims originating in *t* and collected in years *t* and *t+1* (24 months). Any subsequent receipts count

[16] This discrepancy explains why official "arrears" in the 1833-45 are negligible.

towards the "revenues of past (extended) fiscal years" (arrears) of the year when they are collected. The detailed adjustment is shown in Excel sheet "Rev adj. 1833-45".

- Revenues from past fiscal years were all grouped under the heading "arrears" and tracked separately. While most such revenues were derived from past taxes, they were ultimately excluded from the tax revenues series. Several factors contributed to this decision. First of all, it is usually impossible to distinguish between tax and non-tax arrears; adding the balance to taxes might thus inflate the estimate of fiscal capacity. Secondly, inasmuch as these revenues were influenced by the volume of outstanding claims, their relationship with fiscal capacity is debatable: an increase in arrears collected could reflect *either* an increase in overall arrears [reduced compliance], or an increase in collection efforts [increased enforcement]. Thirdly, after 1918, this type of revenue subsides and is replaced by receipts out of "active residuals", which are not recorded in the outturns. The figures could be adjusted accordingly, but not after 1935, because active residuals are not published in 1935-39. Excluding arrears throughout eliminates the need for this adjustment. Last but not least, on average, revenues from past fiscal years corresponded to approximately 3.5% of total revenues, so eliminating them was relatively harmless.

A4. Constructing the expenditure series

Data on expenditures were compiled from published *Statements of Revenues and Expenditures of the Greek state* for the fiscal years 1833-1939. Aggregates were cross-checked against Antoniou *et al*. (1999), as reproduced in SEEMHN, as well as the Zapelloni series. Total expenditures aside, emphasis was placed on two areas, namely military expenditures and debt service, which were then used to calculate two residual series of civilian expenditures.

A4.1 Military expenditures

The military expenditures series was compiled following the SIPRI/NATO definition of defense expenditure as payments made by a national government specifically

to meet the needs of its armed forces (or those of its allies).[17] Armed forces include land (army), maritime (naval) and air forces as well as any other forces trained in military tactics that could be deployed outside national territory (e.g. paramilitary forces trained and equipped for military operations). This is of some relevance to nineteenth century Greece, where funds were often channeled toward arming insurgents or paramilitary forces active within Ottoman territory.

In theory, the SIPRI/NATO definition includes all current and capital expenditure on military personnel (salaries, pensions and social services), operations and maintenance, procurement, infrastructure (e.g. military bases), etc. regardless of whether these are made from the Ministry of Defense budget, or through other ministries. On the other hand, civil defense and current expenditures on previous military activities, such as veterans' benefits, demobilization, conversion and weapon destruction are excluded.

In practice, it is not always possible to distinguish between military and civilian outlays. Priority was thus given to maintaining consistency over time. The baseline series comprised spending by the three defense ministries; additional components include military pensions and transfers to special defense funds (section A2.6).[18] The main components of the new series are described in the table below, with details available in the spreadsheet "Military Expenditure".

Land Forces	ARM	Spending by the Ministry of the Army (Υπουργείο Στρατιωτικών).
National Defense Fund	NDF	Funds allocated by the Ministry of Finance to the special fund (1904-19); after 1919, these allocations were included in the budget of the Ministry of the Army.
Maritime Forces	NAV	Spending by the Ministry of the Navy (Υπουργείο Ναυτικών); includes spending on commercial shipping until 1936-37, when a separate Deputy Ministry of Commercial Shipping (Υφυπουργείο Εμπορικής Ναυτιλίας) appeared. Given how the new Deputy Ministry only spent approx. 1.5% of total military expenditures in 1937-40, its impact on 1833-1937 data was negligible.
National Navy Fund	NNF	Funds allocated by the Ministry of Finance to the special fund (1904-19); after 1919, these allocations were included in the budget of the Ministry of the Navy.
Air forces	AIR	Spending by the Ministry of Air (Υπουργείο Αεροπορίας); appears in 1930-31.
Pensions	PEN	Pensions paid to military personnel (army and navy) by the Ministry of Finance. Includes pensions to veterans, widows and orphans of the War of Greek Independence; excl. pensions to "war victims" after 1925-26. Data for 1935-40 are estimates, since interim outturns did not distinguish between types of pensions.
Various expenditures	VAR	Administrative outlays, e.g. conscription expenses by the Ministry of Interior, etc.

[17] See https://www.sipri.org/databases/milex/sources-and-methods.

[18] Note that Special Funds also had their own revenue streams from private sources (e.g. endowments), which usually financed procurement. However, this spending was not part of *public* expenditures, nor did it matter for the purposes of this paper, which emphasizes those military expenditures generating "pressure" on the government to secure additional revenues.

A4.2 Debt service

Section A2.3 explained how one of the main challenges presented by historical public finance series was that "debt service" expenditures contain both interest and principal outlays: while the former constitute expenditure, the latter do not alter the state's net worth and should not be considered expenditures. Similarly, loans advanced to third parties (e.g. public enterprises) or purchases of real assets are also erroneously recorded as expenses, and should be treated separately.

To tackle the above challenge, all debt service transactions recorded in the published outturns were transcribed and classified into five types; details are provided in the spreadsheet "Debt Service".

Interest	INT	Interest payments on loans (paid).
Fees & commissions	FEE	Transactions fees & commissions related to the management of public debt.
Amortization	AMO	Combined interest and principal payments (τοκοχρεολύσια); includes those debt service expenses where the nature of the expense is unclear.
Principal repaid	PRI	(Regular) payments of principal (χρεολύσια).
Debt pay-off	PAY	(*Ad hoc*) Lump sum debt repayments.
Monetary difference	MON	Additional expenditure associated with the devaluation of the drachma, whenever debt service payments were made in gold (or foreign exchange); combine both interest and principal payments.
Reparations	REP	War reparations for London Protocol (1832) and Treaty of Constantinople (1897).
Other	OTH	Loans/advances to private/public enterprises & entities (railways, pension funds, the Refugee Settlement Commission, banks, etc.), purchases of railway shares (stock), etc.

Two of these expenditure types combine both interest and principal payments: amortization and the so-called "monetary difference" due to the drachma devaluation. The first is easier to tackle: interest payments dominate amortization, which can thus be classified as an expenditure (unlike principal payments and debt paid off, which do not affect the state's net worth). The additional cost due to the drachma's devaluation can be allocated proportionately between interest and principal, provided only loans paid in gold or foreign exchange are taken into consideration. For this allocation to be possible, the currency in which payments were made was also recorded for each type of transaction.

Data was also compiled on two other types of *ad hoc* transactions: reparation payments and other non-expenditures. This last category comprises loans to various private or public enterprises and entities; they are usually ad hoc transactions that did not change the state's net worth and/or were included in the budget for accounting

purposes. On the other hand, purchases of real assets (such as land) were not recorded systematically and remain part of public spending, even though they do not affect the state's net worth.

A4.3 Civilian expenditures

Having identified military expenditures and divided debt service between interest payments – which constitute expenditures – and non-expenditures such as principal repayments, loans to third parties, etc. we can calculate civilian expenditures residually. If interest payments are also excluded, then we can focus on primary expenditures (i.e. net of any debt service). The calculations are shown in the table below, which provides an overview of all the aggregate expenditure series derived:

E. Expenditures	
M. Military expenditures	ARM + NDF + NAV + NNF + AIR + PEN + VAR
D. Debt service	
D1. Interest Payments	INT + FEE + AMO + (part of) MON; the expenditure part of debt service
D2. Principal payments	PRI + PAY + (part of) MON; the non-expenditure part of debt service
O. Other non-expenditures	REP + OTH (non-expenditures)
C. Civilian expenditures	Expenditures (E) – Military expenditures (M) – Principal Payments (D.2) – Other non-expenditures (O)
CP. Primary civilian expenditures	Expenditures (E) – Military expenditures (M) – Debt service (D) – Other non-expenditures (O)

A4.4 Adjustments necessary to produce homogenous expenditure series

As discussed in section 2, original outturn data for the 1833-1939 period was expressed in different currencies and followed different accounting practices. To derive the uniform expenditure series (shown on Excel Sheet "Main"), the following adjustments were also made:

- All figures were expressed in Latin Monetary Union (LMU) drachmas, so pre-1882 data is divided by 1.1168.
- Data on 1914 were published in two separate sections: one for Greece within its "old" borders and one for the new territories acquired after the Balkan

wars; items were grouped by territory before producing a single number for the whole country.

- The 1918-19 fiscal year lasted from 1.1.1918 to 31.3.1919, so figures were scaled by 15/12, to become comparable with other years. As of 1919-20, fiscal years started on April 1 and ran up to until March 31 of the next calendar year.

- As in the case for revenues, figures for 1833-45 were adjusted to correct for the fact that post-1845 "extended fiscal years" reflected a 22-month payment period, whereas previous "extended fiscal years" were almost indefinite. The adjusted figures ensure that expenditures for fiscal year *t* correspond to liabilities originating in *t* and settled in years *t* and *t+1* (24 months). Any subsequent payments count towards the "expenditures of past (extended) fiscal years" (arrears) of the year when they are settled. Excel sheet "Exp adj. 1833-45".

- As explained in section A3.2 above, Law 1555 of 1918 introduced a separate set of active and passive residuals, wherein revenues/expenditures of past (extended) fiscal years were recorded; at the same time, outturn statements ceased to report most arrears. Thus, to bring post-1918 expenditure data in line with the 1846-1918 period, payments out of passive residuals were added to outturn expenditures for the years 1919-35. Unfortunately, passive residuals were not reported after 1935, introducing a discontinuity in the 1935-40 fiscal years. Details of the passive residual calculations are presented on Excel Sheet "Passive Residuals". No similar adjustment was made for revenues, because arrears are not included in our tax revenues series.

A5. GDP data and revenue/expenditure normalization

All GDP data used come from Kostelenos *et al*. (2007). For fiscal years after 1918, which lasted from 1.4 of year *t* to 31.3 of the year after (*t+1*), revenues and expenditures were normalized by a weighted average of the GDP of years *t* (0.75) and *t+1* (0.25).

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Appendix B: Militarized Interstate Disputes involving Greece, 1833-1939

The calculations underpinning Figure 1 are based on the MID database v. 5.0 (Palmer *et al.*, 2020); the number of sovereign states comes from Dedinger and Girard (2021). Rivalries are from Klein *et al.* (2006) and hostility levels follow the classification of Jones *et al*. (1996). The full list of disputes involving Greece is given in the table below; wars are highlighted in bold.

Year		Dispute name	MID	Greece		Counterparty/-ies			Rivalry
Start	End			H	F	Countries	H	F	
1850	1850	Don Pacifico Affair	71	1	:	UK	4	0	No
1854	1854	Blockade of Piraeus	2367	4	:	UK, FR (& TR)	3	0	No
1866	1866	Crete uprising I	1576	3	0	TR	1	0	TUR
1868	1869	Crete uprising II	1575	4	0	TR	4	0	TUR
1877	1877	(no name)	1574	3	0	TR	1	0	TUR
1878	1878	(no name)	1573	4	0	TR	3	0	TUR
1878	1878	Thessaly uprising	2835	1	0	TR	3	0	TUR
1880	1881	Treaty of Berlin/ Dulcigno incident	141	3	0	TR	3	0	TUR
1882	1882	Karalih	1571	4	:	TR	4	:	TUR
1885	1886	Bulgarian Ind/ce I	2836	4	:	TR	4	:	TUR
1886	1886	Blockade of Greece by Major powers	96	1	0	UK, GER, AH, IT, RU	4	0	No
1888	1888	(no name)	1739	3	0	TR	1	0	TUR
1896	1896	Crete insurrection	2837	4	0	UK, FR, GER, AH, IT, and RU	3	0	No
1897	**1897**	**Greco-Turkish War**	**1569**	**5**	**501-999**	**TR**	**5**	**>999**	**TUR**
1897	1897	Major power intervention in Crete	56	1	:	UK, FR, GER, AH, IT and RU	4	0	No
1909	1909	Crete Enosis with Greece	1249	1	0	TR	3	0	TUR
1912	**1913**	**First Balkan War**	**1250**	**5**	**>999**	**TR**	**5**	**>999**	**TUR**
1913	**1913**	**Second Balkan War**	**1251**	**5**	**>999**	**BG**	**5**	**>999**	**BG**
1914	1914	(no name)	3343	3	0	BG	1	0	BG
1914	1914	(no name)	3344	2	0	TR	3	0	TUR
1915	1917	Greece's entry into WWI	324	4	:	BG (and TR, GER)	4	:	BG, TUR
1916	1917	Allied pressure on Greece to enter WWI	323	4	1 to 25	UK, FR	4	1 to 25	No
1916	1916	French Occupation of Corfu	2648	1	:	FR	4	0	No
1917	**1918**	**World War I**	**257**	**5**	**>999**	**GER, AH, BG, TR**	**5**	**>999**	**BG, TUR**
1918	1919	French Intervention in the Crimean	2365	4	:	RU	4	:	No
1919	**1922**	**Greek Turkish war**	**1270**	**5**	**>999**	**TR**	**5**	**>999**	**TUR**

(continued on the next page)

Year		Dispute name	MID	Greece		Counterparty/-ies			Rivalry
Start	End			H	F	Countries	H	F	
1850	1850	Don Pacifico Affair	71	1	:	UK	4	0	No
1922	1922	Turkish nationalist occupation I	625	1	0	UK, FR	2	0	No
1923	1923	Corfu Incident	55	1	0	IT	4	0	No
1925	1925	Greek Patriarch	3183	3	0	TR	3	0	TUR
1925	1925	(no name)	1241	4	:	BG	4	:	BG
1928	1928	(no name)	3187	4	:	BG	1	1	BG
1931	1931	(no name)	3186	1	1	BG	4	0	BG

Notes: Years refer to the years when the dispute starts or ends (not exact dates); dispute names and MID codes, as in the MID database v.5.0. H stands for hostility level, which takes values 1: None, 2: Threat to use force, 3: Display of Force, 4: Use of Force, and 5: War; F stands for the number of battle-related fatalities; (:) means missing/no data. Country codes are AH: Austria-Hungary, BG: Bulgaria, FR: France, GER: Prussia/Germany, IT: Italy, RU: Russia/USSR, TR: Ottoman Empire/Turkey, and UK: United Kingdom. A separate level of hostilities and fatalities is reported for each side. Disputes are part of longer rivalries are identified in the Rivalry column, by the country with which the rivalry exists.

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Appendix C: Details of AR(n) estimation using indicator saturation

Table C1. *Detecting change: impulse saturation of an AR(n) model of military expenditure*

Dep. Variable	Military expenditure (Mt)		
	Coefficient	Std. Error	T-value
Mt-1	0.770	0.0347	22.20
I1879	0.179	0.0117	15.30
S1881	0.104	0.0123	5.69
S1882	-0.104	0.0125	-4.96
I1885	0.067	0.0118	6.90
I1887	-0.060	0.0121	-4.81
I1897	0.081	0.0117	-3.35
I1898	-0.058	0.0120	10.00
S1911	-0.068	0.0086	4.46
S1913	0.069	0.0085	3.90
I1916	-0.039	0.0118	8.44
I1918	0.120	0.0120	-8.32
I1919	0.053	0.0120	-7.92
I1921	0.047	0.0120	8.16
Constant	0.012	0.0041	2.95
Obs.	103	Adj. R^2	0.918
Mean (Mt)	0.0754	SE (Mt)	0.0402
F (14,88)	82.57 [p-value: 0.000]		

Note: AR model for M with fixed constant and up to 4 lags (hence 103 observations), impulse and step saturation at 0.1% significance, selected via autometrics algorithm. I*t* are impulse indicators equal to 1 *on* year *t*; S*t* are step indicators, equal to one until year *t* (thus, a negative sign suggests a step up and vice-versa).

Appendix D: Details of multi-equation estimates

D1. A three equation VAR(k) model

The VAR(k) model estimated was:

$$\boldsymbol{y}_t = \boldsymbol{a}_0 + \boldsymbol{A}_1 \boldsymbol{y}_{t-1} + \cdots + \boldsymbol{A}_k \boldsymbol{y}_{t-k} + \boldsymbol{C}\boldsymbol{w}_t + \boldsymbol{P}\boldsymbol{pw}_t + \boldsymbol{\Phi Z}_t + \boldsymbol{\varepsilon}_t$$

Where $\boldsymbol{y}_t = (TR_t, M_t, C_t)'$ is the vector of endogenous variables, where TR_t, M_t and C_t to denote tax revenues, military and civilian expenditures (as p.p. of GDP). $\boldsymbol{A}_i$ are 3×3 fixed coefficient matrices, $\boldsymbol{w}_t = (W_{1t}, W_{2t}, \dots, W_{nt})'$ and $\boldsymbol{pw}_t = (PW_{1t}, PW_{2t}, \dots, PW_{nt})'$ are vectors of indicator variables for the contemporaneous and legacy effects of each of n mobilisation episodes, while $\boldsymbol{C}$ and $\boldsymbol{P}$ are $3 \times n$ fixed coefficient matrices.

Each W_{it} takes the value one *during* episode *i*, while PW_{it} are step variables set to unity *after* episode *i* (total episodes *n*). Assuming the VAR(k) model is stable, i.e. , then the contemporaneous and long-run effect of each episode is more complex than in the AR model of section 5.1, because of the interactions between all three variables. Nevertheless, the contemporaneous effects still dissipate over time, while legacy effects persist.

As before, $\boldsymbol{Z}_t$ is a vector of controls. Controls only include exogenous effects, so they include the step indicators for the 1893 and 1932 defaults, as well as a dummy variable to single out the 1915-17 civil war. An additional dummy variable was included for 1934 to absorb an outlier in civilian expenditures, which in 1934 included two years of interest payments on debt (payments for 1933 were deferred, until a negotiation with the debtors could be concluded).

Several different lag structurers were tested (shifting the dataset to 1838-1939), but VAR(1) performed better. Table D1 shows the values of the basic information criteria for different lags; all criteria pointed to one lag.

Table D1. VAR *lag order selection information criteria*

Lag	0	1	2	3	4	5
LogL	-548.60	-476.02	-468.46	-461.43	-453.49	-442.97
Sequential modified LR	N/A	119.54	12.02	10.75	11.67	14.85
Final Prediction Error	22.92	*6.62	6.86	7.19	7.43	7.32
Akaike IC	11.64	*10.39	10.42	10.46	10.48	10.45
Schwarz IC	12.80	*11.78	12.04	12.31	12.56	12.77
Hannan-Quinn IC	12.11	*10.96	11.08	11.21	11.32	11.39

* denotes the lag order selected by the corresponding information criterion.

The full model output is reproduced in Table D2, while Table D3 shows the results of Granger causality/block exogeneity tests. VAR residuals were tested for normality, a common problem in VARs including multiple exogenous shocks that end up being mis-specified. The Jarque-Bera statistic was found to be 27.48 and the null hypothesis of multivariate normal residuals couldn't be rejected, even at the 10% significance. Residuals were orthogonalized using the inverse square root of their covariance matrix, as suggested by Urzua (1997), not least to guarantee that the results were invariant to the ordering of variables in the model.

Table D2. VAR(1) *regression estimates*

Dependent variable		RT_t Tax revenues	M_t Military exp.	C_t Civilian exp.
RT_{t-1}		***0.6940 (0.0698)	0.1188 (0.0832)	***0.2920 (0.0880)
M_{t-1}		0.0693 (0.0392)	***0.1772 (0.0466)	-0.0446 (0.0493)
C_{t-1}		-0.0501 (0.0862)	-0.2018 (0.1026)	***0.3241 (0.1086)
Constant		***3.2440 (0.7935)	***5.7258 (0.9449)	***4.2489 (0.9998)
Thessaly dispute	During	-0.8510 (0.7610)	***12.2234 (0.9063)	1.3726 (0.9589)
(1879-81)	After	0.5942 (0.7000)	-0.2644 (0.8336)	**2.0519 (0.8820)
"Peaceful war"	During	-0.3088 (1.0806)	***8.4138 (1.2869)	2.2103 (1.3617)
(1885-86)	After	1.2920 (0.8900)	0.7794 (1.0598)	0.9392 (1.1214)
Greek-Turkish war	During	-1.0540 (1.2882)	***8.3074 (1.5341)	1.6197 (1.6232)
1897	After	0.3252 (0.6555)	0.6875 (0.7806)	0.7472 (0.8259)
Balkan wars	During	**-1.8268 (0.8980	***9.0867 (1.0693)	0.1456 (1.1315)
(1912-13)	After	0.2668 (1.2692)	5.6844 (1.5114)	0.3851 (1.5992)
WWI & Greek-	During	-2.2714 (1.2974)	***5.2657 (1.5450)	2.2328 (1.6348)
Turkish war (1918-22)	After	***3.0574 (1.3328)	**-3.6572 (1.5871)	1.2115 (1.6793)
Trade crisis/default 1893		-0.3823 (0.8063)	-1.6823 (0.9601)	***-3.4424 (1.0159)
Civil war/Schism 1915-17		***-4.4652 (1.3652)	***-6.6927 (1.6258)	-2.0320 (1.7202)
Trade crisis/default 1931		***-2.2390 (0.6593)	-0.1513 (0.7851)	-1.0761 (0.8308)
1934 impulse indicator		0.1556 (1.2370)	-2.3549 (1.4731)	***5.9513 (1.5587)
Observations		102	102	102
R^2		0.9473	0.9042	0.8223

Notes: standard errors in (); *** 1% significance, ** 5% significance, * 10% significance

Table D3. VAR *Granger Causality/Block Exogeneity Wald Tests*

Dependent Variable:	Excluded	Chi-sq	df	Prob.	
Tax revenue	Military exp.	3.12858	1	0.0769	* M → TR
	Civilian exp.	0.337634	1	0.5612	
	All	3.158518	2	0.2061	
Military expenditures	Tax Revenues	2.040582	1	0.1532	
	Civilian exp.	3.86482	1	0.0493	** C → M
	All	3.97946	2	0.1367	
Civilian expenditures	Tax Revenues	11.01809	1	0.0009	*** TR → C
	Military Expenditures	0.817919	1	0.3658	
	All	13.16622	2	0.0014	

Notes: *** 1% significance, ** 5% significance, * 10% significance

D2. Using indicator saturation on the three equation model

Indicator saturation can be used to detect multiple breaks conjointly with all other aspects of model selection; in other words, it doesn't rest on the assumption that the model is correctly specified other than the breaks (Castle and Hendry, 2014). The method was used to estimate the three-equation model

$$\boldsymbol{y}_t = \boldsymbol{a}_0 + \boldsymbol{A}_1 \boldsymbol{y}_{t-1} + \cdots + \boldsymbol{A}_k \boldsymbol{y}_{t-k} + selected\ indicators + \boldsymbol{\varepsilon}_t$$

Where $\boldsymbol{y}_t = (TR_t, M_t, C_t)'$ is the vector of endogenous variables, where TR_t, M_t and C_t to denote tax revenues, military and civilian expenditures (as p.p. of GDP). With the help of impulse indicators, each data point was treated as a potential outlier (Castle *et al.*, 2012), while contiguous impulses of the same sign and magnitude can be replaced by step indicators (Castle *et al.*, 2015). A*utometrics*, a general-to-specific model selection algorithm (Doornik, 2009), was then used to find both the optimal level of lags (up to $k = 4$ lags were tested), and the smallest number of potential step and impulse indicators.

The search algorithm thus started with as many as 213 potenial regressors and estimated as many as 2,201 different models, selecting 32 initial regressors, which were subsequently narrowed down further to arrive at the specification presented in Table D4. To facilitate comparison with the VAR in Table D2, whenever possible, indicators have been named in similar fashion. Of course, this is not always possible since the algorithm selects indicators agnostically. Thus, a number of additional step and impulse indicators are included, while some coefficients need to be interpreted differently: e.g.

the 1885-86 episode was modelled as a step shift (not an impulse), which alters the interpretation of post-war 'legacy' effects (which are now the sum of the two coefficients). Finally, the algorithm treated 1914 as part of the Balkan wars, so the post-war effect could not be disentangled from the 1915-17 civil war.

Table D4. VAR(1) *regression estimates with indicator saturation and autometrics selection*

Dependent variable		RT_t Tax revenues	M_t Military exp.	C_t Civilian exp.
RT_{t-1}		***0.6024 (0.0749)	***0.2794 (0.0826)	***0.2775 (0.0897)
M_{t-1}		***0.1333 (0.0415)	***0.2056 (0.0457)	-0.0148 (0.0496)
C_{t-1}		-0.0618 (0.0829)	**-0.2251 (0.0912)	**0.252102 (0.0992)
Constant		*** 7.9035 (1.616)	**3.9405 (1.7800)	***6.5255 (1.9340)
Thessaly dispute	During	**-2.4974 (0.9815)	***9.8764 (1.0810)	0.8155 (1.1750)
(1879-81)	After	**2.8663 (0.0110)	***-0.1785 (1.2120)	1.2100 (1.3170)
"Peaceful war"	During†	-0.2776 (1.0390)	***8.3197 (1.1440)	*2.4455 (1.2430)
(1885-86)	After	**2.11029 (0.9320)	***-7.9804 (1.0270)	-1.0286 (1.1150)
Greek-Turkish war	During	-1.38887 (1.1390)	***7.9419 (1.2540)	0.8926 (1.3630)
1897	After	Not selected in model (insignificant)		
Balkan wars	During	**-1.69824 (0.7652)	***8.2439 (0.8429)	0.0292 (0.9157)
(1912-13, plus 1914)	After	Not distinguishable from 1915-17 civil war effect (see below)		
WWI & Greek-	During	1.37217 (0.9282)	***12.5717 (1.0220)	*** 4.0949 (1.1110)
Turkish war (1918-22)	After	***5.6253 (0.9832)	***-9.1069 (1.0830)	-0.9166 (1.1770)
Trade crisis/default 1893		0.0614 (0.6133)	**-1.3707 (0.6756)	*** -3.0337 (0.7340)
Civil war/Schism 1915-17		***-2.9020 (0.9106)	***-8.7476 (1.0030)	-1.8081 (1.090)
Trade crisis/default 1931		***-3.4422 (0.9370)	1.3334 (1.0320)	***- 4.0991(1.1210)
1934 impulse indicator		-0.0870 (1.1930)	-1.9805 (1.3140)	*** 5.6808 (1.4280)
1834 impulse indicator		-1.3310 (1.2740)	***5.2633 (1.4030)	0.3607 (1.5250)
1879 impulse indicator		**3.1100 (1.4990)	***6.6097 (1.6510)	0.8484 (1.7940)
1837/38 step indicator		-0.4605 (0.7423)	***-3.5143 (0.8177)	0.1870 (0.8883)
1926/27 step indicator		**2.3473 (1.0770)	***-3.7425 (1.1870)	1.9649 (1.2890)
1928/29 step indicator		0.0039 (1.1170)	0.6206 (1.2300)	*** 5.8013 (1.3360)
Observations		106	106	106
Mean (dep. var.)		13.41	7.70	12.65
Standard error (dep. var.)		4.4615	4.0972	3.0882
R^2		0.9509	0.9294	0. 8533

Notes: † the 1885-86 episode is modelled as a step (not an impulse) indicator; standard errors in (); *** 1% significance, ** 5% significance, * 10% significance

As before, VAR residuals were orthogonalized using the inverse square root of their covariance matrix and tested for normality; the Jarque-Bera statistic was found to be 17.74, showing no evidence of non-normality. Tests for heteroskedasticity and autocorrelation (up to 5 lags) also found no evidence of non-spherical disturbances. Since the new model includes additional indicator variables, compared to the VAR in D2, it's diagnostic performance comes as no surprise. The results of the Granger causality tests in Table D5 are also broadly in line with those in Table D3, with the additional finding of a potential tax-and-spend effect of taxes on military outlays. Most importantly, the

effect of military expenditures on taxation is confirmed, as is the fact that no similar effect appears to be present for civilian outlays.

Table D5. VAR *Granger Causality/Block Exogeneity Wald Tests*

Dependent Variable:	Excluded	Chi-sq	df	Prob.	
Tax revenue	Military exp.	10.3366	1	0.0013	*** M → TR
	Civilian exp.	0.5557	1	0.4560	
	All	10.3398	2	0.0057	
Military expenditures	Tax Revenues	11.4542	1	0.0007	*** TR → M
	Civilian exp.	6.0822	1	0.0137	** C → M
	All	12.3453	2	0.0021	
Civilian expenditures	Tax Revenues	9.5710	1	0.0020	*** TR → C
	Military Expenditures	0.0888	1	0.7657	
	All	9.7493	2	0.0076	

Notes: *** 1% significance, ** 5% significance, * 10% significance

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